Golden Jubilee 1975-2025

COMPENDIUM

KSCST - 50 Years of Excellence:
"Celebrating the Past, Shaping the Future"

KSCST
Celebrating Golden Jubilee 1975 - 2025

Karnataka State Council for Science and Technology

Compendium on KSCST 50 Years of Excellence:

Celebrating the Past, Shaping the Future

Released on the occasion of
the KSCST Golden Jubilee Celebration

Karnataka State Council for Science and Technology
Indian Institute of Science Campus, Bengaluru - 12

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Acknowledgements

As Karnataka State Council for Science and Technology (KSCST) celebrates five decades of innovation and impact, we extend our deepest gratitude to all those who have made this journey possible.

We gratefully acknowledge the invaluable collaboration, guidance, and unwavering support of numerous premier organizations and institutions. We extend our sincere thanks to the Department of Science and Technology (DST), Government of India and the Government of Karnataka for their financial support, encouragement and guidance throughout the years. We are especially thankful to the Indian Institute of Science (IISc) for its enduring academic and research partnership since KSCST's inception.

We express our sincere appreciation for the collaborative spirit and significant contributions of esteemed institutions, including the IITs, NITs, universities, Heads of State Science and Technology Councils, former and present heads of the SSTP program of DST - GoI, research organizations and professional bodies, who have worked closely with KSCST over the past 50 years.

Our heartfelt thanks also extend to our partner organizations, collaborating agencies, Zilla Panchayats, engineering colleges and universities, academic institutions, Science Centres functioning at district level, NGOs, industries, and grassroots innovators. Your instrumental roles have been pivotal in the success of our diverse programs and initiatives.

We also recognize and appreciate the dedicated efforts of past and present Members of the Executive Committee, AGM, Former Secretaries, Executive Secretaries, Project Investigators, Coordinators, Professors, Deans, Chief Scientific Officers, research scholars and all officials across various departments, including those at the Indian Institute of Science, as well as all other stakeholders. Your contributions have profoundly enriched KSCST's journey and success of projects and programmes.

We are deeply grateful for the collaboration and support of the following organizations:

- Karnataka Science and Technology Promotion Society (KSTePS)
- Visvesvaraya Technological University (VTU)
- Karnataka Residential Educational Institutions Society (KREIS)
- Scheduled Tribes Welfare Department (STWD)
- Karnataka State Bioenergy Development Board (KSBDB)
- Bangalore Water Supply and Sewerage Board (BWSSB)
- Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)
- Jawaharlal Nehru Planetarium (JNP)

- Planning, Programme Monitoring and Statistics Department, GoK
- Department of Information Technology and Biotechnology
- Karnataka Information Technology Services (KITS)
- Bangalore Development Authority (BDA)
- University of Agricultural Sciences, Bangalore, Dharwar, Bagalkot
- National Dairy Research Institute (NDRI)
- Department of Collegiate Education
- Department of State Educational Research and Training (DSERT)
- Line Departments of Government of Karnataka
- Survey of India
- Karnataka Science and Technology Academy (KSTA)
- Karnataka State Remote Sensing Applications Centre (KSRSAC)
- ICAR-National Bureau of Soil Survey and Land Use Planning (NBSSLUP)
- CSIR - Central Food Technological Research Institute (CFTRI)
- CSIR - National Aerospace Laboratories (NAL)
- Hindustan Aeronautics Limited (HAL)
- REC Limited, New Delhi
- National Research Development Corporation (NRDC)
- Indian Institute of Horticultural Research (IIHR)
- Department of Archaeology, Museums and Heritage (DAMH)
- Artificial Intelligence and Robotics Technology Park (ART-Park), IISc

Their continued association and contributions have been instrumental in the success of KSCST's programs, projects and initiatives, helping us to achieve our goals and make a lasting impact.

Shri. Siddaramaiah
Hon'ble Chief Minister
Government of Karnataka

Government of Karnataka
Vidhana Soudha, Bengaluru -01

Message

It is with immense pride and joy that I extend my warmest greetings to the Karnataka State Council for Science and Technology (KSCST) on the occasion of its **Golden Jubilee Celebrations,** marking 50 years of dedicated service to the State and the Nation.

Since its inception in 1975, KSCST has been a pioneer in promoting Science, Technology and Innovation for the sustainable development of Karnataka. Through its collaborations with academic institutions, industries, Government departments and rural communities, the Council has translated research into practical solutions that have improved lives, preserved our heritage and fostered progress.

Over the decades, KSCST's achievements - from grassroots innovations and student project programmes to advanced initiatives in geospatial technologies, environmental management, renewable energy and digital heritage documentation - have reflected the State's commitment to applying knowledge for societal benefit. Its ability to bridge scientific research with real-world challenges has made it a model institution in the country.

As we celebrate this milestone, we not only look back with pride but also look ahead with renewed determination. The future calls for greater efforts in climate resilience, sustainable urban planning, rural technology dissemination, AI and digital transformation and the nurturing of young innovators. I am confident that KSCST will continue to lead with vision, integrity and dedication, aligning with the aspirations of Karnataka's people and the goals of our government.

On behalf of the Government of Karnataka, I extend my heartfelt congratulations to KSCST for its remarkable contributions to the advancement of science and technology. I urge the organisation to continue its outstanding efforts towards fostering inclusive growth through innovation. May this Golden Jubilee serve as a proud milestone and a springboard for even greater achievements in the years ahead.

Siddaramaiah

(Siddaramaiah)

N.S. BOSERAJU
Minister for Minor Irrigation,
Science and Technology and
Kodagu District Incharge Minister

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Vikasa Soudha,
Bengaluru - 560 001
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080-22034110

No: MI,S&T/M/05/2025

Message

Date: 11|11|2025

It gives me great pride and joy to join the Karnataka State Council for Science & Technology (KSCST) in celebrating its Golden Jubilee, marking fifty years of remarkable service to Karnataka's progress in science, technology, and innovation. Since its establishment in 1975, KSCST has been a unique institution that bridges scientific research with societal needs, working in close partnership with the Government of Karnataka, academic institutions, industries, and communities.

For fifty years, KSCST has exemplified excellence in fostering innovation, advancing scientific research, and nurturing the young talent of Karnataka. Its flagship Student Project Programme (SPP) continues to inspire thousands of budding innovators, while the Faculty Project Programme (FPP) enables academic researchers to translate student-led ideas into impactful socio-economic solutions. The Council's ongoing projects address diverse needs, from sickle-cell anaemia screening in tribal areas and establishing SHG/FPO enterprises for rural livelihoods, to setting up NTFP processing centres and operating a Patent Information Centre. It is also spearheading digital and geospatial initiatives such as the Natural Resources Data Management System (NRDMS), the Village Information System (VIS), the Karnataka Digital Museum, and water-technology interventions like rainwater harvesting and technical help desks. These are complemented by science outreach in rural schools, teacher training workshops, Children's Day initiatives, and regional centres such as Kalaburagi, creating a vibrant ecosystem of innovation, capacity-building, and societal transformation.

As we celebrate, this milestone, our vision must be forward-looking—embracing emerging technologies, addressing climate and environmental challenges, and ensuring that innovation reaches every section of society. I commend all past and present members of KSCST for their dedication, creativity, and service, and I assure the continued support of the Department of Science & Technology in realising our shared vision for Karnataka's sustainable, inclusive, and technology-driven future.

(N.S. Boseraju)

प्रो. गोविंदन रंगराजन
निदेशक
Prof. Govindan Rangarajan
Director

भारतीय विज्ञान संस्थान
बेंगलूरु – 560012, भारत
Indian Institute of Science
Bengaluru – 560 012, INDIA

Message

It is with great pleasure that I extend my warm congratulations to the Karnataka State Council for Science and Technology (KSCST) on the occasion of its Golden Jubilee. Completing fifty years of dedicated service to science, technology, and society is a remarkable achievement, and this milestone stands as a testament to the vision, perseverance, and impact of the Council.

Since its inception in 1975, KSCST has been at the forefront of applying scientific knowledge to address the real needs of Karnataka - fostering innovation, nurturing talent, and creating solutions that benefit communities across the State. From grassroots initiatives and student innovation programmes to advanced research in geospatial technologies, renewable energy, and digital heritage documentation, the Council's work has consistently demonstrated how science can be a powerful tool for inclusive development.

The Indian Institute of Science has had the privilege of working closely with KSCST since its early days, sharing expertise, infrastructure, and a commitment to excellence. This partnership has been mutually enriching, enabling both institutions to advance their mission of promoting knowledge-driven progress. We take pride in the Council's accomplishments and in its ability to adapt to emerging challenges while staying rooted in its mission.

As KSCST embarks on its next chapter, I wish it continued success in expanding its reach, embracing cutting-edge technologies, and inspiring the next generation of innovators. On behalf of IISc, I assure our continued collaboration and support in all future endeavours, so that together we can further strengthen Karnataka's leadership in science, technology, and innovation.

C. Rangarajan

(Prof. Govindan Rangarajan)
Director, Indian Institute of Science
Vice-President, KSCST

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सत्यमेव जयते

प्रो. अभय करंदीकर
Prof. Abhay Karandikar

सचिव
भारत सरकार
विज्ञान एवं प्रौद्योगिकी मंत्रालय
विज्ञान एवं प्रौद्योगिकी विभाग
Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology

08th October, 2025

MESSAGE

It gives me immense pleasure to extend my heartfelt congratulations to the Karnataka State Council for Science and Technology (KSCST) on the landmark occasion of its Golden Jubilee. Completing fifty years of dedicated service to the State and the Nation is a remarkable milestone that reflects KSCST's unwavering vision, sustained commitment, and significant contributions to the advancement of science, technology, and innovation.

As KSCST celebrates this proud milestone, it is also a moment to look ahead with renewed resolve and vision. In the journey towards Viksit Bharat@2047, the goal of building a scientifically empowered, innovation-driven, and self-reliant nation places a renewed responsibility on institutions like KSCST. The challenges and opportunities of our era ranging from climate resilience and sustainability to frontier technologies and inclusive development—demand transformative ideas, multidisciplinary collaboration, and a strong ecosystem that bridges science with society. With its rich legacy, I am confident that KSCST will continue to serve as a catalyst in knowledge-driven development.

On behalf of the Department of Science and Technology, Government of India, I convey my warm felicitations to KSCST on completing 50 glorious years and wish KSCST continued success in its future endeavours. May this Golden Jubilee serve not only as a celebration of past achievements but also as an inspiration for greater contributions towards realization of Viksit Bharat@2047.

(Abhay Karandikar)

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ಡಾ. ಎನ್. ಮಂಜುಳ, ಭಾ.ಆ.ಸೇ
ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿ

Dr. N. Manjula, IAS
Secretary to Government

GOVERNMENT OF KARNATAKA

ವಿದ್ಯುನ್ಮಾನ, ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ, ಜೈವಿಕ ತಂತ್ರಜ್ಞಾನ
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Department of Electronics, Information Technology Biotechnology and Science & Technology

MESSAGE

It is with great pride and a deep sense of appreciation that, I extend my warmest greetings to the Karnataka State Council for Science and Technology (KSCST) as it celebrates its Golden Jubilee. Completing fifty years of committed service is a remarkable achievement, and KSCST's journey stands as an inspiring example of how Science and Technology can meaningfully address societal challenges.

Over the past five decades, KSCST has consistently demonstrated the power of applied science in improving lives - from grassroots-level technological interventions to advanced programmes that support innovation, research, and digital transformation. Its contributions have touched diverse sectors, reinforcing the role of science and technology as catalysts for progress. The Government of Karnataka is proud that KSCST is an integral part of the Department of IT, BT and Science & Technology.

KSCST's commitment and expertise have also enabled the emergence of several key institutions in the State including the Karnataka State Natural Disaster Monitoring Centre (KSNDMC), Karnataka Rajya Vijnana Parishat (KRVP) and Karnataka Renewable Energy Development Limited (KREDL). These organisations now central to Karnataka's development landscape, draw their early foundations from the Council's vision, leadership and technical guidance. This legacy of institution-building is among KSCST's most profound contributions to Karnataka.

The Department of IT, BT and S&T has consistently supported KSCST financially and institutionally, so that its scientific strengths can be channelled into impactful programmes and interventions across the State. As Karnataka advances towards a future shaped by emerging technologies, climate resilience, digital governance and inclusive development, the role of KSCST will become even more vital.

On this momentous occasion of fifty years, I extend my heartfelt congratulations to all past and present members of KSCST the leadership, staff, project teams, and collaborators whose dedication has brought the Council to this milestone. I am confident that KSCST will continue to expand its horizons and remain a guiding force in the State's science and technology landscape.

I convey my best wishes for the Golden Jubilee celebrations and for many more decades of impactful service.

(Dr. N Manjula)
Secretary to Government
Department of Electronics, IT, BT and Science &Technology
Government of Karnataka

6ನೇ ಮಹಡಿ, ಗೇಟ್ ನಂ.5, ಬಹುಮಹಡಿಗಳ ಕಟ್ಟಡ, ಡಾ.ಬಿ.ಆರ್.ಅಂಬೇಡ್ಕರ್ ವೀಧಿ, ಬೆಂಗಳೂರು–560001, ಭಾರತ.
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☎ Tel : +91-80-22280562, 22374314, 22032434 ✉ **Email :** itbtsec@karnataka.gov.in

INNOVATE KARNATAKA

Prof. Ashok M Raichur
Secretary,
Karnataka State Council for Science and Technology

Karnataka State Council for Science and Technology
(An autonomous organisation under Dept. of Science and Technology, Government of Karnataka)

Message

It is a matter of deep satisfaction and pride for me, as Secretary of the Karnataka State Council for Science & Technology (KSCST), to witness the organisation celebrate its Golden Jubilee—fifty years of service, innovation, and impact. This milestone is not only a celebration of the Council's journey but also a tribute to the countless individuals, institutions, and communities who have contributed to making KSCST a pillar of science and technology advancement in Karnataka.

Over the years, KSCST has worked to bridge scientific knowledge with societal needs, delivering initiatives that promote innovation, sustainable development, and public awareness. Through sustained efforts in research promotion, capacity building, technology dissemination, and community engagement, the Council has reached diverse sections of society and inspired a culture of scientific thinking across the State.

These achievements have been possible due to the unwavering support of the Government of Karnataka, the leadership of our Hon'ble President, the Chief Minister of Karnataka, and the Minister for Science and Technology, Government of Karnataka. I express my sincere gratitude to the Department of Science and Technology, Government of India, and the Department of Science and Technology, Government of Karnataka, for their continuous encouragement, funding support, and policy guidance, which have been instrumental in shaping and sustaining our programmes. I also warmly thank the Director of the Indian Institute of Science, the Executive Committee, and the Annual General Meeting (AGM) members for their vision, technical expertise, and consistent support in steering the Council towards excellence.

As Secretary, I have always considered KSCST's mission my own, and I remain committed to ensuring our initiatives are both impactful and sustainable. Looking ahead, we must embrace emerging technologies, strengthen collaboration with academia and industry, empower young innovators, and continue addressing societal needs with creativity and compassion. With the same collective spirit that has defined our past, I am confident that KSCST will achieve even greater heights in the decades to come.

(Ashok M Raichur)

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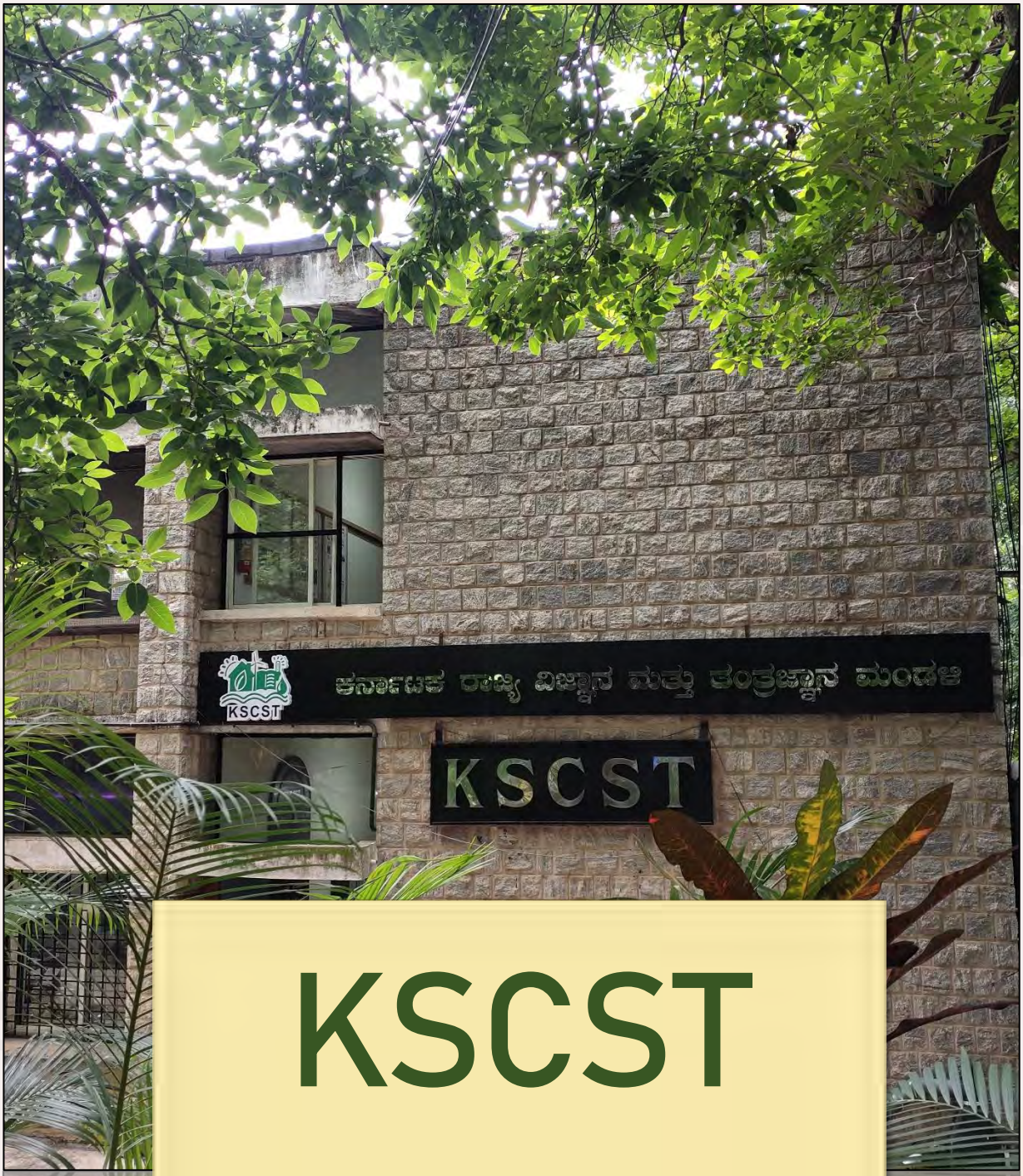

KSCST

50 Years of Excellence: Celebrating the Past, Shaping the Future

1975

KSCST the brain child of visionaries in Indian Institute of Science and administrators of the Government of Karnataka was established as registered society of Government of Karnataka

Karnataka has been one of the first States to establish a State Council for Science and Technology. The Karnataka State Council for Science and Technology was formally inaugurated on **6 September 1975** by Shri D. Devaraj Urs, Chief Minister, who is also the president of the Council. The State Council has since been registered under the Karnataka Societies' Registration Act, 1960, as a Society of the Government of Karnataka.

While inaugurating the State Council, the Chief Minister exhorted the scientists and technologists to design simple but effective implements for use by farmers and suggested that energy problems in rural areas be tackled by the State Council. Low-cost housing and improvements in the design and performance of bicycles and bullock carts were identified by the Chief Minister as subjects worthy of investigation by the Council.

Prof. S. Dhawan, Vice-President of the Council and Chairman of the Executive Committee outlined the goals for the State Council and hoped that it would promote the application of technical skill to solve the problems of those who live below the poverty line. He emphasised the need for the active involvement of the decision making and implementing machineries of Government in the activities of the State Council. Prof. S. Dhawan also explained the methodology of work of the Council; namely, problem identification, constitution of Working Groups to find scientific solution to these problems followed by implementation by agencies and departments identified by Government.

Shri M. Y. Ghorpade, Minister for Finance and Vice President of the Council said that the constitution of such a council was a unique experiment in the proper utilisation of scientific knowledge to solve the problems of the state especially those of the poorer sections of society. To further this objective the State Council would strive to function with a rural bias.

Prof. A. K. N. Reddy, Member-Secretary designate, spelt in clear terms the methodology, strategy and plan of action of the State Council. He suggested a few projects as worthy of consideration by State Council, such as Energy planning in Karnataka, Handpumps for drinking water wells and the conservation of Bamboo resources. Many of these projects are now being funded by the State Council and work on them is in progress.

OBJECTIVES OF THE STATE COUNCIL

To identify areas for the application of Science and Technology to the development needs, objectives and goals of Karnataka, and, in particular, to the prevailing conditions of backwardness, rural unemployment and poverty;

To advise Government on the formulation of policies and measures, including technical, administrative and legal devices, which will promote such application to identified needs, objectives and goats - in particular to health, education and manpower utilisation with special emphasis on the development of human skills in the rural areas and in the slums; and which will promote the scientific management of the natural resources of the State;

To promote effective coordination and to develop and foster communication and other links between centres of scientific and technological research, Government agencies, farms and industries so that promising Research and Development work is initiated, promoted and effectively deployed in agriculture, in industry, in Government and elsewhere;

To initiate, support and coordinate applied research programmes in universities and other institutions in areas identified to be especially suitable for the application of Science and Technology;

To prepare Science and Technology Plans relevant to the development needs of the State;

To consider, and advise Government on, such other matters as are relevant to the application of Science and Technology to the problems of Karnataka State.

COMPOSITION OF THE EXECUTIVE COMMITTEE

Prof. Satish Dhawan, Chairman, Space Commission and Secretary to the Government of India, Department of Space and Director, Indian Institute of Science, Bangalore.	Chairman
Shri M. Y. Ghorpade, Minister for Finance, Government of Karnataka.	Member
Shri G. V. K. Rao, Chief Secretary, Government of Karnataka.	Member
Prof. V. Radhakrishnan, Director, Raman Research Institute, Bangalore.	Member
Dr. S. Ramaseshan, Deputy Director, National Aeronautical Laboratory, Bangalore.	Member
Shri D. J. Balaraj, Development Commissioner, Government of Karnataka.	Member
Shri T. R. Satischandran, Commissioner for Finance, Government of Karnataka.	Member
Prof. A. K. N. Reddy, Professor, Indian Institute of Science, Bangalore, and Convener, ASTRA, cell for the Application of Science and Technology to Rural Areas (Indian Institute of Science)	Member-Secretary

Constitution of KSCST as a Registered Society

G. ASVATHANARAYAN,
JOINT SECRETARY, & EX-OFFICIO
DIRECTOR OF EVALUATION AND MANPOWER
Planning Department

GOVERNMENT OF KARNATAKA

VIDHANA SOUDHA, BANGALORE
DATED 2nd Aug. 1975.

D.O. No.PD 4 PSS 72

Dear Prof. Reddy,

Sub: State Council for Research and Development - Constitution as a Registered Society.

- - -

Please recall the discussions held by the Finance Minister sometime ago about the constitution of a State Council for Research and Development as a registered Society to assist in the application of Science and Technology to the problems of Karnataka State. You might be aware that the Government have taken a decision to constitute this State Council as a registered Society.

Before the Society can be registered, the Memorandum of Association as well as the Rules and Regulations of the proposed State Council have to be finalised to invite comments from all members, so that at the first meeting of the State Council these could be adopted and the Society registered.

I am requesting the Secretary to the Chief Minister to indicate a date in the last week of August 1975 for holding the first meeting of the State Council. In the meantime, a draft of the Memorandum of Association and Rules and Regulations has been prepared in consultation with Shri T.R. Satischandran, Financial Commissioner. I am enclosing a copy for your perusal. It would be helpful if we could discuss this early so that the finalised draft can be put up to the Finance Minister and Chief Minister for approval before circulation.

With regards,

Yours sincerely,
Asvathanarayan

Prof. A.K.N. Reddy,
Professor,
Indian Institute of Science,
BANGALORE

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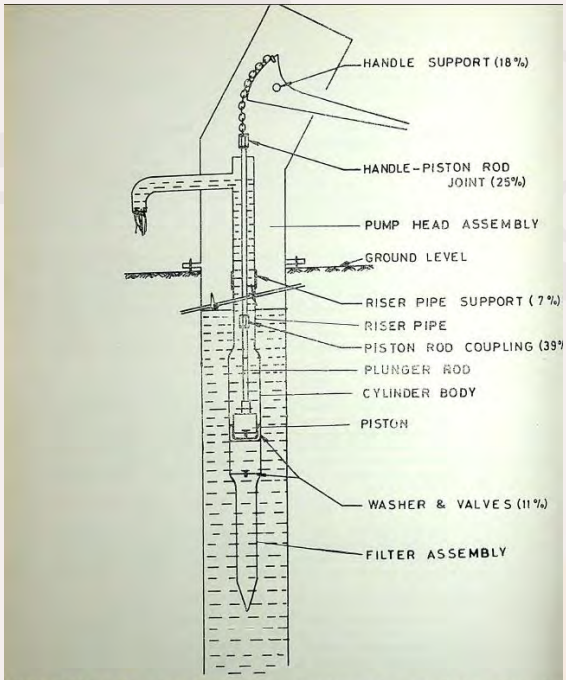
Constitution of KSCST as a Registered Society

KSCST Projects (1975-1976)

1) Handpumps for Drinking Water Wells

With support from UNICEF and WHO, the Government of Karnataka installed nearly 10,000 borewells with 8,000 handpumps by 1977 at a cost of Rs. 9.6 crores, aiming to provide safe drinking water in rural areas. However, frequent breakdowns—60–80% within 6–18 months—made much of the investment ineffective. Failures were traced to poor design, heavy daily use, deeper groundwater levels, and inadequate installation and maintenance. KSCST undertook detailed surveys and laboratory tests at IISc, introducing low-cost modifications such as spring washers, nylock nuts, and better pipe joints. Field trials of improved pumps showed encouraging results, and new designs like the oscillating liquid column pump were explored for local manufacturing. A computerized repair data system and monitoring framework were also developed to strengthen planning and long-term sustainability of rural water supply programs.



SKETCH OF HAND PUMP SHOWING PARTS WHICH FAIL AND FREQUENCY OF FAILURE.

2) Meteorology in the Service of Agriculture

Efforts were initiated to apply meteorological knowledge directly to farming practices. By linking weather patterns to agricultural planning, the project aimed to improve crop productivity and reduce risks associated with uncertain rainfall and climatic fluctuations.

3) Conservation of Bamboo Resources of Karnataka

Bamboo, traditionally the "poor man's timber," has gained industrial significance, especially for paper and rayon. However, natural stocks have severely declined due to poor regeneration, over-extraction, loss of forests, submersion from projects, overgrazing, and recurrent fires. For example, North Kanara's bamboo yield fell from an expected 30,000 tonnes to just 4,000 tonnes annually.

KSCST, under a working group led by Prof. Madhav Gadgil, initiated a project to conserve bamboo through natural and artificial regeneration, farm forestry, sustainable harvesting, and collaboration with industries. The project also promoted reconciling forest use and livelihoods, including developing sylvipastoral systems integrating fodder, biogas, and irrigation to support traditional cattle-herding communities while reducing pressure on bamboo resources.

4) Sandalwood Spike Disease

Sandalwood spike, a fatal disease caused by mycoplasma, has wiped out large areas of sandalwood forests. Research under this project focused on identifying disease-resistant clones, vegetative propagation, use of tissue culture, and large-scale

remote sensing to monitor disease spread. Studies also targeted the role of insect vectors. A budget of Rs. 14 lakhs were allocated for further detailed investigations.

5) Asthma Research

Asthma cases in Bangalore were found to be linked to exposure to pollen grains, fungal spores, and mites in the atmosphere. The project worked on preparing a pollen–spore calendar to track allergen peaks and correlating this data with clinical case records, under the guidance of the Asthma Research Society.

6) Elimination of Parthenium Weed

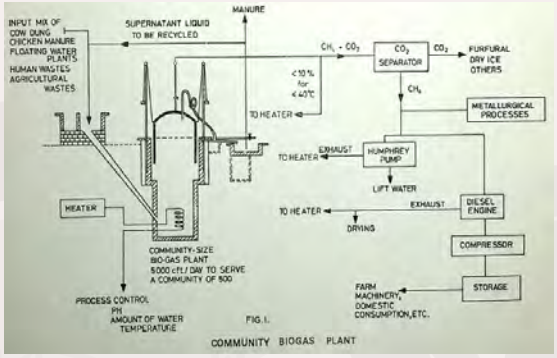
Parthenium hysterophorus, a rapidly spreading weed, covered nearly 35,000 hectares in Karnataka. It posed serious risks by suppressing crop growth and causing allergic dermatitis. Declared a noxious weed, the project undertook herbicide trials, weed distribution surveys, and preparation of ward-level action plans in Bangalore for its control and management.

7) Mosquito Control

Mosquitoes, particularly Culex and Aedes, created nuisance and spread disease in Bangalore. The project highlighted urban problems like blocked drains, waste disposal, and water stagnation that allowed mosquitoes to breed. Recommendations focused on environmental management—improving drainage, reducing breeding sites, introducing larvivorous fish like gambusia, and training municipal staff. Chemical measures were suggested only as a limited, supplementary step.

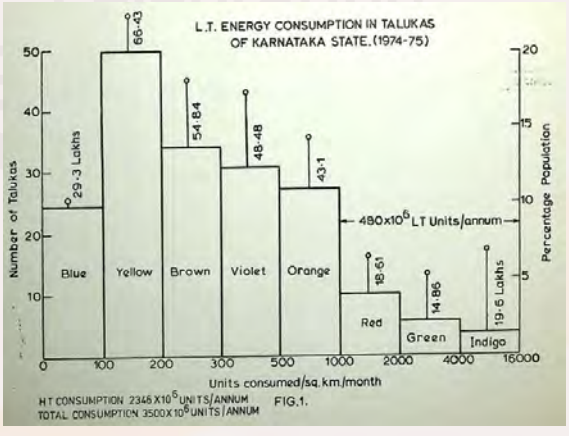
8) Community Biogas Plants

To overcome energy shortages, community-scale biogas plants with a capacity of 5,000 cu ft/day were studied. Research examined their technical feasibility, distribution of gas, end-use applications, and socio-economic acceptance. Field surveys were carried out, along with subsystem modelling and preparation of project reports for further implementation.



9) Energy Planning for Karnataka

An analysis of LT power consumption showed heavy imbalances between rural and urban areas. Bangalore alone accounted for 20% of LT consumption, while taluka-level rural use remained low. The study stressed the need for developing rural industries and rational power distribution before implementing major new projects like Kalinadi, to ensure balanced energy growth.



10) Substitute for CARE Food

CARE food supplied to school children as a nutrition aid was becoming unsustainable. CFTRI developed “Balahar,” a supplement produced from locally available raw

materials, to replace CARE food. The project promoted decentralized production units to enable large-scale supply for mid-day meal schemes, aiming to improve child nutrition while reducing dependence on foreign aid.

11) House Numbering System

A study was taken up to develop efficient house numbering methods to improve urban management. A proper system would help streamline postal services, utility connections, property tax collection, and planning of civic amenities.

12) Bangalore Bus Transport System

The study of Bangalore Transport Service revealed inefficiencies such as numerous routes with very low frequency and over-concentration of services at focal points. Recommendations included introducing nodal stations, city loops, area-to-area services, and stronger interconnections to improve coverage and reduce congestion.

13) Case Study of Dodda Gubbi Village Lake

Dodda Gubbi Lake near Bangalore was studied as a representative case of village water resources. The research focused on environmental conditions of the lake, community dependence, and measures for its conservation and sustainable management.

14) Environmental Impact of Big Dams

Large dam projects in Karnataka were studied for their environmental consequences. The research examined changes in ecology, hydrology, and local livelihoods caused by these projects, highlighting the need for balanced planning to minimize negative impacts.

15) Manpower Planning for Major Projects

This study focused on aligning manpower resources with major developmental projects. It emphasized systematic planning for recruitment, training, and utilization of skilled personnel to ensure timely execution and effective operation of large-scale programs.

16) Science and Technology Plan

A state-level Science and Technology plan was prepared to coordinate policies, guide research priorities, and ensure technology was directed toward Karnataka's socio-economic needs. The plan brought together multiple projects under a single framework for long-term development

KSCST Projects (1976-77)

1) Agroclimatology of Karnataka

The project, led by Dr. K. Ramakrishnan, University of Agricultural Sciences, focuses on transforming rainfall data into actionable information for agricultural planning. It aims to map rainfall distribution, rainy days, probabilities of dry/wet spells, drought analysis, and season commencement/cessation across taluks, districts, and the state. Initiated in 1976, the study uses daily rainfall data from multiple districts to estimate farming season length and guide cropping patterns. Initial results in Bangalore suggest the feasibility of double-cropping (cowpea followed by transplanted ragi), enhancing land-use efficiency under rainfed conditions. This work provides vital insights for optimizing crop planning in Karnataka's diverse agroclimatic zones.

2) Sandal Spike Disease

Sandalwood, of which Karnataka produces ~80% of India's supply, is gravely threatened by Spike disease caused by a mycoplasma and spread by insect vectors. Current measures (tetracycline injections, clearing undergrowth) only suppress or slow spread temporarily. KSCST launched a 3-year project (Convener: Dr. K. Ramakrishnan) to develop practical control through experimental transmission, vegetative propagation, and ecological studies. Since 1976, seeds have been collected, 50 grafts raised, insect vectors studied, and disease surveys in 14 forest areas completed. Mass screening for resistant seedlings and propagation research are ongoing.

3) Case Study of Dodda Gubbi Lake

KSCST studied this wetland (Hoskote Taluk) to assess water storage decline, land use, and ecological damage. Findings show depth reduced from 31 ft (1887) to 12 ft, heavy siltation from agriculture, inefficient water use in paddy, soil erosion and pesticide pollution, grazing impacts on littoral vegetation, and 16 ha of encroachment (out of 58 ha). Flora and fauna were documented. The Working Group, led by WWF's Zafar Futehally, recommended district-level rehabilitation of wetlands, starting with pilot tanks, stressing that Karnataka has over 90 such vulnerable ecosystems.

4) Asthma Research

Asthma in Bangalore was studied due to the belief that incidence is unusually high. Objectives: prepare a pollen–spore calendar and link allergens with asthma prevalence. A sampling apparatus was installed at six sites in 1976, with daily monitoring; a house-to-house survey in five localities found incidence 1.5% (normal). However, over 30% of patients reported relief when away from Bangalore, pointing to a strong environmental factor. Convened by Prof. B. R. Seshachar, the study highlights airborne allergens unique to Bangalore as a likely trigger.

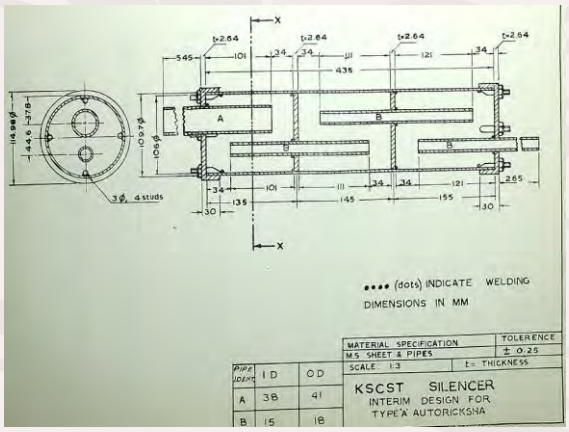
5) Elimination of Parthenium Weed

Declared noxious in Karnataka, Parthenium has spread rapidly (35,000 ha statewide; 3,200 ha in Bangalore). It causes dermatitis in 3–4% of people with exposure and is toxic to livestock. KSCST (Convener: Dr. Arakeri, UAS) supports chemical, biological, and toxicological studies. Manual uprooting, herbicide trials (Simazine, Atrazine, Igron-80, RH 8817), and city-level eradication campaigns are in progress.

Crop studies show negative impacts on germination and growth. Grazing trials caused toxicity and deaths in buffalo and calves; ongoing work is studying toxin excretion in milk and health impacts.

6) Silencers for Autorickshaws

Autorickshaws are a major source of noise pollution in Bangalore. KSCST (Convener: Dr. M. L. Munjal, IISc) investigated muffler improvements. Type A mufflers clog due to absorptive elements and lose efficiency; Type B mufflers perform consistently. A new Type A design without absorptive elements was created, matching thermodynamic and acoustic performance while being easy to install. Lab testing is complete; road tests are planned. The project seeks to cut city noise while keeping costs low and designs practical for adoption.



7) Community Biogas Plants

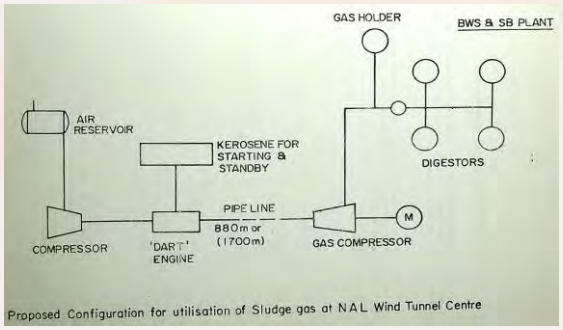
Study of a 5,000 cft/day community biogas plant, analyzing generation, distribution, utilization, and socio-economic aspects. Work covers reactor heating/control (due to seasonal temperature effects), alternative heating methods (methane, steam, exhaust), and simple control strategies. Distribution options include community kitchens and piped supply. Utilization is domestic, industrial, and agricultural. Social acceptance, pricing, and raw material collection are being assessed. Data from a 200 cft/day plant over six months provide performance insights for scaling up.

8) Energy Planning for Karnataka

A taluk-level study of LT electricity consumption (Convener: Prof. D. P. Sen Gupta, IISc) revealed electrification benefits remain marginal in backward taluks. Few households can afford domestic connections, irrigation is underutilized due to poor credit access, and industry is concentrated in cities. Recommendations: flat-rate rural tariffs (Rs. 3–5), easy credit for pump sets, taluk-based planning with backwardness/growth potential as criteria, and targeted industrial incentives. Employment-oriented indices were developed to guide energy-linked development.

9) Utilisation of Sludge Gas

Bangalore's two sewage plants produce large volumes of methane-rich sludge gas, currently flared. At Belur plant, gas output (3.5 lakh cft/day; 70% methane; 2.6 MW equivalent) could power gas turbines. KSCST and NAL prepared a proposal to use this gas to run a DART-7 aircraft engine driving compressors at NAL's Wind Tunnel Centre (12,700 kWh/day output, comparable to its current use). Leakages have been sealed, and DST support sought. Potential exists to replicate at other plants in Karnataka.



Proposed Configuration for utilisation of Sludge gas at N.A.L. Wind Tunnel Centre

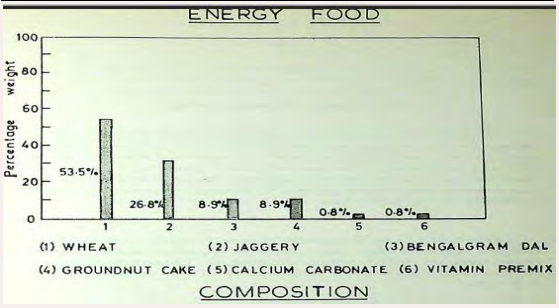
10) Wind Energy in Karnataka

Despite generally low wind speeds (5–15 kmph), KSCST initiated a study (Prof. R. Narasimha, IISc) to assess sites with viable potential. Work involves compiling wind speed, rainfall, and groundwater data to identify promising areas for wind energy use in the state.

11) Replacement of CARE Food

As CARE support for mid-day meals was being phased out, KSCST initiated a project (Convener: Dr. B. L. Amla, CFTRI) to find substitutes. CFTRI's "Energy Food" (roasted, ready-to-eat, low-cost) proved acceptable in a Chitradurga pilot. The government planned five 6-tonne/shift plants (Mysore, Chitradurga, Belgaum, Bellary, Raichur), producing ~24,000 tonnes annually to serve 600,000 children. Budgeted at Rs. 75 lakhs, the units were expected operational in one year.

Year	CARE (Pre-School)	CARE (School)	CARE (Total)	State (Pre-School)	State (School)	State (Total)	Grand Total (in Lakhs)
1974-75	4.50	7.48	11.98	-	-	-	11.98
1975-76	4.67	6.00	10.67	-	0.30	0.60	10.97
1976-77	4.77	5.70	10.47	0.48	0.97	1.45	11.92
1977-78	4.87	5.40	10.27	0.86	1.72	2.58	12.85
1978-79	5.00	5.00	10.00	1.32	2.65	3.97	13.97



12) Bangalore Transport Service (BTS)

Bangalore (~2 million people) depends on buses, but unplanned routes and schedules caused inefficiency. KSCST's Working Group (Convener: Prof. I. G. Sarma, IISc) studied BTS operations (1975–77) and issued six reports. Recommendations: strengthen area–focal node services (City Market, BBS, SBS), develop area nodal stations, rationalize interfocal routes, introduce loop services in business districts, and create intermediate/outer ring routes. Peak-hour solutions include express and diverted services. Integration of other bus fleets and even urban trains on existing rail lines were explored.

13) House Numbering System for Bangalore

Existing house numbering was confusing, especially in new layouts. KSCST's project (Convener: Dr. S. R. Valluri, NAL) proposed dividing the city into zones with local coordinates, sequential numbering by block, and odd/even sides of roads. A uniform mosaic map (5 cm = 1 km) is being developed from 100 survey maps at different scales. The new system will simplify house identification for citizens and government agencies.

14) Engineering College Projects Programme

KSCST expanded its projects beyond major institutes to tap talent in engineering colleges. About 150 B.E. projects were to be funded in 1977–78, addressing two key gaps: lack of funds and lack of relevant project topics. A Steering Committee (Director of Technical Education, principals) was set up. The program aimed to involve colleges statewide, link student work to Karnataka's needs, and widen participation in KSCST's activities.

KSCST Projects (1977-78)

1) Asthma Research

The Asthma Research Society of Bangalore, with KSCST support, undertook a systematic study of pollen and fungal spores in the city's atmosphere to investigate their role in asthma. Over eighteen months (July 1976–January 1978), air-spore surveys at eleven rooftop sites using Durham traps revealed peaks of grass pollen (September), Cassia (August), and Parthenium, and high counts of Cladosporium, Alternaria, and Helminthosporium spores. A comparative IISc study showed annual variation, with some species lower and others higher than the previous year. A large-scale survey covering 147,805 individuals showed a bronchial asthma incidence of 1.26% (ranging from 0.9% in Malleswaram to 2.7% in Chamarajpet), with most cases among the elderly. Gender patterns varied by age group, and housewives were most affected among women, while male office workers, students, and factory workers showed higher incidence. Attacks worsened in winter and rainy seasons, occurring mainly at night or early morning, but 42% of sufferers reported relief when leaving Bangalore—strongly pointing to local environmental triggers.

2) Elimination of the Noxious Weed Parthenium

Parthenium hysterophorus, introduced in 1956, has spread rapidly across Karnataka and other states, causing dermatitis in humans and threatening agriculture. Declared a noxious weed under the 1958 Act, its control was taken up by KSCST with Dr. H. R. Arakeri (UAS) as Convener. By May 1978, its spread in Karnataka was estimated at 31,666 ha, mainly on wastelands and roadsides (57%) and in towns (35%), with cropped land invasion still at 8%. Bijapur, Gulbarga, and Bangalore districts accounted for 78% of the incidence. Control efforts by the City Corporation and Agriculture Department, including uprooting, burning, weedicide use, and notices, had limited impact. UAS continued research on pre- and post-emergent herbicides, testing a wide range of chemicals. Some encouraging results were reported, but re-emergence control remains unresolved.

3) Silencers for Autorickshaws

Autorickshaw exhaust noise has long been a nuisance in Bangalore, with Type A vehicles (86% of fleet) being the main culprits. KSCST formed a Working Group under Dr. M. L. Munjal (IISc) to improve muffler designs. Type A silencers, which use absorptive materials, clog and lose efficiency, while Type B reactive silencers perform more reliably. Sound levels at drivers' ears reached 90–95 dB(A) at full throttle, carrying long-term hearing risks. Fourteen new silencers were designed and tested, and optimal models recommended. These reduce exhaust noise by about 10 dB(A) in Type A and 7 dB(A) in Type B, translating to an overall 5 dB(A) reduction, subjectively a 30% improvement. Manufacturers showed interest, and one model has been road tested. Surveys also confirmed that autorickshaws and buses are the city's leading sources of vehicle noise pollution.

Average value of the maximum noise emitted by motor vehicles

Vehicle Type	Percent Population	Noise Level at 5m (dB(A))	Loudness (Sones) S	Relative population factor (p)	Product S.P.	Percent Relative Annoyance
Buses	15	83.1	19.8	2.26	44.7	23.1
Motorcycles	9	82.1	18.4	1.94	35.7	18.5
Autorickshas	48	77.7	13.7	3.21	44.0	22.8
Tempos	5	76.6	13.6	1.62	22.1	11.4
Scooters	8	75.7	11.8	1.87	22.1	11.4
Cars, Jeeps	15	74.5	10.9	2.26	24.6	12.8

4) Toxicological Effects of Parthenium

Given its spread across Karnataka, KSCST supported detailed toxicology studies on Parthenium hysterophorus under Dr. P. V. Subba Rao (IISc). Feeding experiments in buffalo and bull calves showed both acute and chronic toxicity, with onset in 96 hours. Lesions such as oral and esophageal ulcers, kidney necrosis, and liver degeneration were observed, while buffaloes showed dermatitis. Goats too developed "Partheniosis" and died from chronic toxicity, though they were more resistant. Immunological tests confirmed that dermatitis was an allergic, cell-mediated response. Field surveys in Kolar revealed animals grazing Parthenium and showing symptoms. Experiments with ensiling Parthenium and maize for six months produced a silo that appeared non-toxic in preliminary one-month feeding trials, though further study is required. Several papers documenting this work have been published or communicated in national and international journals.

5) Community-size Biogas Plants

To reduce dependence on firewood and provide decentralized rural energy, KSCST initiated studies on community-scale biogas under Prof. A. K. N. Reddy (IISc). Surveys in Kunigal Taluk villages assessed dung availability, stove efficiency, and fuel use. An experimental plant at IISc showed yields of 34 cm^3 biogas per gram of wet dung, with sludge containing 2.16% nitrogen. In Pura village (340 population, 146 cattle), daily dung availability could generate 45 m^3 of gas—enough to replace the 570 kg of daily firewood use and run a 5 HP engine for pumping and electricity. Villagers expressed willingness to adopt the scheme, and a pilot community plant was proposed as a model for decentralized rural energy supply.

6) Study of LT Electrical Energy Utilisation in Karnataka

Recognizing the need for rational energy planning, KSCST's Working Group led by Prof. D. P. Sen Gupta (IISc) analyzed low-tension electricity distribution at the taluk level. Results showed electrification alone had little impact in backward taluks, with only 9–10% of villagers affording connections and irrigation underutilized due to lack of pump-set credit. Employment gains were minimal, and power utilization lagged in such regions, unlike advancing taluks. Recommendations included block-level metering instead of individual meters for rural lighting, easier credit for small farmers, taluk-based rather than district-based planning, and use of a priority list to guide both rural electrification and industrial policy. Employment-linked indices were suggested to encourage industries in backward taluks.

7) Utilisation of Wind Energy in Karnataka

Although Karnataka's average wind speeds are low (5–15 km/hr), KSCST initiated a project under Prof. R. Narasimha (IISc) to assess viable sites. Data was compiled and analyzed, showing variation across districts. For example, Gulbarga recorded 13.2 km/hr mean speed with 1,382 kWh/m² annual energy, while Bangalore showed 13.7 km/hr with 5,544 kWh/m². The study highlighted the potential of select pockets despite overall low averages. Future work will examine the suitability of different windmills for specific applications and formulate a state-level policy for wind energy utilization.

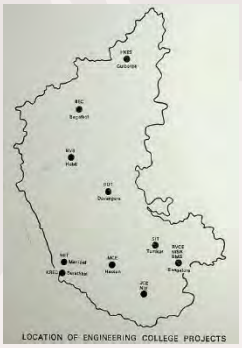
Sl. No.	District	Station	Annual-mean speed (km/hr.)	Annual energy content (KWH/m²)
1.	North Kanara	Honnavar	5.4	95
		Karwar	4.5	55
2.	South Kanara	Mangalore	8.4	356
3.	Belgaum	Belgaum	9.3	483
4.	Bidar	Bidar	13.3	1413
5.	Bijapur	Bijapur	8.3	344
6.	Dharwar	Gadag	11.4	890
7.	Gulbarga	Gulbarga	13.2	1382
8.	Raichur	Raichur	13.0	1320
9.	Bangalore	Bangalore (A)	13.7	5544
		Bangalore	11.5	914
10.	Bellary	Bellary	8.4	556
11.	Chickmagalur	Balehonur	4.0	58
12.	Chitradurga	Chitradurga	8.4	499
13.	Coorg	Mercara	11.0	800
14.	Hassan	Hassan	9.3	483
15.	Mysore	Mysore	10.6	716
16.	Shimoga	Shimoga	5.3	89

8) Popularisation of Science

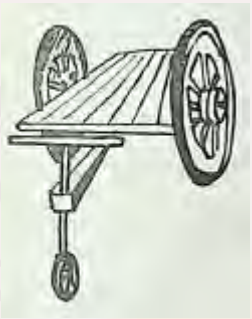
KSCST recognized that people's participation in development requires scientific awareness. Under Shri M. A. Sethu Rao, a Working Group was set up to popularize science, especially among schoolchildren. One of the first initiatives was a monthly Kannada science magazine for ages 10–15. About 250 writers contributed articles, and an editorial board under Prof. J. R. Lakshmana Rao produced an experimental issue of "Vijnana." 5,000 copies were distributed across schools in 19 districts for free, and evaluation forms were circulated.

With support from universities, schools, IISc, NAL, and voluntary organizations, the first formal issue was planned for October 1978.

9) Student Projects Programme



To broaden participation beyond major institutions, KSCST supported engineering student projects across the state. In 1978, 81 projects were funded in 13 engineering colleges with Rs. 1,06,164 released. Support included literature, expert guidance, and monitoring. A state-level seminar was planned for August 1978 to showcase and award 20 projects. Technology Centres were set up in colleges to coordinate activities and serve as nuclei for district-level science councils. The program was expanded to support III- and IV-year students and postgraduates, aiming to link education directly with Karnataka's developmental needs.



10) Bamboo Policy for Karnataka

Bamboo, once abundant, has declined sharply under rising industrial demand. A KSCST Working Group led by Prof. Madhav Gadgil (IISc) surveyed statewide resources and found annual harvests of 160,000 tonnes exceeding growth of 130,000 tonnes, leading to stock depletion. Paper mills in North Kanara faced drastic shortfalls. The group recommended halting new bamboo-based industry expansion until plantations restore balance, joint forestry–industry plantation programs, stricter fire and grazing controls, and improved silviculture and breeding of bamboo. These recommendations, endorsed by the Forest Department, are under Government consideration.

11) Sandalwood Spike Disease

Sandalwood, producing 80% of India's oil from Karnataka, is threatened by spike disease, caused by a mycoplasma and spread by insect vectors. KSCST's three-year project at UAS Bangalore focused on experimental transmission and propagation. Surveys of 53 forests found the disease in 16, with incidence up to 48%. Side grafting transmitted symptoms to seedlings within 60 days; dodder transmission was also tested. Over 5,500 cuttings were tried for vegetative propagation, with promising results from invigorated shoots and adventitious root shoots. Propagation by softwood cuttings under high humidity is being pursued, while other methods were abandoned. Mass screening for resistance continues, but all seedlings grafted so far developed symptoms.

12) Case Study of Dodda Gubbi Lake

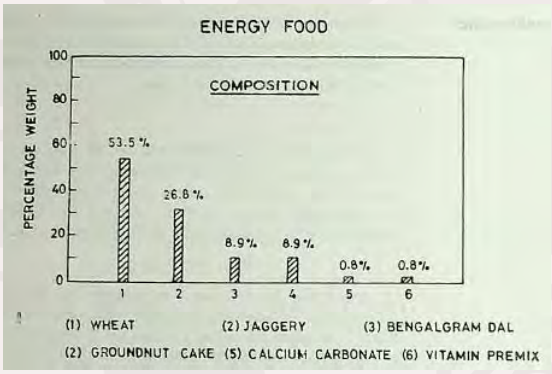
Dodda Gubbi Lake in Hoskote Taluk was studied by a group led by Mr. Zafar Futehally (WWF). Once 31 feet deep (c. 1887), it has shrunk to 12 feet due to siltation, paddy overuse, erosion, and encroachment of 16 ha out of 58. Littoral grazing reduced soil-binding vegetation, and pesticide pollution has increased. The study recommended perennial planting around the lake, embankment strengthening, and general ecological restoration, with lessons applicable to other Karnataka wetlands.

13) Choice of Technology for Groundnut Oil Extraction

Groundnut oil is a dietary staple, and Karnataka contributes about 10% of India's output. KSCST studied extraction technologies (traditional ghani, power ghani, expeller) under Prof. M. N. V. Nair (IIM). A social-cost analysis was inconclusive: expellers were favorable at 12% discount rates, but traditional ghanis at 14%. Capacity utilization in expellers was poor (~180 days/year), with cooperatives underperforming. Recommendations included improving ghani productivity, reconciling conflicting industry data, and carefully assessing secondary solvent extraction since it reduces oilcake nutritional value used for cattle feed.

14) Energy Food

To replace CARE mid-day meals, KSCST supported CFTRI's development of Energy Food, a roasted, ready-to-eat mix. Trials in Chitradurga proved popular. A feasibility report proposed 6 t/shift plants. The Government sanctioned five units at Mysore, Chitradurga, Belgaum, Bellary, and Raichur, each running two shifts to produce 24,000 tonnes annually, enough for 600,000 beneficiaries. Capital cost was Rs. 75 lakhs, with three plants scheduled by March 1979 and two more by September 1979.



15) Technology Improvements for Non-land Based Co-operative Activities (Bidadi Hobli)

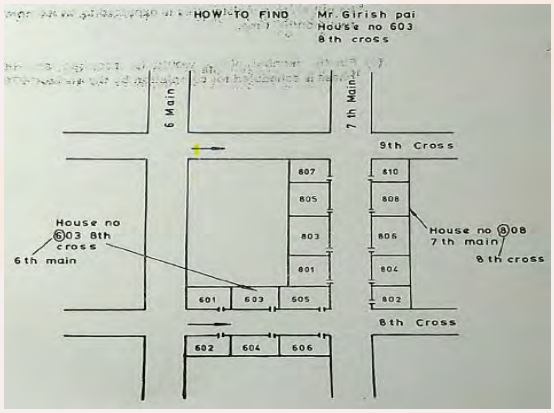
KSCST initiated a project under Dr. Vinod Vyasulu (IIM) to create livelihood opportunities for landless and marginal farmers through non-land activities. The study in Anchipura village focused on sisal utilization. Sisal leaf (80% juice, 2% fibre, 18% bagasse) can yield products such as tissue paper, wax, pharmaceuticals, and detergents. Work is ongoing to develop processes and find cooperative organizations to implement them. Surveys on employment, landholding, capital access, and nutrition were also undertaken.

16) Bangalore Bus Transport System

Bangalore's bus system, serving two million people, was reviewed by a KSCST group led by Prof. I. G. Sarma (IISc). Six reports (1976–77) recommended reorganizing routes around focal nodes (City Market, BBS, SBS), creating nodal stations with high-frequency feeders, bypassing congested areas, adding loop services in business zones, and introducing ring-road routes. Peak-hour express services were proposed, along with integration of industrial/public buses and study of minimal-infrastructure urban train services on existing railway lines. Maps of routes and focal stations were prepared and submitted to KSRTC.

17) House Numbering System for Bangalore

Confusion in house numbering prompted KSCST to design a new system under Dr. S. R. Valluri (NAL). The plan divides the city into zones with local coordinates, defines blocks, and assigns multi-digit numbers encoding block and position, with odd/even sides. Survey maps (100) are being reconciled into mosaic maps at scales 1:30,000, 1:10,000, and 1:5,000. Implementation involves three stages: survey, register compilation, and plate installation, targeted for completion by end-1978.



18) Agroclimatology of Karnataka

To aid agricultural planning, KSCST launched a study using stochastic rainfall analysis and water-balance modelling under Dr. K. Ramakrishnan (till May 1978) and Shri B. V. Ramana Rao. Data from multiple districts was analyzed to compute rainfall probabilities, soil-moisture profiles, sowing windows, and crop durations. Findings showed risks for long-duration crops like rabi jowar, potential for runoff harvesting in Bijapur, and limited double cropping feasibility. Techniques to predict droughts using evapotranspiration ratios are being explored.

19) Handpumps for Drinking Water Wells

Handpump failures plagued Karnataka's rural water program, with 60–80% out of order. KSCST investigated under Dr. J. Gururaja and later Prof. Ramprasad (IISc). Tests showed threaded joints with locknuts failed quickly, while spring-washer joints held for hours. A modified pump installed at Ungra worked reliably for a year. A survey of 413 pumps showed failures mainly due to plunger rod joints (47.9%), cylinder joints (27.1%), and pipe joints (3.9%). New designs for buckets, cages, and valves were tested. Tools for easier repair and a rural artisan training program were developed to build local capacity.

20) Winnower

Traditional winnowing, reliant on natural winds, often causes losses. KSCST supported Dr. B. T. Nijaguna (KREC Suratkal) to develop mechanical models. A power-driven test winnower and a hand-operated version were built and are under field trials. Simpler, cheaper designs are being refined to ensure accessibility to farmers.

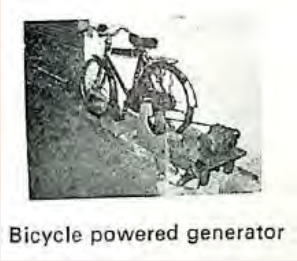
KSCST Projects (1978-79)

1) Popularisation of Science

KSCST recognized the need to spread scientific knowledge, especially in rural areas, and launched a program to popularize science. A seminar recommended a Kannada science magazine for children and coordination of voluntary agencies. A Working Group and Editorial Board (Prof. J. R. Lakshmana Rao, Chief Editor) published *Vijnana* (5,000 free copies) in 1978, followed by *Balavijnana* in November 1978. Positive feedback showed 80% adults and 70% children approved of content and pictures. Government and UNICEF supported with subsidies and paper. By 1979, subscriptions reached 1,100 despite free distribution. Schools strongly endorsed continuation, with 90% ready to subscribe. The program proved successful and sustainable.

2) Student Projects Programme

Started in 1977–78 to involve engineering students in development-oriented projects, addressing funding gaps that limited them to paper studies. In the first year, 81 projects across 13 colleges were funded (₹1 lakh). A seminar at IISc in Sept 1978 showcased 30 projects, with prizes and certificates awarded. The program gained national and international attention as a model. By 1978–79, 145 projects were supported (₹3 lakh), with funding also from the All-India Handicrafts Board. Early outputs showed promising technologies with potential for real applications.



Bicycle powered generator

Coconut husk defibring Machine

3) Community-size Biogas Plants

Following the oil crisis, KSCST proposed community-scale biogas plants as alternatives to firewood and family-scale plants. A Working Group under Prof. A. K. N. Reddy (IISc) surveyed six villages in Tumkur, selecting Pura (360 people, 60 households). With 143 cattle, daily dung could yield 35 m^3 biogas, enough for cooking (replacing 0.6 t firewood/day) and a 5 HP engine for water lifting, lighting 42 homes, and running a rice-husk-ash cement mill. Estimated investment ₹60,000 with 20% net return via cement sales. Villagers responded positively. A pilot plant at Pura was planned to demonstrate decentralized rural energy centers.

4) Potential for Micro Hydro-electric Power in Karnataka

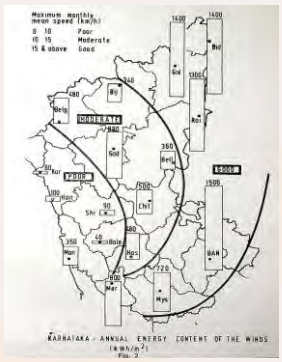
KSCST initiated studies on small hydro potential in Karnataka's streams and irrigation canals under Prof. S. Soundranayagam (IISc). Rising energy costs made small plants viable. Data from Bhadra and Tungabhadra canals showed flows and drops suitable for 40–100 kW mini-units. Challenges include seasonal flow and scattered small units needing maintenance, but benefits include decentralized rural power and low environmental impact. Plans include trial installation of a mini-turbine and further surveys.

5) Solar Energy in Sericulture

Sericulture employs 2 million in Karnataka, producing 2,200 tons of mulberry silk annually. Energy costs in small filatures (10% of production) depend heavily on firewood. KSCST, with Prof. C. R. Prasad (IISc), launched a project to test solar heating for silk operations. Surveys showed 18% energy for stifling, 26% for cooking, 25% for reeling. Flat-plate solar water heaters (ordered from BHEL and Solar Systems) will provide hot water. A Skytherm passive system is proposed to maintain rearing/storage building temperatures at 25 ± 3°C. Pilot installations at Government Silk Filature, Mysore, are planned to demonstrate cost savings and fossil-fuel substitution.

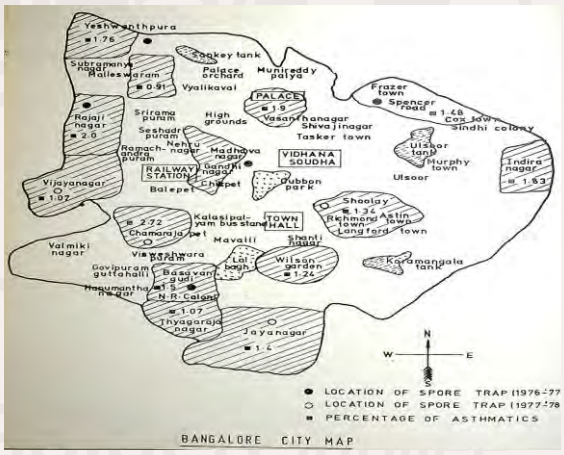
6) Utilisation of Wind Energy in Karnataka

A KSCST study under Prof. R. Narasimha (IISc) analyzed data from 22 stations. Annual averages are generally low, but Bangalore, Bidar, Gulbarga, and Raichur showed >13 km/h with monsoon peaks >20 km/h. Energy potential is modest (5 kWh/day with an 80 m² rotor), but could support farm households. Recommendations: establish wind measurement stations, develop windmills for water pumping and farm use, test designs in windy districts, and conduct a state wind survey to identify high-potential sites.



7) Asthma Research

The Asthma Research Society, with KSCST support, studied Bangalore's asthma triggers (1976–78). Daily pollen/spore data from 11 sites showed peaks of grass, Cassia, Parthenium, Cladosporium, Alternaria, and Helminthosporium. A survey of 147,805 people identified 1,940 asthmatics (1.26% incidence, near national average), but 1/3rd reported relief when leaving Bangalore. Variations across locations (0.99% to 2.7%) and higher incidence in housewives and office workers suggested environmental allergens rather than industrial pollutants. Analysis pointed to allergenic spores and pollens in the 25–80-micron range. Follow-up clinico-immunological studies were recommended.



8) Toxicological Effects of Parthenium

Parthenium hysterophorus was studied for livestock toxicity under Dr. P. V. Subba Rao (IISc). Feeding trials in buffaloes and goats caused ulcers, kidney/liver damage, and death, termed *Partheniosis*. Dermatitis was confirmed as an allergic response to parthenin. Field surveys in Kolar found cattle grazing Parthenium with symptoms. Ensiled Parthenium (50%) with maize became non-toxic and nutritious in short-

term trials. Later studies showed ethanolic extracts were acutely toxic (LD50 = 300 mg/kg by injection), but dried leaves less so. Microorganisms capable of degrading parthenin were isolated, opening possibilities for detoxification. Final phase will standardize silo feed methods.

9) Technology Improvements for Non-land Based Activities, Bidadi Hobli

KSCST sponsored a project under Dr. Vinod Vyasulu (IIM Bangalore) to enhance livelihoods of landless households via non-land-based work. Anchipura village was chosen for study (brick-making, masonry, mat and rope making). Rope making with sisal showed major scope for improvement. India imports most of its 16,000-ton sisal demand though local potential is high. Sisal can yield fibre, paper, rayon, wax, detergents, sugar, and vinegar. A socio-economic survey showed 89% of land under farming, livestock consuming 25% of man-days, agriculture 50–60% in season, with 30–40% unemployment in lean months. The study recommended a separate project on sisal exploitation and developing rural processing technologies.

10) Bamboo Policy for Karnataka

Bamboo, critical for rural housing and paper, is overexploited in Karnataka. Stocks decline as harvest (1.6 lakh tonnes) exceeds growth (1.35 lakh tonnes). A KSCST Working Group led by Prof. Madhav Gadgil (IISc) recommended halting new bamboo-based industries, joint plantation efforts by industry and forestry, stricter fire/grazing control, and improved silviculture. Field experiments showed fire damage is less serious, but grazing and poor extraction practices severely harm regeneration. Studies revealed bamboo's role in housing and food (bamboo rice up to 50 quintals/ha in Coorg). Alternative extraction methods are being tested.

11) Sandalwood Spike Disease

Sandalwood, 80% of India's supply from Karnataka, is threatened by Spike disease caused by mycoplasma. KSCST launched a 3-year UAS Bangalore project on experimental transmission, propagation, and ecological studies. Surveys of 260 forests found 80% disease-free, with affected areas concentrated in a few districts. Lakhs of seedlings were screened, but none resistant. Grafting and dodder transmission produced symptoms within 45 days. Several vegetative propagation methods were tested, with softwood cuttings and clonal techniques showing promise. Insect surveys identified 20 species, but no confirmed vector. Nutritional studies were initiated. No resistant seedlings yet, but propagation advances may aid future control.

12) Recovery of Copper from Masanikere Magnetite Ores

Vanadiferrous magnetite deposits near Masanikere (42 lakh tonnes) are mined for vanadium, but contain up to 0.7% copper, currently unrecovered. KSCST launched a project under Dr. K. A. Natarajan (KREC) to study recovery methods. Preliminary tests explored ferric chloride leaching with bacteria, direct sulphide flotation, and magnetic concentration. Work is ongoing to assess feasibility of copper recovery alongside vanadium.

13) Groundwater Prediction

Groundwater availability is uncertain, limiting well-based irrigation. Prediction accuracy is 80% for availability but only 50%

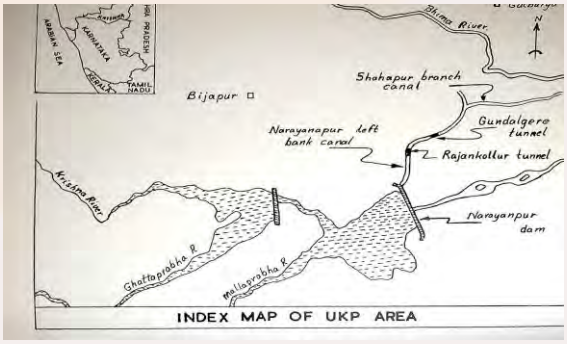
for quantity. Karnataka's Mines & Geology Department has case histories of 1,500 wells. KSCST formed a group under Dr. P. S. Naidu (IISc) to analyze this data, build estimation models, and develop software to improve predictions of groundwater quantity and reliability, reducing risk in irrigation investments.

14) Hand Pumps for Drinking Water Wells

With 9,000 villages lacking drinking water, borewells with handpumps were installed with UNICEF/WHO aid, but 60–80% failed. KSCST formed a group (Dr. J. Gururaja, later Prof. Ramprasad, IISc) to identify failure modes and suggest improvements. Surveys showed main issues: plunger rod joints (48%), cylinder joints (27%), pipe joints (4%). New designs for valves, buckets, and cages were developed and tested in rigs. Modified pumps performed better in field trials. Over 300 engineers were trained in seminars, and a rural artisan training program was initiated. Standards are being developed with ISI.

15) Upper Krishna Project

The World Bank-aided Upper Krishna Project (UKP) is a major irrigation scheme covering four districts. KSCST, under Prof. V. T. D. Balaraman (IIMB), applied network analysis to Phase I of Stage I (Narayanpur Dam, canals, resettlement, infrastructure, extension). About 100 detailed and master networks were developed, with resource analyses using computers. Reports, monitoring systems, and two training workshops for UKP staff were completed in 8 months. The system will help control project progress, optimize resources, and avoid delays and cost overruns.



16) Winnower

Traditional wind-based winnowing causes losses and delays. Existing machines are costly. KSCST initiated a project under Dr. B. T. Nijaguna (KREC Surathkal) to design affordable winnowers. A 50–60 quintal/hr versatile device was built, operable manually, by electricity, or tractor. Farmers accepted it positively. Phase II is developing models of varied capacity and cost for extensive field testing to finalize specifications.

17) Computers in Administration

KSCST studied the role of computers in government administration under Dr. D. M. Nanjundappa (Planning Dept.). Despite Karnataka's early adoption (first computer in 1971), applications were limited. Challenges included scattered data, large volumes, timeliness, and analysis needs across sectors. Computers can aid information management and sophisticated data processing in planning, monitoring, and evaluation. The project aims to develop long-term strategy and demonstrate applications in sectors like transport and agriculture, countering resistance by showing benefits without labor displacement.

KSCST Projects (1979-80)

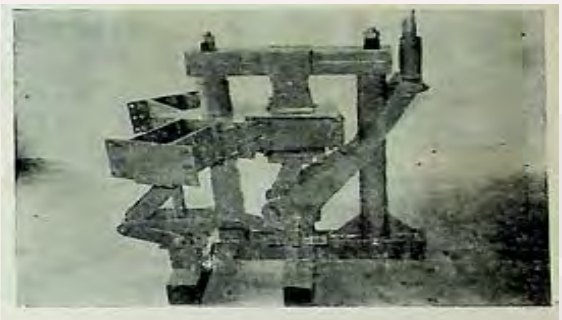
1) Popularisation of Science

In 1977, KSCST initiated a program to spread scientific awareness among students and rural people. A working group produced *Bala Vijnana*, a Kannada science magazine for the 10–15 age group, distributed free across schools and panchayats. The magazine quickly gained ~3,330 subscriptions and enthusiastic feedback, with students and teachers finding it highly useful. Its popular "Question Box" section encouraged interaction. To sustain and expand these efforts, the Karnataka Rajya Vijnana Parishat (KRVP) was established in 1980 with Dr. H. Narasimahiah as President. KRVP now coordinates units across villages and districts, promotes science clubs, lectures, exhibitions, and publications, and is preparing to take over publication of *Bala Vijnana*. Government support ensures the long-term growth of this statewide science popularization movement.

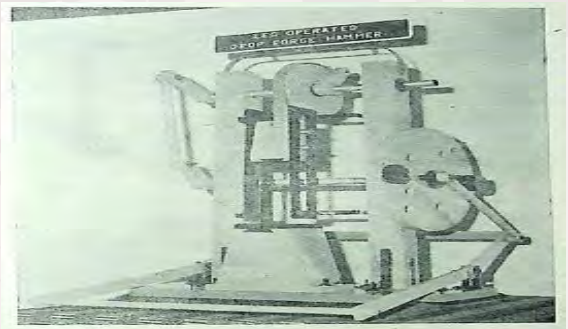
2) Student Project Programme (SPP)

KSCST launched SPP to support final-year engineering projects relevant to Karnataka's developmental needs. It addressed funding shortages and lack of practical topics that earlier forced students into desk studies. By 1979, a seminar at Hassan showcased projects, awarded prizes, and issued merit certificates. Now in its third year, the program supports 184 projects with ₹3 lakh funding. Beyond improving engineering education, SPP has generated promising technologies with commercialization potential, making it a unique model for linking academia with state development.

SPP 78–79 Exhibition at Hassan



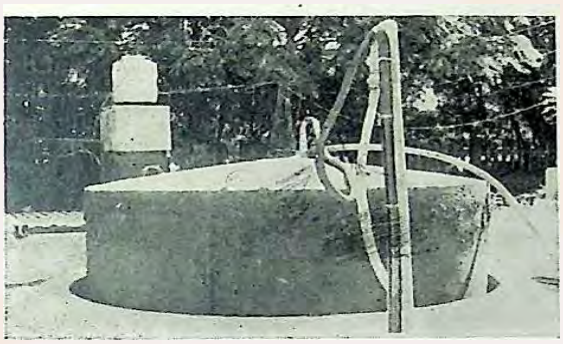
Mud block making machine



Leg-operated drop forge hammer

3) Community-size Biogas Plants

Recognizing the limitations of family-sized plants, KSCST planned community biogas plants for villages. A feasibility study at Pura (Tumkur District) showed that dung from 140 cattle could fuel two digesters, supplying biogas for cooking, lighting, and a 5 HP engine for water pumping and rice-husk cement production. Designs, piping systems, and ferrocement gasholders were completed, with field trials confirming technical and social viability. The project demonstrates decentralized energy centers that are both economical and socially beneficial.



4) Potential for Micro hydro-electric power in Karnataka

Karnataka's small irrigation canal drops and streams offer significant untapped hydro potential. A KSCST group estimated 250 MW could be generated, equivalent to a medium thermal station. Studies identified cross-flow and tubular turbines as suitable options, with lab tests on blade designs and model turbines underway. Site measurements near Mysore are in progress for installation. The project aims to optimize small-scale hydro in canals as a decentralized renewable energy source.

5) Solar Energy in Sericulture

Sericulture employs 2 million in Karnataka, but relies on outdated coal-fired boilers for silk reeling. KSCST initiated a pilot project to use solar heating for hot water and climate control in rearing/storage buildings. Surveys showed reeling needs 25% of total energy, with hot water at 40–45°C ideal for solar heaters. A system with 72 flat-plate collectors was designed for a government filature. Experimental rigs showed satisfactory performance, and "Skytherm" cooling was studied for rearing chambers. The project demonstrates fossil-fuel substitution in a major rural industry.

6) Toxicology of Parthenium

Parthenium hysterophorus, an invasive weed, causes livestock toxicity and dermatitis. KSCST supported studies under IISc. Feeding trials in buffaloes and goats confirmed acute and chronic toxicity (partheniosis), but silage with maize became non-toxic after fermentation. Lab studies showed ethanolic extracts caused acute poisoning, while microorganisms were isolated that degrade parthenin, the allergen. Nutritional trials of parthenium–maize silage proved safe and comparable to standard fodder. The project suggests silage fermentation as a viable detoxification method.

7) Energy Food

To replace CARE-assisted mid-day meals, CFTRI developed a wheat-based *Energy Food*. KSCST initiated research to adapt it with maize, a local crop. Trials produced three fortified formulations with varying wheat–maize proportions. Nutritional studies showed preparations with maize matched the original's value and were more acceptable in taste tests. Shelf-life was 120 days in sealed pouches. Government has already commissioned production units, ensuring a sustainable local alternative for child nutrition programs.


Destoner


Cake Roaster

8) Sisal Utilisation

To address rural unemployment, KSCST explored sisal-based industries. Initial

studies identified fibre, hecogenin, wax, and paper as viable products. At Ungra, 15,000 suckers were planted for trials, showing 6–9 kg leaves/plant annually. Lab tests confirmed yields of 4% fibre, 0.1% hecogenin, 0.3% wax, and 2.5% paper. Market surveys confirmed demand, and equipment for a 0.5-ton/day pilot plant is under fabrication. Plans for a sisal complex at Ungra are being evaluated on socio-economic and environmental criteria.

9) Bamboo Policy for Karnataka

Bamboo resources, vital for rural housing and paper, are overexploited in Karnataka. Annual harvests (1.6 lakh tonnes) exceed growth (1.35 lakh tonnes), leading to depletion. KSCST's working group, led by Prof. Madhav Gadgil, recommended halting new industry expansion, joint forestry–industry plantations, fire/grazing controls, and silviculture improvements. Field experiments showed grazing and extraction harm regeneration more than fire. Protected shoots survived 3–5 times better. Studies also confirmed bamboo's ecological and economic value, including food use (bamboo rice yields).

10) Sandalwood Spike Disease

Sandalwood, contributing 80% of India's oil, faces a fatal spike disease. KSCST supported surveys across 318 forests, finding 8.5% of trees infected, concentrated in scrub and dry deciduous forests of southern Karnataka. Transmission studies confirmed grafting spreads the disease, though insect vectors remain unproven. Large-scale seedling screening found no resistant varieties. Vegetative propagation techniques were developed, achieving up to 96% rooting in young seedlings. Though control remains elusive, propagation advances may help conservation efforts.

11) Copper Recovery from Masanikere Ores

Masanikere vanadiferous magnetite deposits (42 lakh tonnes) contain up to 0.7% copper, currently unrecovered. KSCST investigated extraction methods: bacterial leaching using *Thiobacillus ferrooxidans* (61% recovery), acid ferric chloride leaching (93% recovery), and wet magnetic separation (enriching magnetic fractions to 1% Cu). With rich ores depleting, this project explores low-grade copper recovery alongside vanadium, offering economic potential for Karnataka's metallurgical industry.

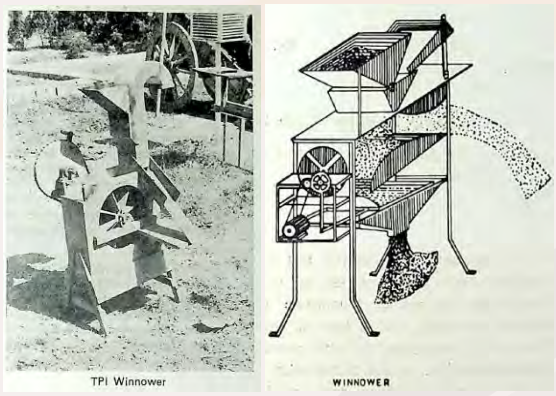
12) Handpumps for Drinking Water Wells

Borewell handpumps introduced with UNICEF/WHO aid suffered 60–80% failure rates. KSCST studied 413 pumps, identifying plunger rod and cylinder joint failures as key issues. New piston designs, lifting clamps, and improved components were developed and field-tested. Reliability models and ISI test facilities were established. Manuals, models, and training materials in Kannada were prepared for rural artisans. The program directly improved pump reliability and built local repair capacity.

13) Winnower

Traditional winnowing is weather-dependent and inefficient. KSCST developed a low-cost, versatile winnower under KREC Surathkal. The design, adaptable to manual, motor, or tractor operation, processes 50–60 quintals/hour at a cost of ₹1,500–2,500. Field trials showed 95% grain purity across paddy, ragi,

jowar, and coriander. Farmers accepted it enthusiastically. Phase II will produce variants for wider trials and assess commercial potential.



14) Alternative Rural Housing Technologies

Traditional rural building materials are declining, while modern alternatives deplete resources. KSCST initiated research under IISc to develop low-cost, energy-efficient technologies using soil, lime, bamboo, and agro-fibres. Achievements include stabilized soil blocks using lime, design of a low-cost ASTRA ram press, small-scale lime burning techniques, surkhi from clay soils, and bullock-powered gear for cement grinding. Studies confirmed protected soils and improved mortars can produce durable, affordable housing, promoting self-reliance and rural employment.


Mud block-macking Machine

15) Computers in Administration

Karnataka pioneered computer use in government (since 1971), but applications were limited. KSCST launched studies on non-traditional uses. A KSRTC materials management system proposed a computerized data bank for faster procurement, stock control, and budget monitoring. An agriculture information system aimed to process crop and input data from village level, replacing bulky reports. Both projects demonstrated the scope of computers in improving efficiency, timeliness, and analysis in government administration.

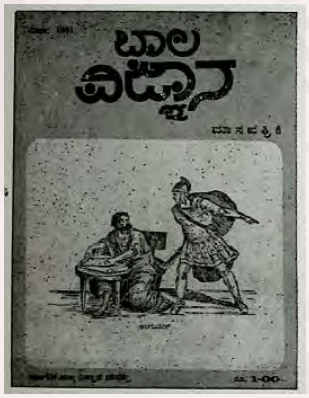
16) Science & Technology Plan for Karnataka

KSCST prepared a methodology for linking S&T planning with socio-economic planning. The draft was discussed in a 1980 expert meeting. Key elements include: broader scope beyond R&D, inclusion of infrastructure, manpower, information systems, and science popularization. The approach emphasizes need-based project identification via seminars, integrating planners, users, and scientists. Recommendations highlight alignment with perspective plans, prioritization using ABC classification, and open, participatory project generation. This methodology is expected to guide a common framework for all state S&T plans.

KSCST Projects (1980-81)

1) Popularisation of Science

In 1977, KSCST launched a science popularisation project to foster scientific attitudes, especially among students and rural people. A major outcome was the Kannada monthly *Balavijnana* (1978), targeted at high-school students, distributed free to schools and panchayats, and soon reaching 7,500 subscribers. Its interactive features like the "question box" proved highly popular. To sustain and expand activities, the Karnataka Rajya Vijnana Parishat (KRVP) was established in 1980 with Dr. H. Narasimhaiah as President. By 1981, over 100 units were active in 50 taluks, conducting workshops, seminars, science exhibitions, environmental studies, and publications. The Government bulk-purchased subscriptions, and KSCST sanctioned funding support. KRVP's five-year plan envisages expanding circulation, publishing educational materials, setting up science centers/clubs, and organizing workshops and exhibitions, making it the state's major science popularization movement.



2) Training Programme in Network Techniques

To address delays and cost overruns in government projects, KSCST initiated a project-on-project management using network analysis (PERT/CPM). After initial application to the Upper Krishna Project, a training programme was launched in 1980 with IIM Bangalore, led by Prof. V. T. D. Balaraman. Four six-day programmes trained 100 government officials from departments including agriculture, forestry, irrigation, and health. The training combined theory, exercises, and workshops applying network techniques to actual departmental projects, creating a pool of officials trained in scientific project planning and control.

3) Student Projects Programme (SPP)

Initiated in 1977–78 to utilize student talent for state development needs, SPP shifted engineering projects from desk studies to practical, field- and machine-based work by providing financial support. It fostered collaboration between engineering colleges, universities, and research institutions like UAS and CFTRI. By 1980, a Seminar-cum-Exhibition in Mysore showcased 24 presentations and 45 project exhibits, with prizes and certificates awarded. Now in its fourth year, SPP supports 198 projects with funding of ₹4.6 lakhs, continuing to harness educational institutions' expertise for developmental challenges.

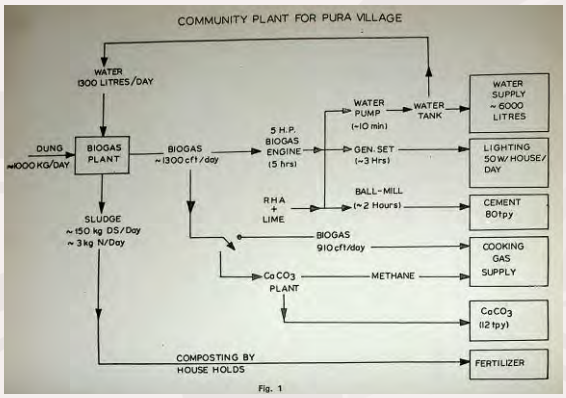

Maize Corn Sheller


Low cost roofing tiles

4) Community Biogas Plant

Recognizing the limitations of family-sized plants, KSCST initiated a village-scale community biogas project at Pura (Tumkur District) under IISc's ASTRA group. Two 750 cft/day plants were constructed with

masonry digesters and mild-steel gasholders, and a piping system was laid to supply fuel to households. Simple low-cost burners were developed, and experiments with a 5 HP biogas genset provided electricity and hot water. Ferrocement alternatives for gasholders were explored, though fabrication challenges remained. Villagers were trained in construction, operation, and maintenance, demonstrating the technical, economic, and social feasibility of community biogas plants as rural energy centers.



5) Solar Energy in Sericulture

Sericulture, employing 2.5 million people in Karnataka, depends heavily on inefficient coal boilers. KSCST initiated a project under Prof. C. R. Prasad (IISc) to explore solar applications in reeling and cocoon rearing. A survey identified hot water needs for reeling, and a solar water heating system using 72 flat-plate collectors and thermosiphon circulation was designed for a government filature, with installation underway in 1981. Parallel work on "Skytherm" building design for cocoon storage applied nocturnal radiation cooling with a roof pond and movable insulation. An experimental building using stabilized mud blocks and ferrocement roofing was constructed at IISc. The project demonstrates practical solar substitutes in sericulture.

6) Energy Food – Phase II

To replace CARE-assisted mid-day meals, CFTRI developed a wheat-based *Energy Food* (Phase I). As wheat is scarce, Phase II focused on maize substitution under Dr. M. S. Narasinga Rao. Trials with maize grits showed good puffing and cost-effectiveness. Nutritional studies confirmed protein content and efficiency ratios comparable to wheat-based formulations. Acceptability trials showed maize-based food was well received, and shelf-life was 120 days in LD polythene packaging. The Government has accepted CFTRI's recommendations, ensuring sustainable, low-cost nutrition for child feeding programs.

7) Sisal Utilisation

KSCST launched a project in 1979 under Prof. M. S. Murthy (IISc) to develop sisal-based industries for rural employment. Laboratory trials yielded fibre (4%), hecogenin (0.1%), wax (0.3%), and handmade paper (2.5%) from sisal leaves. Surveys in Ungra region confirmed resource availability (4 tonnes/day). Market analysis highlighted demand for fibre, hecogenin, and wax (all imported). Feasibility studies across scales identified a 2 TPD unit as optimal, offering a 30% internal rate of return and regional gains of ₹30.9 lakhs over 10 years. A demonstration unit producing rope, hecogenin, wax, and handmade paper is proposed at Ungra, to be run by a cooperative.

8) Community Jaggery Making

In Uttara Kannada, jaggery making traditionally consumes large amounts of firewood. KSCST initiated a project under Prof. R. Kumar (IISc) to design a bagasse-fuelled system. A three-pan evaporator was installed in Unchagi village in 1980,

modified for better heat transfer, and operated by locals after training. About 45,000 liters of juice were processed, using only 75% of bagasse. Jaggery quality improved with pH correction, fetching higher market prices. Neighboring villages adopted the system, saving fuelwood (₹8,400) and boosting cane cultivation. Four more villages expressed interest, with a computer model under development for wider replication.

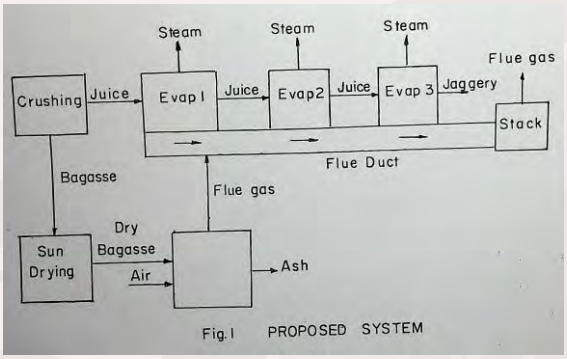


Fig.1 PROPOSED SYSTEM

9) Bamboo Policy for Karnataka

With bamboo resources depleting, KSCST initiated a conservation study in 1976 under Prof. Madhav Gadgil (IISc). Field surveys across 81 ranges identified four bamboo zones and declining densities due to grazing and overexploitation. Studies showed protection doubled clump density and improved shoot survival, while fires had less impact than grazing. Stock assessments estimated 1.47 million tonnes, with demand exceeding supply by 22,000 tonnes annually. Recommendations included lengthening extraction cycles, monitoring regeneration, retaining branches during cutting, and adopting integrated management in the Western Ghats. The study provided a scientific basis for sustainable bamboo policy in Karnataka.

10) Recovery of Copper from Masanikere Ores

Masanikere vanadiferous magnetite deposits (Shimoga) used by VISL for ferrovanadium contain up to 0.7% copper, currently unexploited. In 1979, KSCST supported studies at KREC under Dr. K. A. Natarajan and later Prof. T. Ramachandran. Trials explored bacterial leaching with *Thiobacillus ferrooxidans*, acid ferric chloride leaching (93% recovery), magnetic separation, and flotation studies. Results confirmed copper enrichment with finer grinding and separation methods, though recoveries varied. The project provides insights into economic recovery of copper from low-grade ores, enhancing resource utilization.

11) Handpumps for Drinking Water Wells – Phase II

Building on Phase I, which identified failures in UNICEF-supported handpumps, Phase II focused on maintenance systems, training, and design improvements under Prof. Rama Prasad (IISc). Training camps were organized to train rural youth and PHE mechanics using Kannada manuals. An information system is being developed to track pump status, failures, and repairs. A new force-pump design with fewer components and higher reliability is under field trials, with 50 units planned. This approach strengthens maintenance capacity and pump reliability, ensuring sustainable potable water access in rural areas.

12) Alternative Building Technologies for Rural Housing

Following a 1979 seminar, KSCST initiated R&D on low-cost rural housing technologies using local materials under

Prof. K. S. Jagadish (IISc). Studies showed strength improvements in soils with wetting cycles, kneading, and lime/starch stabilization. ASTRAM, a manual mud-block press, was tested and found more efficient than existing models. Lime-pozzolana cements from waste materials and bullock-driven milling were developed, offering 50–60% cost savings. Roofing experiments with stabilized soil tiles and waterproof coatings (starch, animal glue) are underway. Field trials and demonstration buildings are planned, promoting energy-efficient, affordable rural housing.

13) Computers in Administration

KSCST studied applications of computers in state administration, focusing on KSRTC materials management and agriculture information systems. At KSRTC, a database-driven system was designed to improve procurement, planning, and supplier evaluation, with forecasting and quality-control software for spares like tyres and batteries. In agriculture, computer-aided fertilizer monitoring and production forecasting models were developed to improve planning and resource allocation. These studies demonstrated the scope of computers for efficiency and decision support in state administration.

14) House Numbering System for Bangalore

KSCST initiated a project in 1977 under Dr. S. R. Valluri (NAL) to design a rational house numbering system for Bangalore. The new system, based on zones, local coordinates, and odd/even allocations, simplifies house identification. Specifications for number plates were finalized, and city maps at 1:7,500 scale with layouts, roads, and landmarks were prepared. The Corporation began implementation in 1981. The new system reduces confusion, aids public navigation, and improves administrative efficiency in the fast-growing city.

15) Meeting on State Councils of Science & Technology

In January 1981, KSCST, with DST, organized a national meeting of state S&T councils at IISc, attended by 12 states, 3 UTs, central ministries, and scientific bodies. The meeting discussed guidelines for objectives and structures of state S&T councils, emphasizing their role in applying science for socio-economic development, addressing rural poverty, backwardness, and unemployment, and promoting science popularization. Recommendations included high-level status within government, flexible organizational models (committee, council, or commission), strong linkages with R&D institutions, sectoral panels, and funding support. A Standing Advisory Body at the Centre was proposed for coordination and guidance. This meeting provided the first comprehensive framework for state-level S&T planning and cooperation.

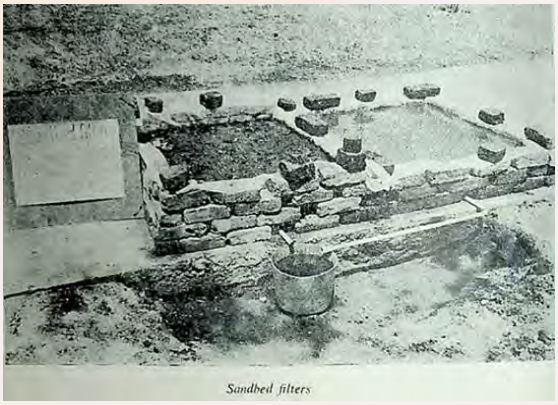
KSCST Projects (1981-1982)

1) Revision of Text Books on Science and Mathematics (Higher Secondary)

Proposal (June 1981) by Directorate of Text Books to form an IISc faculty group (Convener: Prof. K. P. Subramanyam) to revise VIII–X science & maths textbooks to correct syllabus coverage, factual/conceptual errors, illustrations, outdated data, wrong answers and language mistakes. IISc faculty worked with selected high-school teachers; drafts were iterated two–three times weekly. Workshops checked suitability: Mathematics (Nov 27–29, 1981) and Physics/Chemistry/Biology (Dec 14–17, 1981) with IISc faculty, 15 subject teachers, RCE Mysore faculty and textbook representatives. Final manuscripts: mathematics handed over Dec 1981; sciences Jan 1982; Directorate asked to publish by academic year 1982–83. Revisions were substantial but constrained by existing syllabus and time (6 months).

2) Community Biogas Plant (Pure village, near Mysore)

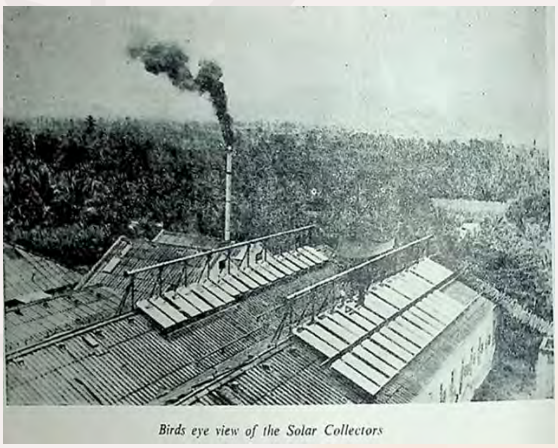
KSCST–IISc project to install a village community biogas plant with distribution for gas and slurry. Fabrication and distribution network completed: PVC piping 1,500 m; gaslights in 76 households; 23 dual-lamp fittings (30W/40W). Dung requirement ~500 kg/day (7% solids) — collection began Feb 2, 1982; villagers meeting 1 June 1982 set rules and formed collection group. Gas balloon filled after 36 hours of dung; trial supply to 51 households; by June all 76 houses running on plant. Operation transferred from youth-run start to villagers; women's team trained; plant easily operable locally.



Sandbed filters

3) Solar Energy in Sericulture (Kanakapura)

Project to introduce solar energy into sericulture (solar water heating for reeling; solar steam for cocoon drying). Solar water-heating systems installed on two roofs at the silk institute, Kanakapura. Initial leaks required replacements; system has Auto/Manual/Valve-to-Solar modes with thermostat control; header reached 60°C and transfers hot water to insulated tank. Second-roof system ran from 2 May 1982 and continued into early June 1982.

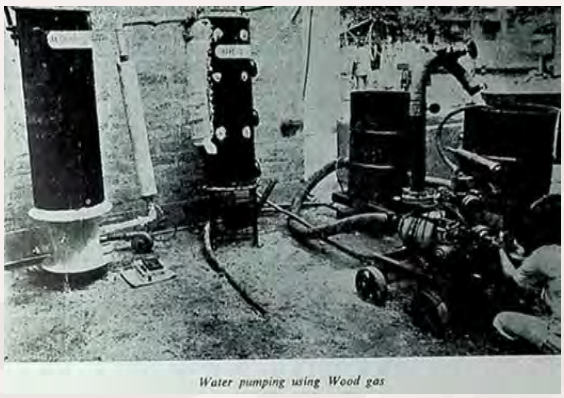


Birds eye view of the Solar Collectors

4) Wood-Gas Generators for Small Engines

KSCST–IISc study (Convener Prof. S.P. Sukhatme) on producer/wood gas for small rural engines (pump sets 5–7 HP, tractors). Reactor for charcoal/wood chips fabricated and run: 8 hours continuous, consumed

~45 kg wood chips, converted chips to charcoal before burn zone; gas ignitable and scrubber-cooler satisfactory. Preliminary use on 5 HP diesel pump set reduced diesel consumption to 15–20% of normal at 10–15 m head. Petrol pump tests and performance measurements planned to simplify design.



Water pumping using Wood gas

5) Wind Pump (10,000 L/hr target)

Goal: windmill–pump delivering 10,000 L/hour at average wind speed 10 km/h and capital cost = Rs.10,000 for semi-arid Karnataka (Raichur, Gulbarga, Bidar, parts of Bangalore). Analysis of chain-washer pump with controlled leak promising; prototype designed and under fabrication. Computer programs for rotor and tower analysis developed and being debugged; control device and remaining components to be fabricated and tested.

6) Mini-hydroelectric Demonstration Unit

Working Group (Convener Prof. B.C. Sheshacharaya) to demonstrate small hydropower from small streams. Cross-flow turbine fabricated (Flow = 60 L/s, Head = 8 m, Speed = 375 rpm) being tested on a Chickmagalur coffee estate. Low-head demonstrator designed: Flow = 2.5 m^3/s, Head = 3 m, Speed = 300 rpm, expected output ≈ 60 kW; electronic ballast control designed. 60 kW demonstration unit expected to be set up in 1983.

7) Feasibility Study: Repair & Maintenance Centre for Medical Equipment

Survey (12 hospitals, Bangalore & Mysore) of 742 instruments: 486 (65.5%) working, 67 (9%) condemned; age distribution: 27.8% >15 years, 47.8% = 5–15 years, 25.1% <5 years — implying 75.6% in age groups needing frequent servicing. Data collected on type, failure modes, MTBF, reliability, repair cost/time and existing maintenance procedures. Findings justify a dedicated repair/maintenance centre and further detailed study.

8) Community Jaggery Production Units & Improved Wood Stoves (Uttara Kannada)

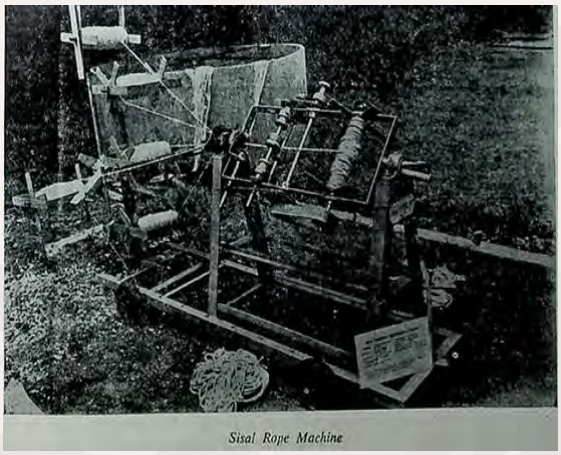
Project to reduce fuelwood use and improve jaggery quality: three-pan jaggery unit and improved wood stove with heat exchanger designed (prototype 1980–81) — estimated stove efficiency = 50%. Prototype tested at CFTRI Mysore showing large fuel savings; implementation underway near Sirsi and first phase nearing completion. Plans to disseminate technology and analyze system inefficiencies.

Improved Wood Stove

9) Sisal Industries Demonstration Unit at Ungra

KVIC demonstration & training unit (20 acres) to promote sisal agro-industry, rope production and rural employment. Project includes 2 t/day sisal complex and rope

unit; pilot 0.5 t/hr digester/pilot plant designed and fabricated. Demonstration unit installed at Ungra; project started/sponsored by Dept. of Rural Development, Government of India (noted start 1 April 1983). Work continues on process variables, economic viability and training rural youth. (Protein recovery from processing ≈ 25–30% on average.)



Sisal Rope Machine

10) Recovery of Copper from Masanikere Ores

KSCST project (Mar 1979) at KREC to recover copper from low-grade vanadiferous magnetite (Masanikere, Shimoga). Studies: crushing/grinding, magnetic separation and flotation. Non-magnetic fraction used for flotation had 0.37% Cu vs ore 0.22%. Various collectors tested — sodium diethyl dithiocarbamate best. Ferric chloride leaching of concentrate gave 90% Cu recovery at 20 min and 98% at 30 min. Process flowchart and extraction procedure developed and tested satisfactorily.

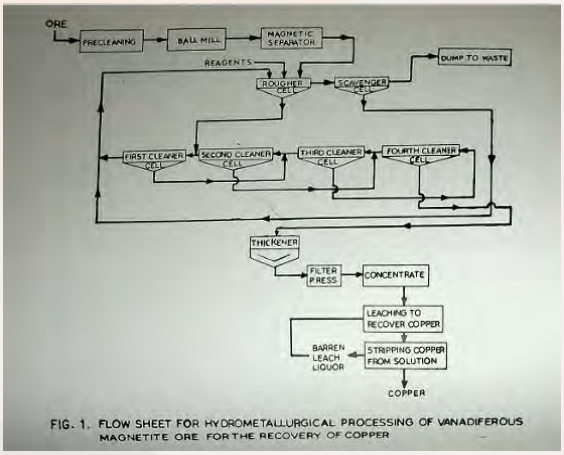


FIG. 1. FLOW SHEET FOR HYDROMETALLURGICAL PROCESSING OF VANADIFEROUS MAGNETITE ORE FOR THE RECOVERY OF COPPER

11) Handpumps for Drinking Water Wells — Phase II

Follow-up to improve handpump reliability and maintenance. Objectives: verify on-site fittings, field trials, maintenance storage/system, information/inspection and quality control procedures. Training program for village youth (near Hassan) prepared; training aids produced. Improved force-pump design finalized; two prototypes fabricated (38 mm × 300 mm stroke and 64 mm × 140 mm stroke). Comparative stroke studies of Jalina and India Mark II pumps revealed design stresses affecting service life; information system for pump locations and service history initiated for maintenance planning.

12) Groundwater Recharge — West Coast Karnataka (Phase I)

Study of steep lateritic coastal terrain where heavy monsoon rainfall rapidly runs off, causing post-monsoon water shortages. Preliminary topography, geology and rainfall survey and groundwater monitoring done. Model studies on flow/percolation conducted; some percolation ponds and check dams constructed with observed improvement. Next phase: detailed model study at a site, further check

dams/percolation ponds, and development of percolation theory for lateritic terrain

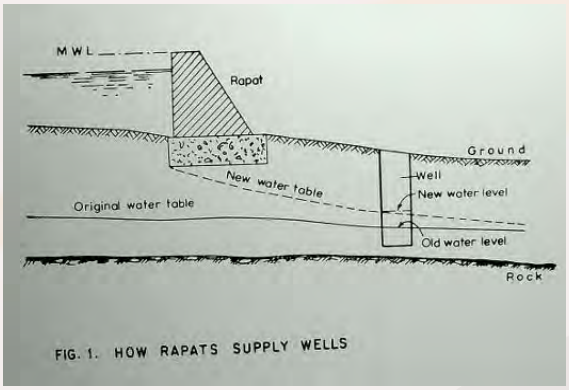


FIG. 1. HOW RAPATS SUPPLY WELLS

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13) Alternative Building Technologies for Rural Housing

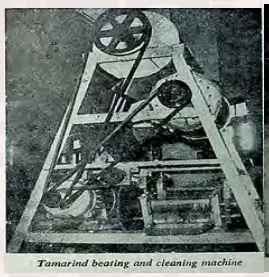
Seminar (May 1979) identified low-cost housing needs and alternative materials/techniques: mud blocks, bamboo, laterite, ferrocement, wood composites and energy-conservation. Progress: Astra mud-block production (compressive strength 15–20 kg/cm²) and additive trials (lime, cement, cow dung); ferrocement 4,000-gallon water tank developed; bamboo–lime–cement composite concept introduced; waterproof coatings for mud walls trialed; copper sulfate trials showed strength gains in mud blocks.

14) Alternative Building Technology Demonstration Unit

Construction of low-cost demonstration school building (Ungra/Allasandra) to showcase soil-block technology and train masons. One-room school using compacted soil-blocks under construction; roof level reached; lime glue coating used to protect walls; framed doors/windows; lime-surkhi floor with cement finish; expected completion by end of September (year implied). Technology transfer via a "Manual on Soil Block Construction" distributed widely and masons' training planned (manual in English & Kannada).

15) Student Projects Programme

Initiated 1977–78 to involve students/faculty in state development problems; moved projects toward practical fieldwork and machine building. Now in 5th year: expanded to College of Fisheries (Mangalore) and Marine Bio Research Station (Karwar). Seven projects sanctioned for 1982–83; annual seminar/exhibition at KREC Surathkal on Feb 5–6, 1982 (40 project presentations, 16 exhibits). In 5th year: 151 projects funded totalling Rs. 479,944.56. Faculty sponsored for short courses in Wind Energy (Jan 17–20, 1982) and Solar Energy (Jan 22–24, 1982).


Tamarind beating and cleaning machine


Tile Crusher

16) Popularisation of Science

Working Group (1977) to popularize science, especially in rural areas; objective to publish a Kannada science magazine. BALAVIJNANA launched with initial circulation 5,000, Chief Editor Prof. J.R. Lakshmana Rao; positive reader response and active question box. Publication rights transferred to Karnataka Rajya Vijnana Parishat (KRVP) with KSCST support (grant Rs. 3 lakhs for 1981–82). Multiple district activities (science camps, exhibitions, training, community science centres) listed (Raichur, Nyamagondlu, Mastikatte, Chickamagalur, Bangalore, Mysore, Santheribennur, Gungurouhalli, Kurtagi, Raichur & Gulbarga).

17) Meeting on Microhydro Electric Power Generation (Feb 24, 1982)

One-day meeting convened by KSCST and Karnataka Power Corporation to standardize microhydro designs and discuss issues: capacity levels, induction generator problems, reversible pumps as turbines, conduits from dams, cost–benefit, low/high head technologies and feasibility guidelines. Attendees 20 experts (Karnataka Power Corp, IISc, KEB, NAL, DST, etc.). Two demonstration projects contemplated: Kilowar Electric Company plant on Kaveri Canal near Mysore and 60 kW unit on Tungabhadra Canal. A Working Group to address issues and update small hydro potential was formed.

18) Seminar on Rural Health Care for Karnataka (Mar 2–3, 1982)

Seminar at IISc Faculty Hall with 80 invited participants from social sciences, administration, voluntary organizations and medical professionals to draft an R&D programme for rural health care. Sessions covered Nutrition; Sanitation & Hygiene; Major Diseases & Control; Occupational Health Hazards; Prosthesis Development & Rehabilitation; and formulation of an R&D programme. Draft R&D programme revised and finalized based on deliberations.

19) Rural Health Care — R&D Programme (Priorities & Areas)

Priorities: balance long-term research with immediate demonstration projects emphasizing preventive approaches. Programme components: demonstration projects (nutrition, sanitation, child care, occupational health, blindness & rehabilitation), action/research where data lacking, and R&D to improve rural health-care technologies. Background R&D areas: health status indices, environment & diagnostics, anthropological studies, indigenous medicine studies, education (training packages & health education for literate/non-literate), and health-care delivery mechanisms (communication systems, referral/clinical links, facility improvements, organizational structures).

20) Short-Term Course on Wind Energy (Jan 17–20, 1982)

Course “Wind Energy Systems” at IISc to promote wind energy projects in engineering colleges following wind potential studies (wind stations in 15 colleges). Sponsored by KSCST, Solar Energy Society of India, ASTRA and DST (CASE); Chief Organizer Prof. S. P. Govindarajulu. 50 participants (15 sponsored by KSCST); topics: history, wind patterns & measurement, rotors, rotor theory, performance, design problems and economics. A booklet “Lecture notes in Wind Energy Systems” was released.

KSCST Projects (1982-1983)

1) Community Biogas Plant (Naduvatti, Tumkur)

A large-scale community biogas plant was set up at Naduvatti village, Tumkur, as a DST-funded project implemented by IISc (ASTRA group). The plant, a 50 m³ KVIC-type masonry digester, included a dung collection centre, slurry pumps, distribution pipelines and gas burners, with villagers allocating land for construction. Dung collection began in February 1982, and by June that year, gas supply started to ten houses, later extended to more households, operating for about 15 hours a day. Villagers, particularly women, readily adopted biogas cooking, while youths were trained to operate and maintain the plant. Although the system has functioned for over a year, gas shortages arose because of low dung collection, poor dry matter content, increased household demand, and reluctance of villagers to bring dung to the centre. The experience highlighted the need for technical improvements, diversification of feedstock beyond cattle dung, training for efficient usage, and disciplined community management to make such systems sustainable.

2) Solar Energy in Sericulture

In sericulture, where cocoon processing consumes large amounts of energy through coal-fired boilers, KSCST initiated solar applications to reduce fuel costs and improve efficiency. At the Karnataka Silk Filature in Kanakapura, a solar hot-water system was installed in 1981–82. Initial collector defects caused leaks and failures, leading to dismantling and redesign. A new set of 12 collectors, an improved storage tank, and a mechanical control unit with valves and bypass systems were installed, now providing hot water at 60 °C efficiently. The Working Group also redesigned the collectors using durable, low-cost materials suitable for local fabrication, and prototypes tested successfully. The improved design avoided earlier bonding failures and is being taken up by private workshops, with full-scale use expected by 1983, demonstrating the feasibility of solar energy in sericulture processing.

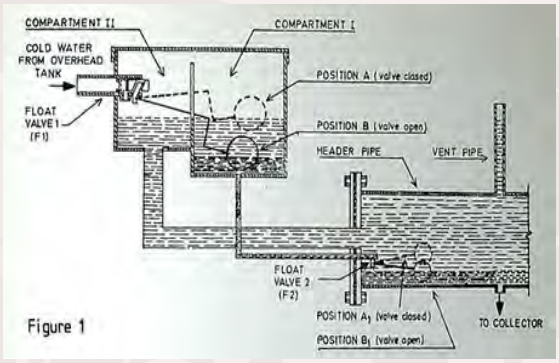


Figure 1

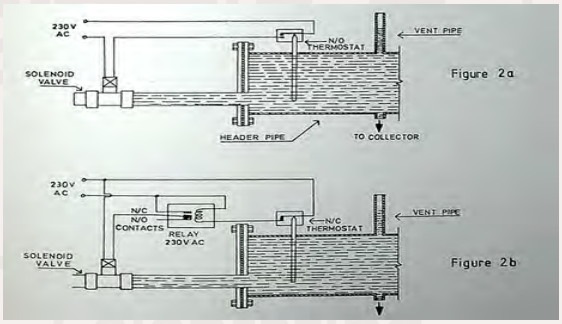


Figure 2a

Figure 2b

3) Woodgas Generator for Small Engines

Recognising the potential of biomass-derived producer gas as a substitute for diesel and petrol, KSCST launched a project at IISc to develop woodgas generators for small engines. A reactor–cooler system capable of producing 3–5 litres per second of combustible gas (20% CO, 20% H_2, 10% CO_2 and 50% N_2) was designed and tested. When used with a diesel engine, it enabled

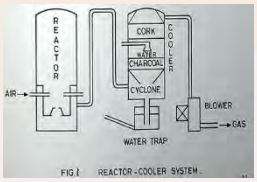


FIG.1 REACTOR-COOLER SYSTEM

up to 83% substitution of diesel while still providing around 70% of the rated power. Tests showed that the generator works reliably with good-quality wood chips, but large wood pieces or poor charcoal reduce gas yield. Phase I demonstrated the concept, while Phase II is refining the engineering design, with plans to fabricate and field-test 3–4 prototype units. This technology has the potential to make small pumpsets and engines more economical and less dependent on petroleum fuels.

4) Wind Pump (10,000 L/hr Target)

Following studies on rural windmill performance, KSCST initiated a project to design a wind pump capable of delivering about 10,000 litres per hour at 10 km/h wind speed for irrigation in semi-arid districts. A lightweight 10 m tower design weighing only 600 kg (about one-third the weight of conventional towers) was developed through computer optimization, improving cost-effectiveness and safety. A prototype wind pump with an 8 m^2 rotor was fabricated and erected at Ungra for training programmes. A chain-washer pump with controlled leak was tested for suitability, and a variable-speed test rig with torque and discharge measurements was built. Additional studies determined extreme wind speeds for design purposes and assessed tower frequencies under fluctuating loads. Three technical reports — on wind speeds, optimal tower design, and pump analysis — have already been published, laying the foundation for rural adoption of wind pumps.

5) Mini-Hydroelectric Demonstration Unit

KSCST recognised the potential of Karnataka's small streams and canal systems for decentralized power generation and initiated a mini-hydro demonstration project. Surveys were conducted in Mandya and Ghats districts to identify suitable sites. Detailed civil and mechanical designs, including turbine drawings, were prepared, and fabrication of subassemblies began. A comprehensive project report with cost estimates was submitted to KSCST for approval. Once sanctioned, installation of the unit is expected to begin, paving the way for demonstrating small-scale hydropower as a reliable energy source in rural areas.

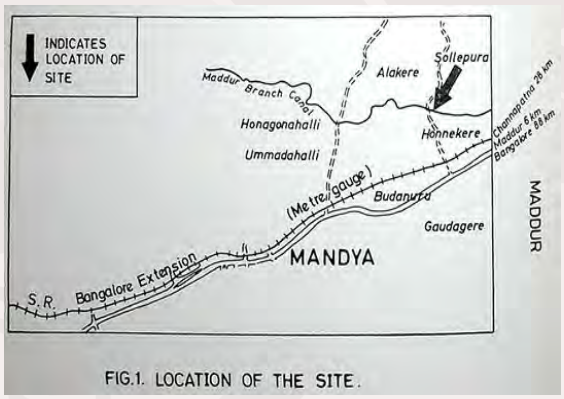


FIG.1. LOCATION OF THE SITE.

6) Development of Woodstoves for Domestic Cooking

To address the inefficiency and smoke hazards of traditional stoves, KSCST supported the development of an improved woodstove. The new design, built with sheet-metal and mud insulation, included a grate for better combustion and ducts to channel smoke. It achieved about 40% heat utilization efficiency, compared to less than 10% for traditional stoves. Cooking experiments showed that the stove supports a two-stage process: initial vigorous heating to boiling point, followed by sustained simmering using stored heat in the stove body. This reduced fuel consumption to 60–80 g of wood per kg of food compared to 200–250 g for traditional

stoves. The design is smokeless, cost-effective, and suitable for rural use, offering a major improvement in household energy efficiency.

7) Solar Ponds for Power Generation

KSCST explored large-area solar collection through non-convecting salt-gradient ponds to store low-grade heat for power generation. A 400 m^2, 2 m deep pond was selected near the IISc thermal plant, where polyethylene lining is being tested to reduce seepage losses. Methods of establishing the salt density gradient — either layering solutions or injecting dense brine — are under trial. Parallel efforts are underway to modify a 3-tonne refrigerant compressor into a regenerating engine and link it with an organic Rankine cycle system to generate about 3 kW. This project demonstrates the feasibility of solar ponds as large-scale, low-cost thermal collectors for rural power needs.

8) Community Jaggery Unit (Uttara Kannada)

Traditional jaggery-making, which burns large quantities of firewood, has become uneconomical. A community jaggery unit using bagasse fuel was developed and installed at Killara. The new three-pan design transfers juice progressively from top to middle to bottom pans, ensuring better quality jaggery while achieving about 40% heat efficiency. The system is easier to operate, eliminates the need for chimneys, and relies on bagasse instead of firewood. The project shows that community-based units can reduce costs, save forest resources, and improve product quality.

9) Sisal Industries Demonstration (Ungra)

To create rural livelihoods in semi-arid regions, KSCST initiated a sisal processing project at Ungra. Laboratory and pilot tests on resin extraction initially gave low yields, but a new solvent-based process achieved up to 1% extraction of high-quality resin, though costs were high. A decorticator capable of processing 200 kg of fibre per day was fabricated and installed. Alongside fibre production, yarn and rugs are being made, and a heckle device has also proven effective for fibre processing. The project demonstrates the potential for sisal as a drought-resistant industrial crop and highlights the need for further process optimisation.

10) Intensive Prawn Culture (Karwar)

With growing demand for prawns, KSCST established a hatchery and pilot plant at Karwar in June 1982 to develop intensive cultivation methods. Facilities include tanks, aerators, seawater filters, and a digital oxygen analyzer. Experiments proved that *Penaeus monodon* larvae can be successfully reared in captivity using algae and artificial feed. Mass culture of Chaetoceros algae was standardised to provide larval feed. These advances demonstrated the technical feasibility of large-scale prawn farming in coastal districts, with the potential to raise yields far above traditional practices.

11) Double-Cropping in Ungra (Mechanized Ploughing)

In dryland areas where draught animals cannot meet ploughing needs during the short pre-monsoon window, KSCST introduced tractor mechanisation at Ungra in 1982. Farmers provided land and bore

seed costs, while tractors were hired for ploughing and sowing pulses like cowpea, greengram, and horsegram. Although rainfall was delayed and yields were low, the experiment showed that pre-monsoon crops could be established earlier than in neighbouring villages dependent on animals. This trial highlighted the potential of mechanised ploughing to increase cropping intensity and farm incomes in dryland Karnataka.

12) Water-Lifting Devices for Irrigation

With more than 3.5 lakh irrigation wells in Karnataka, demand exists for efficient, animal-powered devices handling 1–10 m lifts and up to 25,000 L/hr discharge. KSCST developed two prototypes: a horizontal Archimedes screw driven by bullocks through gear transmission, and a double-acting diaphragm pump using scooter components. Fabrication is nearly complete, with field trials planned to assess performance. This initiative also includes documenting and improving traditional devices, aiming to provide farmers with efficient, locally fabricated water-lifting options.

13) Alternative Building Technologies

Since 1979, KSCST has explored low-cost rural housing technologies using local resources. Research produced soil–lime pressed blocks with high compressive strength (70–80 kg/cm²), lime–pozzolana cement from rice-husk ash, bamboo–lime concrete roofs, and reinforced hollow tile roofing. These materials reduce cost, improve durability, and can be manufactured locally. Reports documenting these findings are being disseminated to promote adoption in rural construction.

14) Building Technology Demonstration Project

To diffuse innovations, a demonstration programme built a one-room school at Allalasandra using compacted soil blocks, Mangalore tile roofing, frameless doors, and surkhi flooring. The 560 sq.ft. building cost Rs.16,500 and was handed to the Panchayat. In addition, a pictorial manual on alternative construction was prepared by architecture trainees and translated into Kannada. Masons' training programmes are planned to popularise these methods further.

15) Study of Bangalore as an Urban Ecosystem

Rapid urbanisation has strained Bangalore's resources, infrastructure, and environment. A study by IISc is examining land use, water resources, solid waste, air pollution, energy and transport, social stress, urban greening, and governance as interlinked components of an "urban ecosystem." Initial surveys, mapping, and data collection have begun to provide a framework for future city planning that balances growth with ecological sustainability.

16) Computers in Administration (Gulbarga)

To improve efficiency in district administration, KSCST developed a computer-based management information system with modules covering irrigation works, housing, fertilizer use, employment schemes, land records, and file processing. The project was piloted in the Deputy Commissioner's office at Gulbarga, where RTC (Record of Rights, Tenancy and Crops)

digitisation was initiated. Programmes replicated existing formats and mapped workflows, demonstrating how small computers could transform administrative processes.

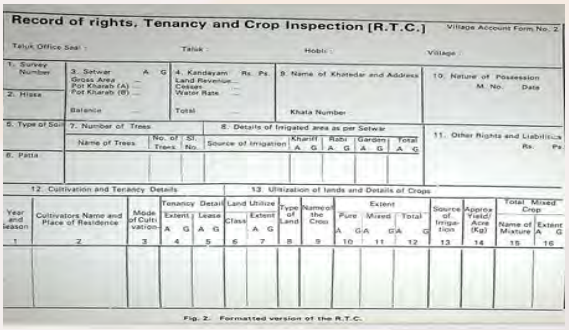

Record of rights, Tenancy and Crop Inspection [R.T.C.]

Fig. 2. Formatted version of the R.T.C.

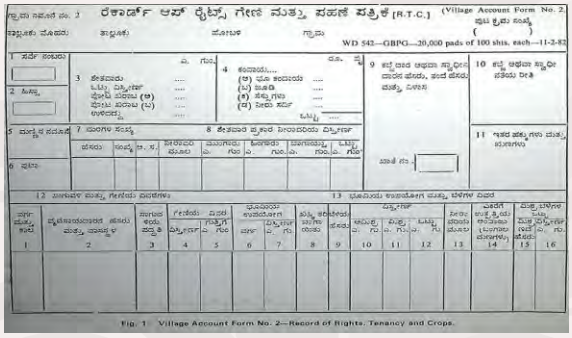


Fig. 1 Village Account Form No. 2—Record of Rights, Tenancy and Crops.

17) Student Projects Programme (SPP)

Launched in 1977–78 to link academic research with state development needs, SPP spans five universities and the fisheries college. By 1982–83, the Fifth SPP had funded 151 projects across 16 institutions (Rs.5.06 lakh), with 54 exhibited at Gulbarga. The Sixth SPP sanctioned 155 projects (Rs.4.64 lakh) and emphasised quality improvement through faculty training workshops and technical manuals. The programme fosters innovation, local problem-solving, and technology dissemination through student engagement.

18) Meeting on State Councils of S&T (Trivandrum, 1983)

An all-India workshop in April 1983 reviewed the functioning of state-level S&T bodies, attended by 45 participants from 14 states and five agencies. Papers highlighted successes and challenges, including duplication of efforts. KSCST presented a paper on the functions of national and state bodies, suggesting cooperation, clear roles, and information sharing. DST agreed to launch a newsletter to link state councils, and discussions covered planning methodologies, council structures, and activities to strengthen state-level science governance.

KSCST Projects (1983-1984)

1) Community Biogas Plant – Phase II (Pura, Bangalore South Taluk)

Phase II built on the technical and social success of the Pura pilot to undertake a systematic social–economic evaluation, disseminate lessons, expand installations and run training programmes; surveys by IISc social scientists showed major benefits (reduced firewood collection time for women, village income from gas and slurry sales) alongside operational challenges (high maintenance costs and management shortfalls). The team produced a design/construction manual for wider use, held workshops and trained villagers in operation, safety and troubleshooting, and proposed roll-out to additional villages with state collaboration. Technical–economic indicators show increased plant capacity and output between phases (Phase I → Phase II: plant capacity 1,000 → 1,500 m^3/day; gas 800 → 1,200 m^3/day), falling unit gas cost (Rs.2.50 → Rs.2.00/m^3), slightly higher slurry value (Rs.100 → Rs.120/ton), and amplified social gains (women's hours saved rising from 50 → 75 hrs/day and monthly income generation rising from Rs.2,000 → Rs.3,000).

Fig. 1 Community Biogas Complex at Pura Village

2) Solar Energy in Sericulture (Mysore / Kanakapura)

KSCST, IISc, IIT and Central Silk Board collaborated to apply solar hot water, storage and rearing devices to reeling, storage and chawki rearing; an early system in Mysore suffered collector leakage and corrosion, prompting redesign. A new collector uses two pressed mild-steel sheets with trapezoidal flow channels crimped together (no brazing), phosphated and painted, with sealed headers to avoid corrosion and bonding failures; fabrication is simple (1 hour/panel) and inexpensive. Twelve redesigned collectors were installed on a second roof and plumbing, storage and control completed; the system attains 60°C and is now operational, with commercial fabrication of the new design scheduled for December 1984 and wider adoption planned for reeling centres.

3) Development of Woodstoves for Domestic Cooking (Astra Ole)

An IISc/ASTRA design produced the three-pan *Astra Ole* stove giving 40% useful thermal efficiency (versus <10% for traditional stoves), enabling a two-stage cooking method (initial rapid heating then use of stored stove heat for simmering) and reducing fuelwood requirements to about 1.5–2 kg per 4 kg meal (2.5–3 hr cooking) — versus 200–250 g/kg for traditional stoves. The stove is fabricated from hollow sheet-metal packed with insulating mud/rice husk mix, includes a grate and controlled ducts, and delivered PHU values of 40–60% and SFC improvements (19–25%). Theoretical models of flow, pressure drop and heat transfer were developed and validated by water-boiling tests; field acceptance has been strong and the

Government of Karnataka has decided to implement the stove at scale with KSCST/ASTRA support.

4) Solar Ponds for Power Generation and Low-Grade Heat (IISc)

KSCST constructed a 10×10 m (100 m^2), 2–2.5 m deep solar pond at IISc using low-density polyethylene lining after trialing other liners; a salt-gradient (non-convecting) stratification was established and the bottom reached 70°C. A floating, movable bridge was installed for systematic temperature/salinity profiling and a diesel pump circulated hot bottom water to a heat exchanger. Work focused on seepage control, algal and wind mitigation, salt-gradient methods, and conversion of a 3-tonne compressor into a regenerating engine; the goal is to couple the pond to an organic Rankine cycle to generate 3 kW from low-grade heat and to develop larger, more efficient thermal wells and corrosion-resistant designs for future scale-up.

5) Woodgas Generator for Small Engines (Phase II)

IISc developed and refined a woodgas reactor producing combustible producer gas (approx. CO 20%, H_2 20%, CO_2 10%, N_2 50%) for use with diesel engines; long duration testing (e.g., 150 h run, 115 h coupled to engine) showed up to 80% diesel replacement at near-full power and mean diesel substitution 70%. Engineering problems addressed included reactor leaks (resistance-welded joints), cooler/cleaner maintenance and water-spray cooling requirements; a dry cooler design that transfers heat to incoming wood chips was tested successfully. An improved, transportable prototype on a trolley was fabricated; the project emphasised re-engineering for field robustness, extended testing and demonstration at field sites and consideration of alternate feedstocks (compressed biomass).

6) Field Studies of Windmills for Water Pumping in Karnataka

Under a national demonstration (CASE/DST) KSCST field-tested ORP-Tool / WERDO horizontal-axis windmills (12-PU-500) at multiple Karnataka sites. Installations were delayed, and the Karnataka wells' deeper heads (10 m) required special cross-beam adaptations. Extensive field rectification revealed poor foundations, mismatched manufactured parts, missing delivery plumbing and suboptimal siting (vegetation interference, pumps above water). Only 12 of 25 windmills were installed and many lacked storage/delivery systems; the project devolved into maintenance and rectification rather than design comparison and was closed after objectives could not be fully met.

7) Mini-Hydroelectric Demonstration Unit

KSCST targeted small drops in canals and streams as decentralised power sources, selecting a Maddur Branch canal site (head 2.5 m, flow 7 m^3/s at one site) and fabricating initial turbines. A 6 kW turbine was installed in a Western Karnataka hill site and successfully used to run tea-factory auxiliaries during grid failures, proving small-grid utility; a planned 40 kW Maddur canal unit awaited government approval and further fabrication. Studies also considered retrofitting irrigation dams to tap 3–10 MW potential at suitable sites, showing minihydro's promise for rural electrification.

8) Wind Pump with 10,000 L/hr Pumping Capacity

Building on wind resource studies, a complete design programme delivered an optimised, lighter 10 m tower (600 kg) and matching rotor/chain-pump system targeted to deliver 10,000 L/hr at 10 km/h winds. A test rig with variable drive (autorickshaw engine), instrumentation for rpm, torque and discharge, and a chain-washer pump prototype were fabricated and tested (50 hours), showing pump overall efficiencies up to 75% in normal ranges. Computational tools for rotor and tower optimisation were developed, and a practical design procedure for rotor geometry, tower weight optimisation and pump coupling was produced.

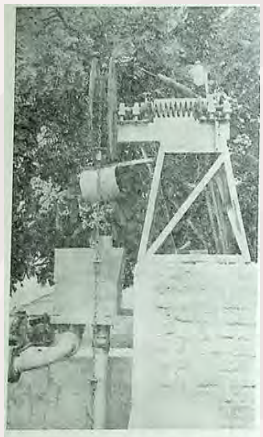


Fig. 3 Experimental Rig for Chain Washer Pump Testing

9) Sisal Industries Demonstration Unit (Ungra)

To diversify rural employment KSCST established an Ungra demonstration for sisal processing. A raspador (400 kg leaves/hr) and decorticator (200 kg leaves/hr) were developed; pilot solvent extraction processes isolated hexagonal resins and wax (initial yields low, improved to ~1% resin with new solvent but at high cost). Pilot units for resin extraction, fibre processing, a small paper mill (10 kg batch) from sisal waste, and a pilot wax plant (5–8 L batch) were demonstrated; products (fibre, yarn, rugs, paper) and training indicated sisal's feasibility as an agro-industry, with continued emphasis on process economics and scale-up.

Fig 2. Sisal Decorticator in Operation

10) Utilisation of Plant Wastes for Village-Scale Paper Manufacture – Phase I

A KSCST/ASTRA study catalogued abundant Karnataka plant wastes (paddy straw, banana stems, areca nut husk, bagasse, coffee waste) and designed a simple, village-scale paper unit (digester, pulper, beater, paper machine). Pilot runs showed good paper quality; villagers were trained in process steps (digestion, pulping, beating, sheet forming) and economics were evaluated as viable. Phase II will focus on scaling up and replicating units across villages.

11) Intensive Prawn Culture Technology – Phase I (Karwar)

To raise prawn yields in Uttara Kannada KSCST set up a hatchery and pilot plant at Karwar (hatchery building, concrete tanks, pumps, aerators, filters and a digital seawater oxygen analyser). Experiments with *Penaeus monodon* and other species standardised methods for hatching, larval rearing using Chaetoceros algae and artificial feeds, and mass culture of feed algae. Early constraints (compressor procurement) were resolved and the pilot validated captive hatching and larval rearing under local environmental conditions.

12) Double-Cropping in Ungra Dryland Agriculture by Mechanised Ploughing

To increase cropping intensity in drylands, ASTRA/KSCST introduced tractor mechanisation in Ungra to exploit the pre-monsoon sowing window and enable a Pre-Monsoon Season (PMS) pulse crop; farmers bore seed costs and hired tractors for tillage and sowing. Despite delayed rains and erratic yields in initial trials, PMS sowing and harvest demonstrated feasibility of double-cropping with mechanisation, reduced dependency on draught animals, and potential for higher farm incomes under normal rainfall patterns.

13) Utilisation of Cassia tora as Fodder and Feed Ingredient for Cultivable Carps

KSCST initiated studies to use *Cassia tora*, a widespread leguminous weed, as green fodder and pelleted feed ingredient for carps to reduce feed costs. Chemical analysis showed leaves contain 25–30% crude protein and 8–12% fat (dry basis); palatability tests indicated grass carp readily consumed fresh *Cassia tora* leaving midribs. Progress slowed due to erratic plant availability and induced-breeding challenges for grass carp, but initial results validated *Cassia tora*'s potential as a low-cost protein source for aquaculture.

14) Groundwater Recharge through Percolation Tanks in Coastal Karnataka

Facing rapid coastal runoff and summer water shortages on lateritic terrain, KSCST modelled and field-surveyed percolation tanks as low-cost recharge structures. A two-dimensional theory for percolation in lateritic geology was developed and lab model experiments confirmed predictions; site surveys (with College of Fisheries, Mangalore) and collaborations with PWD and Mines & Geology supported design studies. The project emphasized the tanks' potential to raise groundwater storage, reduce freshwater loss to the sea, support drinking and agricultural water supply and serve community needs, with further design/model verification and scaling studies planned.

15) Studies on Water-Lifting Devices for Irrigation

With hundreds of thousands of wells in Karnataka and diverse lift/discharge needs, KSCST developed animal-driven alternatives to scarce centrifugal pumps: a horizontal Archimedes screw and a double-acting diaphragm pump (using scooter tyres) driven by bullock transmission. The diaphragm pump prototype with gear transmission and adjustable stroke was fabricated and laboratory tested; the initial tin-sheet Archimedes screw showed leakage and eccentricity problems, leading to a refined steel-sheet design and planned laboratory/field trials through 1984 to validate reliability for minor irrigation.

16) Alternative Building Technology Demonstration Project (Allalasandra, Ungra)

To demonstrate diffusion, KSCST built a 560 sq.ft. one-room school in Allalasandra using compacted soil-block walls, cellulose/lime coatings for rain protection, traditional Mangalore tile roofing, lime-surkhi flooring, and frameless doors/windows — completed at Rs.16,500 and handed to the Panchayat. A pictorial masonry manual was

produced by architecture trainees and translated into Kannada and a masons' training programme planned for 1983–84 to scale adoption; ASTRAM soil-block machines were disseminated to multiple agencies for replication.

17) Study of Bangalore as an Urban Ecosystem

An interdisciplinary IISc study framed Bangalore as an urban ecosystem under rapid urbanisation stress, launching eight subprojects (land use/urban ecology, water resources/quality, solid waste management, air pollution, energy & transport, social stress & health, urban greening & biodiversity, planning & governance). The work compiled baseline maps and data, delivered topic reports, and held seminars covering transport, food supply, housing, water losses, energy inefficiencies, high vehicle growth (10–12%/yr), slum expansion, sanitation gaps and administrative challenges — forming a systems basis for urban planning and policy recommendations.

18) Repair and Maintenance of Medical Equipment

Surveys by KSCST and student teams across hospitals (3,061 items sampled; e.g., 747 instruments needing repair) revealed high downtime and a large proportion of ageing equipment (many instruments >5–15 years old), demonstrating inadequate in-situ maintenance capacity. The analysis showed many defects were simple fixes and recommended establishment of a central repair & maintenance centre, improved spare-parts planning, training of technical staff and an information system to track failures and mean time between failures, with the aim of reducing downtime and extending equipment life.

19) Student Projects Programme (SPP) – Engineering & Life Sciences

Launched 1977–78 to align student projects with state development needs, SPP spread across engineering, fisheries and medical colleges. Sixth SPP (1982–84) funded 157 projects (18 institutions, Rs.4.64 lakh) and the Seventh series supported 160 projects (17 institutions, Rs.3.69 lakh). SPP introduced faculty training (wind & solar short courses), produced manuals (e.g., *Perspectives in Technology*, Vol. I: Solar Energy), expanded into life sciences/medical colleges (guidelines, committee), and created Product Development Centres (e.g., SJCE Mysore) to commercialise promising student prototypes such as electronic kits, teaching projectors, dynamometers, EPROM programmers and a deflossing machine for sericulture. Selected projects were presented at seminar-cum-exhibitions (Hubli 1984, Gulbarga 1983).

20) Student Training Programme & Product Development Centres

KSCST ran short industrial/research placements for students (IIT Madras, IIT Kanpur, UVCE) on projects such as tile-kiln efficiency, solar hot water for dairies, Monte-Carlo radiative transfer and urban water supply; PDCs were created to carry forward commercialisable SPP outputs, with screening committees linking academia and industry to develop marketable prototypes and undertake field testing and fabrication support.

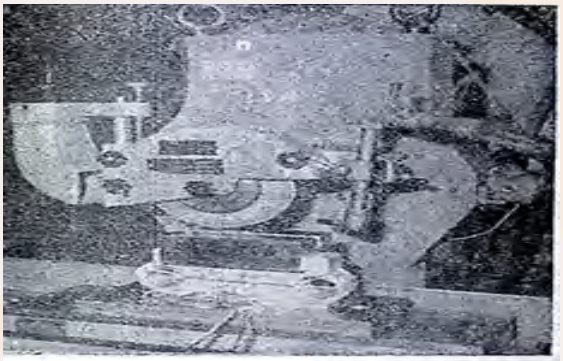


Fig. 1 Surface Grinding Dynamometer

21) Diffusion of Astra Ole

To scale the widely accepted Astra Ole stove, KSCST/ASTRA trained trainer batches and planned district-level diffusion through DRDS; training camps (Unchagi, Ungra, Anekal) produced instructors and trainees with a quality-control emphasis (stove geometry, grate size, clearances). A pictorial Kannada manual was prepared and 180 training camps (2,400 artisans targeted in 1984–85) were planned, with ongoing stove testing of artisan-built units to maintain design integrity and efficiency.

22) Dissemination of Improved Community Jaggery Stoves (Two-pan unit)

An improved two-pan jaggery furnace (compact firebox, controlled draft, raised chimney) was developed to suit smallholders and community units; field adoption in nine villages demonstrated 52% efficiency, ease of operation, fuel savings (300 tons wood saved in one season across units), cost recovery potential (Rs.2,000/unit), and strong acceptance. Manuals were prepared for DRDS and Social Forestry diffusion, with training of 150 villagers per roll-out.

KSCST Projects (1984-1985)

1) Solar Energy in Sericulture

KSCST, with sericulture institutions, developed solar hot water systems for silk reeling and cocoon storage. Early units failed due to leakage and corrosion, leading to a new collector design with G.I. pipe headers, trapezoidal trenches, flexible connectors, and insulation. A prototype achieved 50% efficiency, was leak-free, and durable. Twelve collectors were installed at KSIC, fully covering the roof. The system demonstrated reliability and effective heating, proving solar energy's role in silk production.

2) Development of Woodstoves for Domestic Cooking (Astra Ole)

The *Astra Ole* three-pan stove (1983) achieved 40% PHU and 120–180 g/kg SFC, far above traditional stoves. Field-tested in Ungra, it was adopted under the national chulha programme. Models for canteens and two-pan urban homes were developed, and a portable single-pan stove consistently exceeded 40% PHU. Heat from wood volatiles was effectively used, optimizing combustion. Engineering trials continue to refine mass-producible, market-friendly models.

3) Solar Ponds for Power Generation and Low-Grade Heat

A 100 m² LDPE-lined solar pond at IISc achieved bottom temperatures of 70°C using a salt gradient. Problems of seepage, evaporation, and algal growth were controlled through insulation, covers, and copper sulfate treatment. A modified 3-tonne compressor engine, powered by hot pond water, produced 1 kW electricity and cold water at 10°C. The system operated for six hours with good efficiency. The project demonstrated solar ponds as a viable low-grade heat and power source.

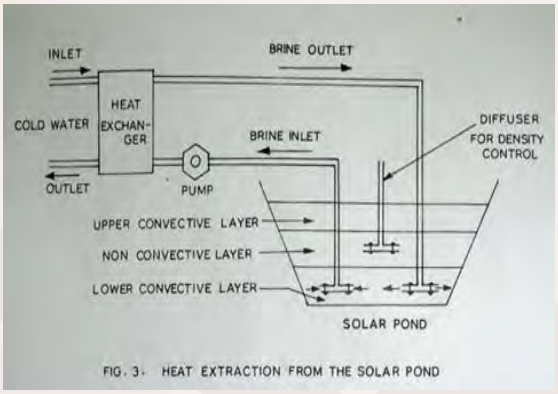


FIG. 3. HEAT EXTRACTION FROM THE SOLAR POND

4) Biogas Generators for Small Engines

A woodgas generator was designed to fuel 5 hp engines, producing 3.2–3.5 g/s gas at 1000–1200°C. It worked on wood, charcoal, and agricultural waste. When coupled to a dual-fuel engine, it delivered ~4 hp at 2600 RPM with 19% efficiency. Continuous six-hour runs were successful, showing reliable performance. The system proved renewable gas could effectively power small engines and rural pumps.

5) Dissemination of Astra Ole in North Kanara

Surveys in Ungra showed 325 t of annual fuel demand for cooking and bathing. Astra Ole stoves reduced SFC from 330 g/kg to 160 g/kg, saving over 60% fuelwood. About 160 stoves were installed in three villages, later spreading to 200 more homes nearby. A bathwater heating stove achieved 40% efficiency, lowering household fuel use further. Adoption reduced fuel consumption from 325 t to 130 t annually, proving community-level energy savings.

6) Activated Carbon from Coconut Shells

A pilot plant at IISc processed coconut shells through carbonization (100–150 kg/batch) and activation (10 kg/batch) with steam/flue gas. Initial runs produced high-quality activated carbon meeting standards. The process showed shells are an excellent raw material, with gases and condensates as by-products. The plant proved feasibility for scaling coconut-based activated carbon for industrial applications.

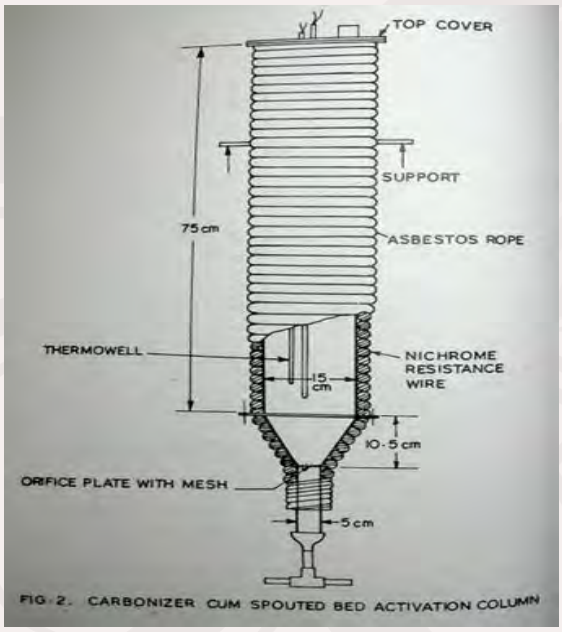


FIG. 2. CARBONIZER CUM SPOUTED BED ACTIVATION COLUMN

7) Utilisation of Plant Wastes for Manufacture of Paper on A Village Scale - Phase I

Depithing and pulping of bagasse gave 55% fibre yields. Atmospheric pulping at 65°C with caustic soda produced 52% yield with good fibre quality. Black liquor recovery using combustion and three-pan stove methods achieved 40–45% sodium hydroxide recovery. Combustion inefficiency reduced yields but proved viable. Work continues on improving efficiency and economics for village-scale paper units.

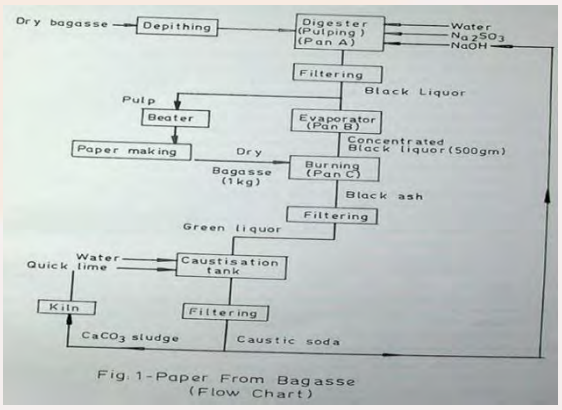


Fig. 1-Paper From Bagasse (Flow Chart)

8) Intensive Prawn Culture (Karwar)

Hatchery methods for *Penaeus indicus* and *P. merguensis* were standardized. Spawners were collected live from fishermen and bred in captivity. Larval rearing with phytoplankton, Chaetoceros, and egg yolk achieved 56% survival under lab conditions. Hatchery protocols for hatching, feeding, and rearing were developed. Large-scale seedling production awaits hatchery facility expansion.

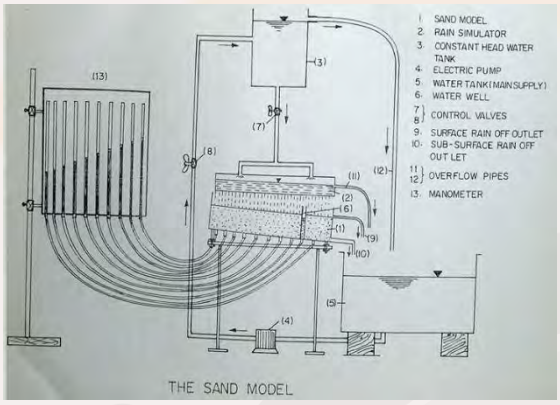
9) Double-Cropping in Ungra (Dryland)

Mechanized ploughing enabled pre-monsoon (PMS) crops before kharif, trialled on 28 ha in 1983 and 56% of land in 1984. Yields were low due to erratic rains, but benefits included fodder, nitrogen fixation, and women's employment. The study showed feasibility of double-cropping with tractors but highlighted the need for climatological and water balance analysis to ensure success.

10) Conservation of Surface and Ground Water

Farm ponds and subsurface storage were tested at Ungra to address rainfall gaps. A trapezoidal pond stored rainwater for irrigation at critical crop stages. Subsurface storage minimized evaporation and

supplied groundwater in stress periods. The trials proved small-scale water conservation could sustain crops and reduce drought impact in rainfed regions.



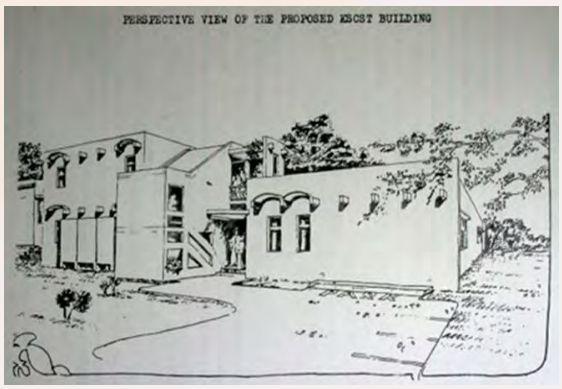
THE SAND MODEL

11) Alternative Building Technologies

ASTRA developed soil block machines (ASTRAM), lime-pozzolana cements, bamboo-composite roofing, and reinforced tile roofs. Block mould sizes were optimized for easy compaction, and bullock-powered ball mills were introduced for village-scale cement grinding. Rice husk ash reactivity was studied, and bamboo roofing trials faced bonding issues. Reinforced brick roofing showed promise for rural housing.

12) Demonstration in Urban Environment

A low-cost demonstration building was initiated for KSCST and ASTRA libraries. Soil-cement blocks, RCC beams with reusable moulds, and cylindrical shell roofing with hollow tiles were used. Precast panels reduced costs and showcased material- and energy-saving methods. The project aimed to prove alternative technologies feasible for urban offices and institutions.



13) Repair and Maintenance of X-Ray Equipment

A survey of 129 x-ray units found 30% out of order, with 20% down >12 months. Belgaum had fastest repairs despite high failures, while Gulbarga had longest downtimes. PHCs had lowest usage but newer machines; colleges had highest breakdowns due to heavy use. 87% repairs finished within 2 months; major repairs often delayed by spares and procedures. Training operators for minor repairs was piloted to reduce downtime.

14) Allergy in Bangalore Due to Parthenium

A survey of 2,000 people during IISc Open Days found 30% asthma and 20% rhinitis cases, with 5.8% sensitive to Parthenium pollen. Skin tests confirmed Parthenium and house dust mites as major allergens. Patients are being followed up with immunotherapy and antibody monitoring. Findings provide inputs for vaccine development against Parthenium-induced allergies.

15) Paralytic Shellfish Poisoning (PSP) in Karnataka

Six coastal estuaries were monitored for PSP after the 1983 Kumble outbreak. Most shellfish samples were safe, except Tadri oysters showing 320 MU/100 g toxin

(below 400 MU/100 g safety limit). Dinoflagellates producing PSP and DSP were identified, raising concerns for exports. Continued vigilance is needed as blooms can occur under favourable conditions.

16) Student Projects Programme (SPP)

Started in 1977, SPP funded 160 projects (7th series) with Rs.3.6 lakh; 43 were showcased at a Davangere seminar. The 8th series (165 projects, Rs.4.4 lakh) began in 1985. Projects produced innovations like tricycles for armless handicapped, electronics kits, and energy devices.

17) SPP in Life Sciences & Fisheries

Since 1981, SPP expanded to fisheries and medical colleges. By 1984–85, 22 life science projects were supported with Rs.49,464. Fisheries projects covered inland fish culture and processing. Seminars at Mangalore shared findings, boosting research in non-engineering fields.

18) Student Training Programme

Since 1983, 18 students from engineering and management trained on KSCST projects for 2–6 months. Topics included wind rotors, woodgas, solar heating, energy analysis, and pollution studies. Reports enriched applied research and supported KSCST projects.

19) Diffusion of Astra Ole

149 training camps trained 2,500 artisans in 1984–85, constructing 12,000 stoves. By year-end, 27,000 Astra Oles were in use across Karnataka. Field tests showed 40% efficiency. Films and manuals in Kannada supported large-scale diffusion.

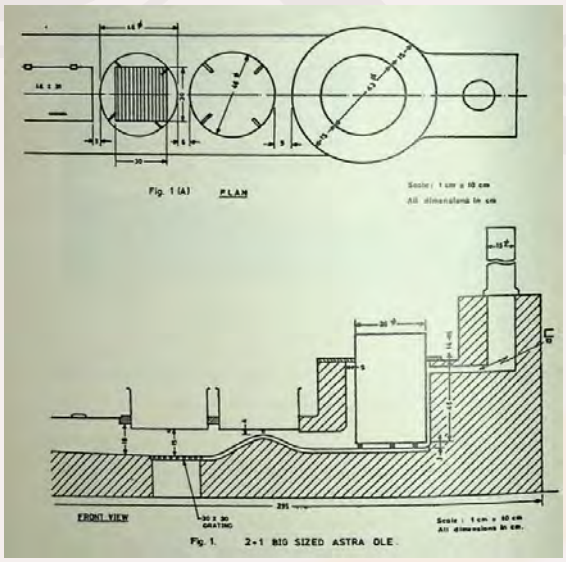
20) Product Development Centre (SJCE, Mysore)

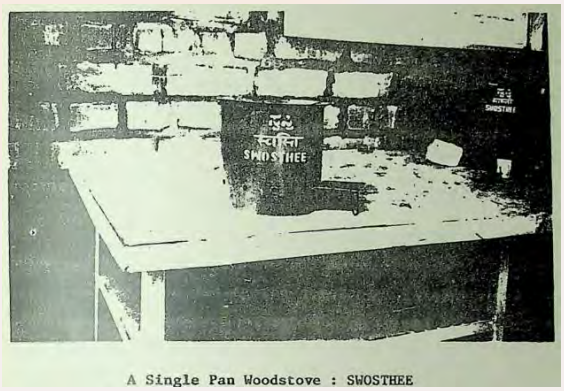
Set up to commercialize student prototypes, PDC developed EPROM programmers, erasers, deflossing machines, and mobile service units. Consultancy projects like “Bias Cutter” for Vikrant Tyres were completed. Field tests and design refinements advanced towards mass production.

KSCST Projects (1985-1986)

1) Development of Woodstoves - Prase II

In Phase-I, Astra Ole woodstove was developed with high efficiency (40–50%), smokeless combustion, and wide use (1,00,000 units), but had limitations like in-situ construction, vessel-specific design, and unsuitability for large-scale cooking. To overcome this, Phase-II focused on developing portable metallic stoves and large-sized earthen hearths. The SWOSTHEE metal stove (48% efficiency) is smokeless, portable, uses varied fuels, and saves space; 100 units of 1 kW were field-tested though higher capacity (2 kW, 5 kW) models are under development. Compared to PRIYAGNI and TARA, it saves 20% more wood. Large mud stoves include a 3-pan canteen stove (35–45% efficiency), a 3-pan domestic stove (35–38%), and a bath-water heating stove yielding 15L at 60–65°C every 10 minutes with PHU 44.5–48.5%. Field trials are being conducted at the Govt. Polytechnic, Channapatna, and Ecumenical Centre, Bangalore, with further designs underway for Hutti Gold Mines.

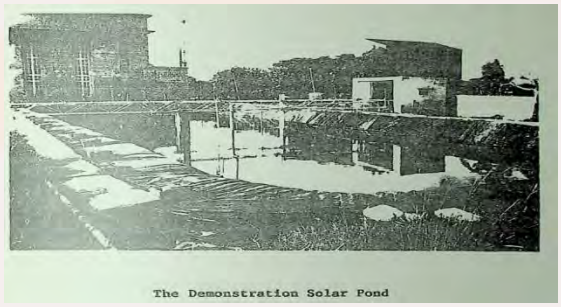




A Single Pan Woodstove : SWOSTHEE

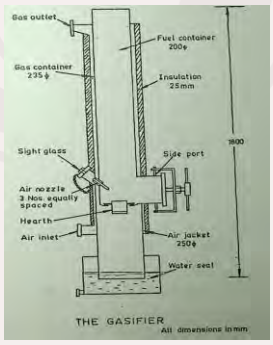
2) Demonstration of Solar Ponds for Low Temperature Process Heat

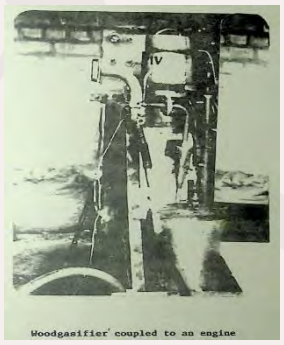
A 240 m² solar pond (8m × 30m, 2m depth) was built in 1984 using salt density gradients to trap heat, attaining 72°C. Objectives included heat extraction, conversion of a 3-tonne compressor into an engine, and integration with an organic vapour Rankine cycle, though power generation was later dropped due to low pond temperatures (<75°C) and equipment constraints. Algal growth was controlled using bleaching powder, and continuous heat extraction was tested via a titanium plate heat exchanger (500 MJ/day; 11.5% efficiency). Rainfall studies showed minimal impact on the gradient zone if the upper mixed layer exceeds 50 cm, though energy absorption reduces in monsoon. A 240 m² pond under Bangalore-like climate can deliver 50,000 kWh/year of thermal energy at 60°C at ₹1.00/kWh, making it cheaper than coal or oil; efforts are underway to apply solar ponds for hot water supply in live conditions.


The Demonstration Solar Pond

3) Woodgas Generators for Small Engines

KSCST, with IISc, developed woodgasifiers to generate 3–6 L/sec of gas (20% CO, 20% H_2, 10% CO_2, 50% N_2), replacing up to 80% diesel in diesel engines and nearly 100% kerosene in petrol-start kerosene engines. Phase-II focused on redesign for field use, durability testing, demonstrations, and alternative fuels. The final prototype included water seals, compact design, and moist wood use, but required efficient filtering; nylon cloth filters proved durable compared to polyurethane foam. Trials on Petter and Kirloskar engines showed that dual-fuel operation could replace 70% diesel, with sensitivity to air–fuel control. Modifications included enlarging the inlet, redesigning grates, and using water seals, enabling 100+ hours continuous operation with reduced dust and tar deposits. Engines ran 200 hours efficiently, and demonstration projects for irrigation pumpsets at 10 sites in Karnataka have been initiated for farmer use.





4) Efficient Kilns for Bricks and Tiles

Karnataka, with over 100 brick and tile factories, mostly uses intermittent wood-fired kilns of low thermal efficiency (10%). Rising firewood scarcity prompted KSCST to initiate a project with IISc to build an experimental kiln for 1000 tiles/bricks, test heat recovery methods, and model thermal processes. Studies showed tiles could be preheated safely if the heating rate is kept below 80°C/hour. A mini kiln with four chambers was built using magnesium oxide insulation, later redesigned with independent chimneys and an induced draft (ID) fan to prevent back firing. This achieved 20% firewood savings without reducing tile quality. A 5000-brick kiln at Ungra using lime kiln-type heat recovery is under construction for small-scale application trials.

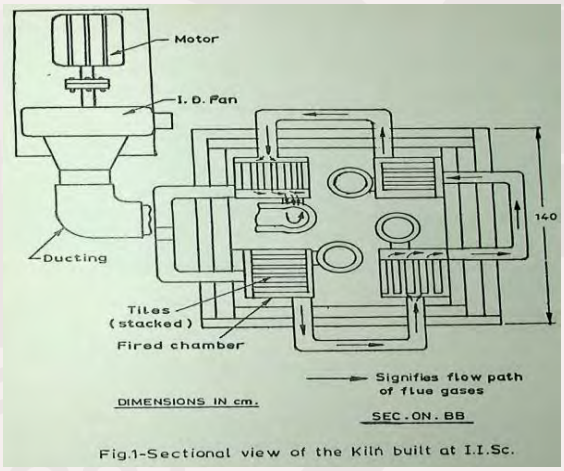


Fig.1-Sectional view of the Kiln built at I.I.Sc.

5) Activated Carbon from Coconut Shells

Activated carbon, widely used in effluent treatment and air pollution control, was explored using coconut shells, abundantly available in Karnataka. At KREC, Surathkal, KSCST initiated a project to design and test a pilot plant for carbonisation and activation. A 10 kg tilting suspension carboniser was developed, serving both carbonisation (best yield 36% at 500°C, 80 min, feed size –6+8) and activation using CO_2, air, and steam under spouted bed conditions. A 50-litre stirred fluidized bed activator with continuous feed/withdrawal was later installed, giving yields of 67% with CCl_4 adsorption 46.5% and benzene adsorption 39.4%. Finally, a 50 kg batch carboniser–cum–activator heated by oil-

fired flue gases was fabricated for scaling up and design data collection. Entrepreneurs from Bangalore and Kerala have shown interest in setting up such plants.

6) Sisal Industries Demonstration Unit at Ungra

KSCST launched a sisal utilisation project to promote rural agro-based industries using locally available Agave Veracruz. A sisal complex was set up at Ungra (1986) to process 1 tonne of leaves/day, producing 30 kg rope, 1 kg hecogenin, and 35 kg paper. The Rope section faced difficulties in making uniform slivers, but non-ISI ropes are sold in local markets; demand exists for yarn/fibre from large companies. In the Hecogenin section, a pilot plant with hydrolyser and solvent recovery system was established, yielding 0.08% hecogenin per leaf weight (250–300 g per 100 litres juice) after solving contamination issues. The Paper section converts sisal waste into pulp using efficient chulas, beaters, and moulding units; trial paper has met acceptable standards. All equipment is installed at Ungra, and full-scale operations are underway to demonstrate commercial viability of sisal-based rural industries.

7) Utilisation of Plant Wastes for Manufacture of Paper on a Village Scale – Phase I

KSCST undertook this project with IISc to enhance rural industry viability by converting sugarcane bagasse and sisal waste into paper. Key objectives were to develop a low-energy depithing process, optimise cooking parameters at village scale, and explore chemical recovery from black liquor. Bench-scale depithing using a rod mill gave 55% fibre yield. Atmospheric pulping at 65°C with caustic soda and sodium sulphate gave a 52% pulp yield. Initial chemical recovery using black liquor combustion achieved only 40–45%, but improved furnace design with coal beds raised recovery to 57–77%. A furnace was developed to concentrate 600 L of black liquor and pulp 40 kg of residues in 5–6 hours, proving feasibility for village-level paper making.

8) Conservation of Surface and Ground Water

In Karnataka, only 10% of rainfall infiltrates into the ground, 20% is stored in reservoirs, while the rest runs off, leaving 85% of agriculture rainfed and vulnerable to drought. KSCST initiated this project with IISc to study farm ponds for dryland crops and subsurface dykes for groundwater conservation. Trials at Ungra showed ragi yield increases of 90% (grain) and 80% (straw) with pond irrigation, giving a net benefit of ₹300/ha despite seepage and evaporation losses. A crop growth simulation model using weather data, runoff and soil moisture balance was developed, supported by experiments with rain simulators and runoff plots to validate water needs and percolation. For groundwater, sand models and a larger adjustable catchment model with rain simulators and simulated wells were fabricated to study slopes, runoff, percolation and conservation parameters; experiments are being initiated.

9) Alternative Building Technologies for Low Cost Housing – A Demonstration Project in an Urban Environment

Following successful rural housing trials, KSCST initiated this project with IISc–ASTRA to demonstrate low-cost building

technologies in an urban setting. Two units (plinth area 2800 sq.ft.) were planned for the KSCST, ASTRA, and KRVP offices/libraries, built at ₹90/sq.ft. Foundations used stone in mud mortar, with soil-cement pressed blocks (ASTRAM machine) for walls; rounded corner blocks were also introduced. Internal plastering employed lime-soil-cement-sand mortar for economy, with cement painting externally. Innovations included cylindrical shell roofs made of hollow tiles assembled on precast RCC beams/trusses, reinforced brick lintels, burnt brick stair slabs, and hollow clay panel roofs. Hollow weatherproof tiles were also used as an alternative to metal grills. The project demonstrated the feasibility and cost-effectiveness of alternative technologies in urban construction.

Double storeyed building with alternative technologies

10) Occurrence of Paralytic Shellfish Poison (Saxitoxin) in Shellfishes of Karnataka

Paralytic Shellfish Poisoning (PSP), caused by saxitoxin from toxic dinoflagellates, was first reported in India at Kumble (1983), leading to fatalities. KSCST initiated monitoring across six estuaries (Kumble, Mulki, Malpe, Kundapur, Tadri, Karwar) under Dr. Indrani Karunasagar. Monthly sampling (1984–86) recorded detectable PSP levels in April 1985 (oysters at Tadri: 320 MU/100g, below the 400 MU/100g safe limit) and unsafe toxin levels in March 1986, coinciding with summer blooms. Known PSP-causing dinoflagellates were not observed, possibly due to transient blooms or unrecorded species, warranting further culture and toxin studies. Diarrhoetic Shellfish Poison (DSP) linked to Dinophysis sp. was detected in 21 of 65 samples (1985), significant since India exports clam meat to Japan, where DSP safety limits are enforced. Though toxin levels later declined to safe limits, periodic monitoring remains crucial for public health and export safety.

TABLE 2: LEVELS OF PSP IN SHELLFISH FROM DIFFERENT ESTUARIES

Month and year	Estuary	Shellfish involved	PSP levels MU/100 gm
April 1985	Tadri	Oyster	320
March 1986	Mulki	Clams (Katelysia sp)	438.96
		Clams (Meretrix sp)	950.16
	Udyavara	Oyster	1109.68
	Malpe	Clams (Katelysia sp)	1272.64
	Kollur	Clams (Meretrix sp)	948.44
		Oyster	575.00
	Tadri	Clams (Katelysia sp)	744.66
		Oyster	566.20
	Kali	Clams (Paphia)	465.00
April 1986	Mulki	Clam (Katelysia sp)	399.60
	Malpe	Clams (Meretrix sp)	464.00
		Oyster	485.00
	Kollur	Oyster	445.20
	Tadri	Oyster	394.40
	Kali	Clams (Paphia)	377.11
		Mussels (Perna)	372.48

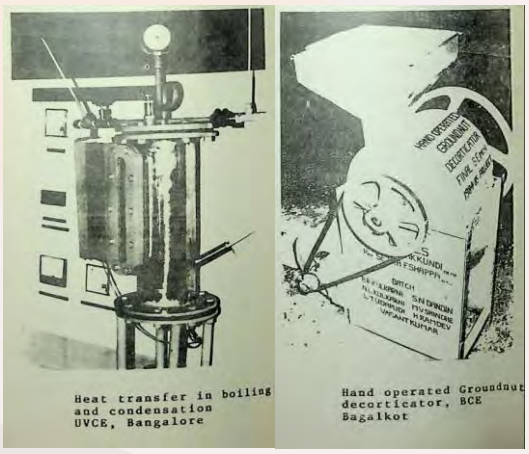
11) Survey of Allergy in Bangalore due to Parthenium

Parthenium hysterophorus, introduced in India in the 1950s, has spread rapidly and is linked to allergic contact dermatitis and nasal rhinitis. Airborne pollen surveys in Bangalore (1979) showed Parthenium contributed up to 48% of total pollen during June–September. A clinical survey of 2000 subjects (1985) revealed 20% had chronic rhinitis; 6% were sensitive to Parthenium pollen, and another 3.3% showed positive skin reactions without

symptoms, with peak aggravation during July–October. Skin prick tests on rhinitis patients (1985–86) showed 49.5% positive reactions, and RAST confirmed IgE antibodies specific to Parthenium pollen. A larger project supported by the Government of India is underway, focusing on immunological research, antibody development, and vaccine trials. Animal trials are nearly complete, and human clinical trials for immunotherapy against Parthenium rhinitis and dermatitis are expected to begin soon.

12) Student Projects Programme in Engineering Sciences

The Student Projects Programme (SPP) was initiated in 1977–78 to improve engineering education by funding design, fabrication, and field projects, enabling students to address State development needs. It fostered collaboration between colleges and premier institutes like IISc, UAS, CFTRI, etc. The Eighth SPP supported 164 projects in 21 institutions with funding of ₹4.41 lakh; 38 were exhibited at a seminar in Belgaum (1986), and five were awarded Project of the Year (e.g., drop forge hammer, scroll cutting on lathe). The Ninth SPP (1985–87) sanctioned 131 projects in 22 institutions with funding of ₹4.00 lakh, covering diverse topics such as robotics, solar energy, soil blocks, groundwater studies, biogas, biomedical electronics, and rural technologies. To aid dissemination, manuals under the series "Perspectives in Technology" (Volumes 1–3) were published on solar collectors, solar devices, and pressed soil block construction. The programme has significantly enhanced student innovation, rural technology relevance, and industry-academia linkages.

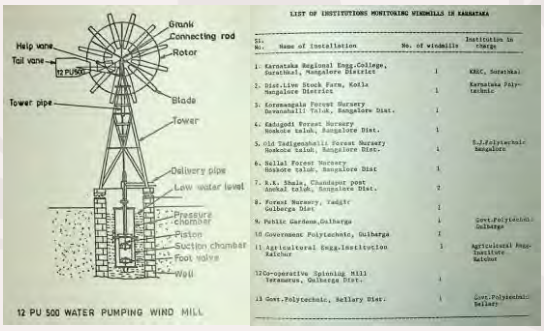


13) Student Projects Programme in Life Sciences

Following its success in engineering, the Student Projects Programme (SPP) was extended to fisheries (1981–82) and later to medical and science colleges. The programme emphasises field techniques, culture practices, and health-related studies, addressing State development needs. In 1983–84, 9 life science projects (₹24,250) and 5 fisheries projects (₹20,000) were sanctioned; in 1984–85, 22 projects (₹89,465) marked a 57% increase. By 1985–86, 48 projects were sanctioned (₹1,91,131), raising the cumulative total to 40 completed projects, with an average grant of ₹3,982. Projects spanned nutrition, immunisation, disease detection, diagnostic tools, epidemiological surveys, fisheries biology, aquaculture, and biomedical studies across institutions like J.N. Medical College, Kasturba Medical College, St. John's, Bangalore Medical College, MSRMC, Mangalore, Gulbarga, and the College of Fisheries. The programme has emerged as a strong platform to apply life sciences to rural health, diagnostics, and fisheries development.

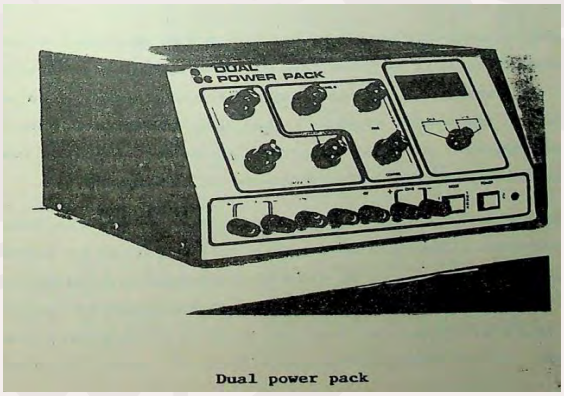
14) National Wind Energy Demonstration Programme

Following recommendations on wind power use in Karnataka, 13 windmills (CASE design) were installed, though initial performance was poor. KSCST assigned maintenance to local polytechnics/engineering colleges and trained 8 caretakers at Anekal. Major deficiencies included buckling of connecting rods, fractured blade supports, lack of provision for lowering pumps with water level, and short bearing life. Corrective measures such as stiffeners, redesign of blade supports, extension rods, and replacing nylon with brass bushes improved performance; 12 of 14 windmills now function satisfactorily. A study by the Agricultural Engineering Institute, Raichur, showed pumping costs of ₹0.09/m³, enabling irrigation of 0.76 ha hybrid jowar, 3.13 ha greengram, and 0.55 ha groundnut per windmill in suitable soils.

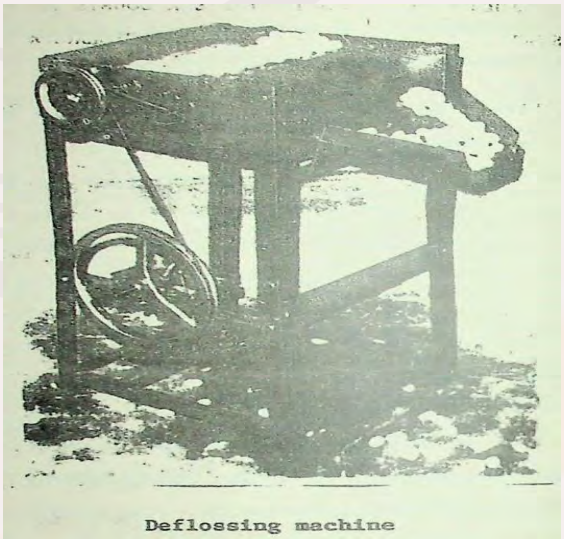


15) Product Development Centre

To bridge the gap between student project concepts and commercialisation, a Product Development Centre (PDC) was established in 1983–84 at SJCE, Mysore, under Prof. M.H. Dhananjaya. Early outputs included electronic kits, orthographic view projector, and tool dynamometers, some commercialised via industry. PDC has since developed dual power packs, EPROM programmer and eraser, with the power pack adopted as a standard instrument in all Karnataka engineering colleges. A deflossing machine was found competitive with Japanese models but commercially viable only for limited demand, which PDC will meet. The Centre also works with PSUs like BHEL on specialised equipment, runs a mobile electronic service unit, and is developing products with higher market potential such as IC-based pump controllers. Proposals for a Production Centre and a Science & Technology Entrepreneurs Park (STEP, ₹5 crore) have been accepted in principle with support from institutions like IDBI.



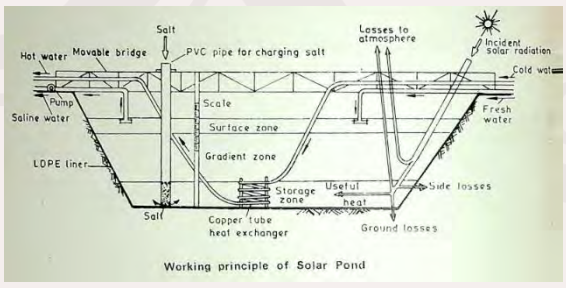
Dual power pack


Deflossing machine

KSCST Projects (1986-1987)

1) Demonstration of Small Solar Ponds

KSCST initiated a solar pond study (1983) at IISc under Dr. J. Srinivasan to explore low-grade heat and power generation. A 240 m² pond (2 m depth) was built, reaching 72°C (1984), but power generation was dropped due to equipment issues and low pond temperatures (<75°C). Focus shifted to continuous heat extraction, initially with titanium exchangers (clogging, corrosion), later replaced successfully by a 15 m copper coil heat exchanger, enabling reliable operation. A novel passive salt addition technique (50 kg/day via PVC chute) was demonstrated for the first time worldwide, ensuring stable density gradients. The pond delivers 500 MJ/day (11.5% efficiency) and 50,000 kWh/year of thermal energy at 60°C, at ₹1.00/kWh—cheaper than coal or oil. With proven low maintenance, solar ponds are feasible for rural use, and Deejay Hatcheries has shown interest in a 400 m² system for incubator heating.



Working principle of Solar Pond

2) Community Biogas Plant for Pura

The Pura village biogas project (1979), led by Prof. A.K.N. Reddy (IISc), aimed to supply cooking gas to all households via two 750 cft/day plants, a 1500 m PVC pipeline, and low-cost burners. Though villagers enthusiastically adopted biogas (1982), demand exceeded supply due to lower dung yield (1.86 kg/animal vs. 7.35 kg assumed) and higher per capita gas use (0.212 m³/day vs. 0.072 planned). In Phase II, two more plants were added, doubling gas yield to 0.066 m³/kg, and aluminium vessels were introduced for conservation, but dung shortage limited success. As villagers prioritized drinking water, the project was reoriented in 1986 towards biogas-based electricity for water pumping and lighting. Renovated plants now fuel a 7 HP biogas-diesel engine with 5 KVA generator and submersible pump, supplying 25,000 litres/day from a borewell to overhead tanks and 9 village taps. Test runs (July 1987) confirmed success, with further repairs and six months of monitoring planned.

3) Woodgas Generators for Small Engines

KSCST initiated a project with Prof. H.S. Mukunda and Dr. U. Shrinivasa (IISc) to design wood gasifiers for small engines (<10 HP), as none were available earlier. Four prototypes were built and tested; the final throatless version proved compact, tar-free, capable of using moist wood, and with longer engine valve life. The system includes a cyclone, cooler, and nylon mesh filters for dust removal and can run in burner or dual fuel mode. When coupled to diesel engines, the gasifier replaces 80–97% of diesel, and in petrol engines, nearly 100% fuel. Field tests with pumpsets (≤7.5 HP) and gensets (≤5 kW) showed wood consumption of 1.22–1.8 kg/kWh. With over 200 hours of continuous operation, the 145 kg, 2.7 m high unit is now being disseminated at 50 locations in Karnataka under the DNES demonstration programme.

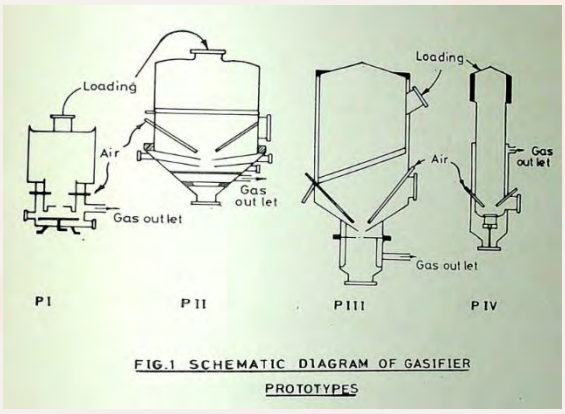


FIG.1 SCHEMATIC DIAGRAM OF GASIFIER PROTOTYPES

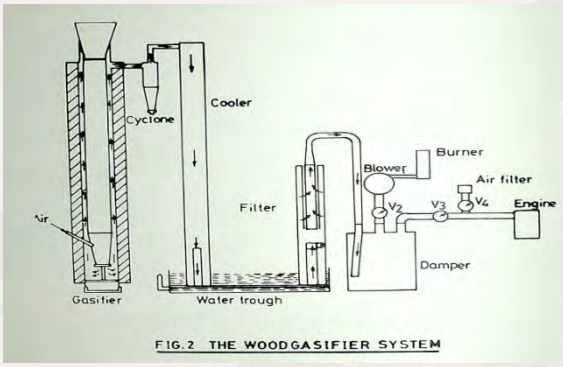


FIG.2 THE WOODGASIFIER SYSTEM

4) Design and Development of 100 kW Gasifier

To address power shortages and losses in transmission, KSCST initiated a project in 1986 with Prof. H.S. Mukunda and Dr. U. Shrinivasa (IISc) to design a 100 kW wood gasifier for decentralized power generation. Building on earlier <10 HP gasifiers, a prototype throatless design was developed with a scaled-up cooling and cleaning system, open hopper for wood chips, and improved flow design. In blower mode tests (20 hrs), ignitable gas was produced within 2 minutes, with cooling enhanced by a water spray system and dust removed using 12 cartridge filters (nylon + rubberized coir). Insulation was optimized to allow heat dissipation. The system is now ready for rigorous testing and integration with a 100 kW diesel engine genset for performance evaluation under field conditions.

5) Evolution of Briquetted Fuels for Gasifiers

KSCST, under Prof. H.S. Mukunda (IISc), initiated work on briquetting biomass to expand the use of gasifiers beyond woody fuels, using residues like sawdust, rice husk, bagasse, and parthenium. Initial tests with high-pressure pressing produced dense pellets, but they disintegrated without binders. Trials with starch, bitumen, and paper mill sludge produced stable pellets (0.65 gm/cc), which successfully replaced 80–90% diesel in engines but generated excess char. Screw-conveyor heating was found inadequate for briquetting. After detailed evaluation, the team concluded that pulverising biomass for cyclone gasifiers was a more energy-efficient and versatile alternative to briquetting, enabling use of a wider variety of biomass fuels.

6) Development of Portable Metallic Woodstoves

Following the success of the Astra Ole stove, KSCST initiated the development of portable woodstoves under Prof. H.S. Mukunda (IISc) to address user demand. Initial prototypes with swirl chambers achieved 48% efficiency, but user feedback called for larger fuel ports and higher power rating. Redesigned models, though with slightly lower efficiency (40%), still performed far better than traditional or improved chulas (10%). The stove, named Swosthee, has a cylindrical metal design with controlled airflow and comes in 2 kW (medium) and 4 kW (large) versions. Field trials showed favourable acceptance, and two manufacturers have been identified to commercially produce and market Swosthee stoves.

7) Development of Woodstoves

Building on the success of the Astra Ole (1.8 lakh units in Karnataka), KSCST initiated development of large 3-pan woodstoves and bath water heating stoves under Prof. R. Kumar (IISc). Field trials of large stoves at six sites showed clear benefits—low fuel use, smokeless cooking, faster operation, and cleaner kitchens, at a cost of ~Rs. 2,000. Bath water heating stoves were tested with both Hande and cylindrical vessels, achieving thermal efficiencies of 42–48% with 1.4 kg/hr fuelwood, with cylindrical vessels proving more efficient and easier to maintain. A special arecanut processing stove cut fuel use from 45 kg to 12 kg per batch, with potential for large-scale savings. Future work focuses on stoves using rice husk and agro-residues for cottage industries like silk reeling and rice products.

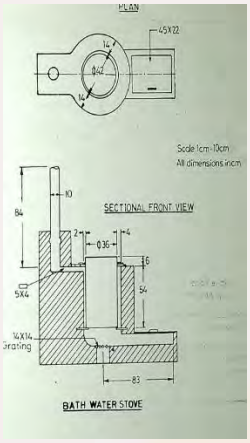


TABLE I

Place	No. of stoves	Purpose
1. Govt. Polytechnic Hostel, Channapatna	One	To cook food for 150 students every day
2. E. C. C., Whitefield	One	To cook food for 50-100 people everyday
3. Hatti Gold Mines Hatti, Raichur district	Three	1. For heating 360 lit of milk everyday 2. To cook medical diet for 100 people everyday 3. To cook the following items every day : a. 3,000 vadas b. 100 kg. chivda in 3 hrs c. cook food for 500-1,000 people occasionally
4. Executive Hostel VISL, Bhadravathi	One	To cook food for 50 people
5. M/s. John Fowler & Co., Bangalore	One	To cook food for 200 people
6. Sri Jayachamarajendra Polytechnic, Bangalore	Two	1. To cook food for 100 students 2. To make dosas and chapathis

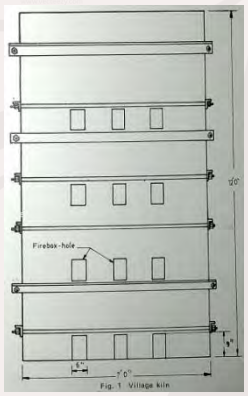
8) Green Manure for Paddy Crops of Karnataka – Stem Nodule Legume

To reduce dependence on costly chemical fertilizers in paddy fields, KSCST initiated a project in 1987 under Prof. K. Shivappa Shetty (UAS, Bangalore) to study the effectiveness of Sesbania rostrata, a stem-nodulating aquatic legume capable of fixing up to 267 kg N/ha in 52 days. Unlike other legumes, S. rostrata produces 5–10 times more nodules, fixes nitrogen under waterlogged conditions, and has potential to fully meet paddy nitrogen needs, especially for small farmers. Rhizobial cultures from stem and root nodules have been isolated and characterized. Comparative trials with other legumes (S. aculeata, S. sesbane, S. grandiflora, Crotalaria juncea) are underway. A seed multiplication programme has produced 100 kg of treated seeds, with initial field trials in Doddaballapur and Magadi taluks, and ongoing studies on nodulation and nitrogen fixation.

9) Efficient Kilns for Bricks and Tiles

Most of the 100+ brick and tile factories in Karnataka use low-efficiency intermittent kilns (10% efficiency), leading to heavy

fuelwood use. To address this, a project under Dr. J. Srinivasan (IISc) aimed at building experimental kilns, adopting heat recovery, and modelling thermal processes. A village kiln at Ungra with 3000-brick capacity achieved better heat utilization, though tile cracking occurred; reinforcement and design changes were suggested. A modified village clamp using rice husk-soil plaster and ash insulation improved efficiency to 52% against 38% in traditional kilns. Further trials at Punja Tile Works, Dakshina Kannada, are evaluating heat recovery in intermittent kilns and the use of combustible additives (coal dust, rice husk, sawdust) in soil to improve quality and save fuel.



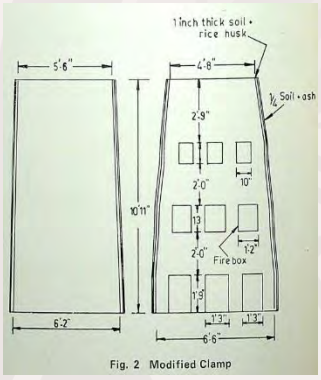


Fig. 2 Modified Clamp

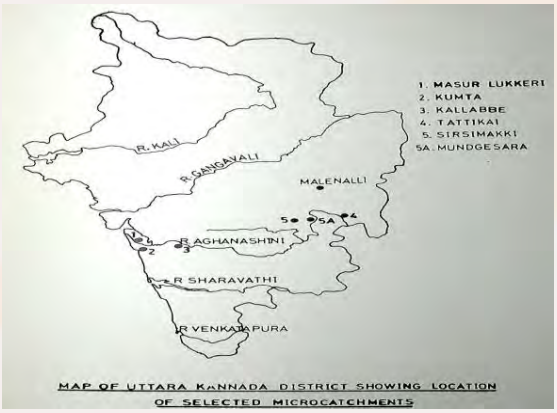
10) Conservation of Surface and Ground Water in Small Basins

To address drought-prone agriculture, a project was initiated in 1984 under Prof. Rama Prasad (IISc) to conserve surface and subsurface water. At Ungra village, farm ponds improved ragi yields by 90% (grain) and 80% (straw), with net benefits of about Rs. 300/ha. Models simulating crop water needs using weather and soil data were developed to optimize pond storage. An experimental facility with a rain simulator studied groundwater recharge under different land treatments; results showed recharge decreased with higher rainfall intensity and slope, with broadbase and bench terraces enhancing infiltration under low-intensity rains.

11) Eco-Development in Selected Micro Catchments of Bedthi–Aghanashini Basins

The Planning Commission identified ecologically sensitive Bedthi–Aghanashini River valleys in Uttara Kannada for action research, and KSCST initiated a project in 1986 with Prof. Madhav Gadgil (IISc) as Convener. Objectives included soil and water conservation, sustainable use of vegetation, improved animal husbandry, and efficient use of plant materials. Five localities (400–700 ha each) across different ecological zones were selected, and detailed household and ecological surveys covering land use, livestock, fuel, fodder, water, and erosion were completed in Masur–Lukkeri and Sirsi–Makki. Findings showed unequal access to resources, especially fuel scarcity for the landless. Based on surveys, action plans were drawn up, covering gully plugging, check dams, afforestation, fodder development, nurseries, livestock improvement, fuel-efficient chulas, and allied activities like fishery, rabbit farming, and bee keeping. Implementation is being pursued with line departments, with initial demonstrations already taken up in afforestation and animal husbandry.

Ecological Zone	Name of the location
Coastal	Masur (Lukkeri)
Base of ghats	Kallabbe
Crest of Ghats	Tattikai
East of crestline (rain shadow region)	Malenalli, Sirsimakki



MAP OF UTTARA KANNADA DISTRICT SHOWING LOCATION OF SELECTED MICROCATCHMENTS

12) Use of Black Cotton Soil for Low Cost Building

Large parts of Karnataka have black cotton (BC) soil, unsuitable for traditional brick making or pressed soil block processes due to cracking and lump formation. To address this, KSCST initiated a project with Prof. K. S. Jagadish (IISc) to explore stabilisers and block-making methods. Studies showed lime to be an effective stabiliser, improving soil properties like volume stability and wet strength. A modified moulding method with detachable bottom plates produced denser, sharper-edged bricks, though at slower rates. Solar curing techniques accelerated strength gain, making bricks usable after 7 days, while wet burlap curing required 21 days. Additives such as red mud, wood ash, and tile surkhee were also found useful. Simple moulding and curing innovations can enable viable low-cost building materials in BC soil areas.

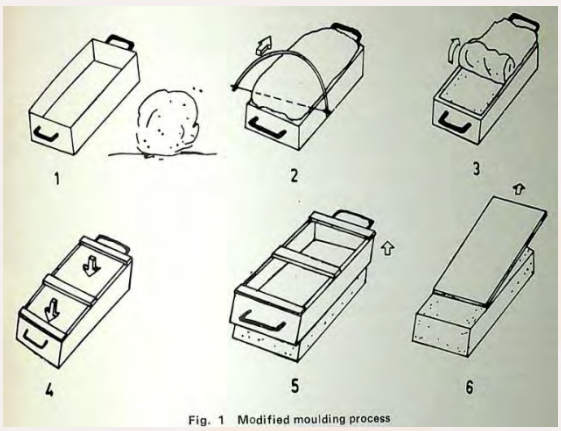


Fig. 1 Modified moulding process

13) Environment Education and Information Service Centre (ENVIS)

To address the neglect of dryland ecology, KSCST set up ENVIS on the suggestion of the Department of Ecology and Environment, GoK. Its objectives include creating a detailed dryland database (micro-catchments, soils, groundwater, biomass, human resources), maintaining relevant literature, and developing simulation models/games for planning. Initial work focused on a micro-watershed in Chitravathi catchment (Kolar), with databases being built in consultation with the Dryland Development Board. Efforts include storing contour maps, designing optimal bunds, and simulating crop scheduling using farm ponds. Programmes model rainfall, soil moisture, crop growth, and irrigation decisions to compare yields with and without farm ponds, helping reduce risks in monsoon farming and improving dryland productivity.

14) Renewable Energy Dissemination Activities

Over the past 12 years, KSCST has promoted projects in biogas, biomass gasification, efficient woodstoves, solar systems, microhydel units, windmills, and more, leading to viable devices like Astra Ole, solar ponds, and small gasifiers. It has also acted as a technical support agency for national demonstration projects in Karnataka. With technology diffusion reaching an advanced stage, a dedicated wing—Cell for Renewable Energy Dissemination Activities (CREDA)—was established. CREDA focuses on solar thermal, wind, biomass gasifiers, sludge gas, solid waste energy, microhydel, and woodstoves. Its thrust is demonstration

and dissemination, though selective R&D support will also be provided. Progress on each technology is being reported separately.

15) Solar Thermal Extension Programme

Solar thermal devices are used for heating/cooling fluids, with solar water heating systems being the most popular, capable of heating water up to 80°C through black-surface absorption. These systems are used in households, hotels, hostels, dairies, and industries for bathing, cleaning, boiler feed water, and silk reeling, leading to 10–15% fuel savings. Large-scale installations include Bangalore Dairy (50,000 & 48,000 L/day) and Kanakapura Silk Filature (8,000 L/day). Under the DNES subsidy scheme (33–75%, with 50% for households up to Rs. 3,000), CREDA oversees dissemination in Karnataka. In 1986–87, 51 systems were installed, comprising 38 domestic and 13 industrial units.

District-wise break-up of installations

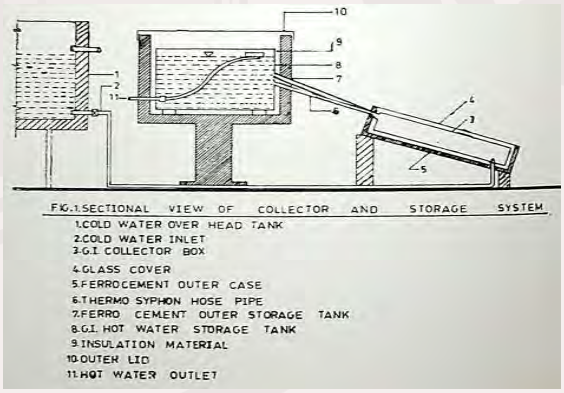
Districts	Number	Industrial collector area in m²	Domestic Number
Bangalore	6	450	24
Mysore	2	48	5
Kolar	1	30	—
Dharwad	1	24	—
Gulbarga	1	24	—
Chitradurga	1	160	—
Shimoga	1	80	—
Dakshina Kannada	—	—	9

Important installations undertaken during 1986-87

Organisation	Capacity (LPD)	Cost Rs.	Subsidy Rs.
I. I. Sc. Bangalore	10,000	6,09,125	,09,125
KAIC, Bangalore	8,000	4,96,350	2,48,175

16) Dissemination of Low Cost Domestic Solar Water Heating System

To overcome the high cost of conventional solar water heaters (Rs. 8,000 for 100 L/day), a low-cost system 'SURJA' developed at NAL has been introduced, costing about Rs. 3,000. SURJA comprises a 1 m² matt-black galvanized iron collector box with ferrocement insulation and a 200 L storage tank, operating on a thermosiphon principle to deliver water up to 50°C. In Bangalore, 19 domestic units, one at KSCST, and one at Visvesvaraya Museum have been installed. Initial issues in construction and management were solved with design improvements, and the systems are now in regular use. Users bore the installation cost and are monitoring performance through daily logs. Fabrication drawings and manuals are under preparation to enable large-scale dissemination.



17) Wind Energy Programme

KSCST has initiated three programmes under DNES sponsorship: (i) Windmills for water lifting, (ii) Windchargers for electricity generation, and (iii) Windmapping of Karnataka. Thirteen windmills of 12 PU 500 design were earlier installed, modified after feedback, and found suitable for irrigation and drinking water (pumping up to 7,200 L/hr at 10 km/hr windspeed, cost Rs. 0.09/m³). For 1987–88, 35 windmills were allotted, with 30 beneficiaries identified across five districts. Two 2 kW 'Whirlwind' windchargers were allotted—one installed at IISc for monitoring and the other to BEL

for village electrification. To assess potential, 30 wind stations with cup anemometers are being set up across Karnataka, with data analysis by Indian Institute of Tropical Meteorology.

18) Biomass Gasification Programme

Biomass gasification under limited oxygen produces CO and H_2, which can replace up to 90% diesel in CI engines and 100% petrol/kerosene in SI engines. The IISc gasifier developed under KSCST has four main components: gasifier unit, cyclone separator, cooler, and filter, producing clean wood gas for use in pumpsets or gensets. It can be coupled to a 5 HP pumpset for irrigation (open wells up to 25 ft) or to a 3.5 KVA genset for rural electrification. Under the DNES demonstration programme (1987–88), 50 gasifier-pumpset systems (Rs. 29,500 each, free to beneficiaries) are to be installed across Karnataka, with users bearing incidental costs. District-wise allocation includes Uttara Kannada (15), Shimoga (10), Bangalore (5), Raichur (5), Dakshina Kannada (5), Others (10). Additionally, 10 wood gasifiers of 20 kW each will be installed as decentralized power supply units, implemented by CREDA.

19) Student Projects Programme

The Student Projects Programme (SPP) was launched by KSCST in 1977 to provide financial and academic support to final-year students in engineering, agriculture, fisheries, medical, and polytechnic institutions. It encourages students and faculty to apply their knowledge to solve local problems, with annual seminar-cum-exhibitions showcasing selected projects and awards to the best entries. Since inception, 1568 projects have been completed in engineering sciences, involving 945 students, with about 50% rural focus and an average grant of Rs. 2,295. The Ninth Series (1985–86) supported 189 projects, with five adjudged "Project of the Year." The Tenth Series (1986–88) has sanctioned 122 projects in 19 institutions with funding of Rs. 3.48 lakhs. In Life Sciences, 68 projects have been completed since 1984–85, with Rs. 74,900 sanctioned in 1986–87. The programme is being expanded to medical and science colleges for wider impact.

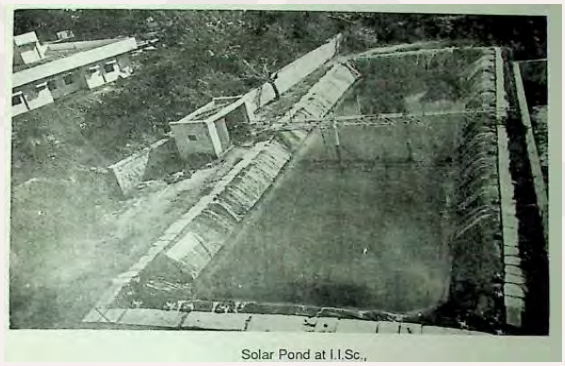
20) Workshop on Science and Technology Programme Against Drought and for Drylands Development in Karnataka

Given Karnataka's heavy dependence on monsoons and the recurring droughts affecting nearly 140 taluks and 60% of its population, KSCST organized a Workshop on S&T Programme Against Drought at IISc in June 1987 with 50 experts from multiple fields. The deliberations covered definitions of drought, rainfall studies, water conservation, dryland farming, forestry, sericulture, watershed management, remote sensing, and rural industries. A comprehensive S&T programme was evolved, focusing on drought assessment tools, rainfall prediction systems, run-off and groundwater management, crop improvement, efficient irrigation, silviculture, sericulture, village industries, and low-cost habitat technologies. The programme emphasized ecologically sustainable, decentralized development, especially for small and marginal farmers in drought-prone areas.

KSCST Projects (1987-1988)

1) Dynamics of Solar Pond

KSCST initiated a study on solar ponds in 1983 with IISc to explore low-cost solar thermal alternatives to flat plate collectors. A 240 m² pond was built, reaching 72°C, and later used for studies on heat extraction, rainfall impact, and passive salt addition. Continuous heat extraction using copper tube exchangers proved successful, maintaining pond temperatures above 55°C with 500 MJ/day output. Power generation objectives could not be realized due to equipment limitations, but the pond effectively demonstrated potential for low-grade heat applications. A follow-up project on the Dynamics of Solar Pond was launched in 1987-88 with DNES support, focusing on effects of weather, bottom reflectivity, heat extraction techniques, and modelling. Initial experiments interfacing the pond with a hatchery incubator maintained stable temperatures (~35°C) with electrical backup, and continuous monitoring systems are being developed.



Solar Pond at I.I.Sc.,

2) Efficient Kilns for Bricks and Tiles

Most tile kilns in Karnataka are of the intermittent type with low thermal efficiency (10–13%), leading to large firewood consumption. KSCST initiated a project with IISc to improve efficiency through heat recovery techniques and thermal process modelling. An experimental village kiln at Ungra achieved brick production at Rs.0.31 per brick and a modified clamp improved efficiency to 52%, though tile cracking persisted. Heat recovery modifications were then proposed for existing kilns, starting with Punja Tile Works, where a 16% fuel saving could recover costs in just 3 weeks, but implementation faced resistance. Later, Canara Tile Works, Mangalore was approached, but precision control requirements prevented adoption. The modifications are now being implemented at Shri Sangameshwar Tile Works, Sagar, with data collection planned after installation in August 1988.

Fireboxes at Sangameshwar Tile Factory

3) Development of Large Wood Stoves

Following the success of the Astra Ole domestic stove, KSCST initiated a project at IISc to design large wood stoves for community cooking and other applications. The stoves, built with firebricks and cement mortar, cost around Rs. 2000/- and field trials at six locations confirmed their acceptability. Bath water stoves with cylindrical vessels performed better than traditional hande types, while an arecanut processing stove reduced fuelwood use from 45 kg to 12 kg per batch. Studies on fire box design, finned vessels, and wood

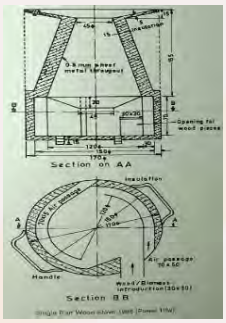
burning rates showed efficiencies up to 45% for 3-pan stoves. Construction has been standardized using precast reinforced cement plates with improved durability. An action plan proposes the dissemination of 30 large-sized, bath water, and arecanut stoves with partial KSCST support.

Stove type	Purpose	Efficiency as measured in laboratory
1. 3 pan stove with 3rd pan totally embedded in the stove (embedded pans used for heating water	Small scale domestic cooking	40%
2. 2 pan stove with 2nd pan totally embedded into the stove		35%
3. Two pan rice husk stove	Silk reeling	35%

4) Development of Portable Metallic Stove

KSCST, after the success of the Astra Ole, initiated a project at IISc to design a portable, single-pan metallic stove to overcome the limitations of in-situ construction and 3-pan operation. The first prototype (1 kW, 42% efficiency) was efficient but failed due to a small fuel port and low output. A larger 4 kW model with a wider fuel port was developed, achieving ~35% efficiency and proving more practical for rural households. Field demonstrations showed favourable response, leading to technology transfer to three manufacturers and dissemination through KSAgro Industries Corporation. 250 sites across Karnataka were chosen for demonstrations, supported by 50 trained volunteers of Karnataka Rajya Vijnana Parishat. With half the demonstrations completed, large-scale production of SWOSTHEE is being explored.


Swosthee



5) Development of Gasifiers and Use of Pulverised Biomass

KSCST initiated a project at IISc under Prof. H.S. Mukunda and Dr. U. Shrinivasa to develop biomass gasifiers that reduce fossil fuel use. The earlier wood chip gasifier achieved up to 93% diesel replacement and is being disseminated nationwide. However, field feedback highlighted shortages of woody biomass while agro-waste like leaves, twigs, sawdust, and coir pith is abundant. To utilise this, a cyclone gasifier for pulverised biomass was designed and fabricated, though initial tests produced poor gas quality. Improvements through air–fuel ratio control are underway. A fuel feed system delivering 2 g/sec has been developed, and a working prototype is expected within two years.

6) Design and Development of 100 kW Gasifier

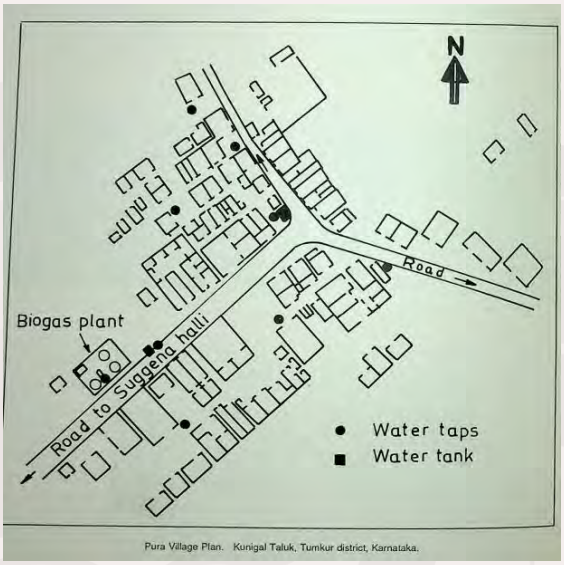
Building on earlier small engine gasifier success, KSCST initiated a project at IISc under Prof. H.S. Mukunda to design and integrate a 100 kW wood gasifier with a diesel engine genset for decentralised power generation. The system comprises a combustor, dual water-spray coolers, cyclone dust separator, and open hopper with belt conveyor for continuous wood chip feeding. Tests showed ignitable gas generation within 2 minutes in blower mode. An 88 KVA diesel genset has been installed and test-run prior to integration. A microprocessor-based control system and electrical loading unit are being developed. DNES has requested commissioning of a complete system with wood chipper for the Andaman and Nicobar Islands by Nov 1988.

7) Evaluation of City Garbage for Power

With Bangalore generating about 650 tons of garbage/day (much less than the assumed 1500 tons), KSCST undertook a study to assess its quantity, composition, and energy potential. Surveys at 15 dumping sites showed 51% dumped, 35% transported for manure, and 14% composted. Garbage composition included 65% vegetable matter, 20% non-combustibles, and 14% paper/plastic, with 15% picked for recycling. Phase II laboratory tests indicated fresh untreated garbage had biogas potential comparable to cow dung, though handling posed problems due to sedimentation and flotation. A two-stage biogas plant is being developed to overcome these issues, while garbage was also tested for calorific and ash content for possible incineration-based power generation.

8) Biogas for Water Pumping and Illumination

The Pura village biogas project in Tumkur district, initiated under Prof. A.K.N. Reddy, began with a community biogas plant supplying gas for cooking, but limited dung availability and higher-than-estimated demand made this unviable. The project was later redirected to biogas-based electricity generation for water pumping and lighting. A 7 HP biogas-diesel engine with a 5 KVA generator now powers a borewell pump supplying 25,000 litres of drinking water daily through overhead tanks and taps, increasing per capita consumption from 17 to 21 litres. Villagers are compensated for dung supplied, and slurry is returned as manure. An electricity distribution scheme to provide one lamp per household has been approved, with external wiring completed. Cost recovery is planned through dung collection and diesel-sharing contributions.



Pura Village Plan. Kunigal Taluk, Tumkur district, Karnataka.

9) Demonstration of Microhydroelectric Unit

Recognising the potential of microhydro plants for decentralised, eco-friendly power generation, KSCST initiated a project under Prof. S. Soundaranayagam to design and demonstrate a 40 kW axial flow turbine for canal drops of 2.5 m head. Earlier trials with a 6 kW cross-flow turbine in a coffee estate proved the concept feasible. After rejecting an initial site at Sollepura, a location near Keregodu village on Vishveshvaraya branch canal was finalised, with support from Karnataka Power Corporation Ltd. The canal provides >2 cumecs discharge for over 300 days/year, sufficient for the unit. The system will initially feed power into the grid, with later plans for decentralised generation. Orders for the generator and gearbox have been placed, civil works designed, and commissioning is targeted by March 1989.

10) Energy Survey for Industries in Karnataka

To address the acute power shortage and promote conservation, KSCST initiated energy audits in 30 small-scale industries, under Mr. M.S. Ramaprasad (CREDA). The project aims to identify scope for energy saving and renewable energy use in sectors where energy is a critical input but professional guidance is lacking. Ten representative industry types have been chosen, with surveys already in progress. The findings will guide practical conservation measures and alternative energy adoption in Karnataka's industrial sector.

11) Sisal Industries Demonstration Project

KSCST launched the Sisal Utilisation Project in 1979 under Prof. M.S. Murthy to establish sisal-based rural agro-industries. Technologies for rope making, hecogenin extraction, and handmade paper were developed and a 1-tonne/day demonstration unit was set up at Ungra with support from KSFC. The unit, comprising preliminary, fibre, hecogenin, and paper sections, processed 50 tonnes of sisal leaves, yielding acceptable fibre for rope industries and hecogenin with improved hydraulic crushing. Handmade paper trials from sisal bagasse were also successful. Economic analysis showed an 8-year payback period, proving viability. Efforts are underway to promote 10-acre sisal cultivation plots and identify entrepreneurs for large-scale adoption.

Sisal Complex at Ungra

12) Green Manure for Paddy Crops of Karnataka – Effectiveness of S. rostrata

With high fertilizer costs limiting usage among small farmers, KSCST initiated a project in 1987 under Prof. K. Shivappa Shetty to evaluate Sesbania rostrata, a stem-nodulating aquatic legume, as a green manure for paddy. S. rostrata produces 5–10 times more nodules than other legumes and can fix up to 267 kg N/ha in 52 days, showing potential to sustain rice yields up to 6 t/ha. Efficient rhizobial strains were isolated and tested, confirming high nodulation and nitrogen fixation under waterlogged conditions. Comparative studies showed S. rostrata and S. aculeata as superior to other green manure crops. Plant hormones enhanced growth and nitrogen yield. Ongoing studies focus on nitrogen response and transfer to rice after incorporation of S. rostrata.

Nodulation on the Stem of *S.rostrata*

13) Plant Irrigation Using FRP Tubes

To provide a low-cost alternative to drip irrigation, KSCST initiated a project with Dr. R.M.V.G.K. Rao (NAL) to develop porous FRP tubes that discharge water directly near plant roots. Unlike conventional nozzles, FRP tubes avoid blockages, corrosion, and leakage issues. Tubes with discharges of 2, 5, and 10 litres/hr were fabricated and tested in a 5×5 ft plot with lady's finger plants under controlled water feeding (6 l/day). After 30 days, plant

growth showed satisfactory results with average heights ranging from 19–35 cm, demonstrating the feasibility of FRP tubes for horticulture crops. The next phase aims at large-scale rural field trials to assess utility and economic viability.

14) Effect of Polymers (Jalashakti) in Water Conservation Measures

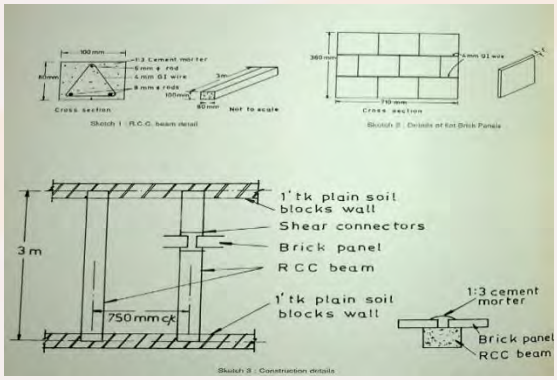
KSCST initiated this project with Prof. Ramaprasad (IISc) to study the role of water-absorbing polymer Jalashakti in improving soil moisture and crop yield. Infiltration tests showed no significant moisture retention except in very dry soils. Seed coating with polymer improved germination by 50–100%, while root-dip treatment before transplanting showed higher grain (36%) and dry matter yield (19%) per plant, though overall survival was lower. Yield trials under different treatments (seed, soil, and root applications) showed no significant improvement in total crop yield or soil moisture retention. The study concluded that Jalashakti helps germination but does not significantly enhance soil moisture conservation or yield at recommended dosages.

15) Eco-Development in Selected Micro Catchments of Bidthi–Aghanashini River Basins

KSCST initiated this eco-development project in Uttara Kannada with Prof. Madhav Gadgil (IISc) as Convener, focusing on sustainable watershed management. Objectives included soil and water conservation, efficient land use, vegetation and fodder management, and improved animal husbandry practices. Surveys and resource flow studies led to an integrated Rs. 59 lakh action plan covering fuel-efficient chulhas, biogas plants, solar ponds, improved cattle management, vaccination, fodder nurseries, and mussel culture. Measures also included desilting tanks, gully plugging, drip irrigation, algae-based fertilizers, coconut-prawn farming, and coir/lime industries. Multi-level committees were formed to align interventions with government schemes and community participation, ensuring sustainability.

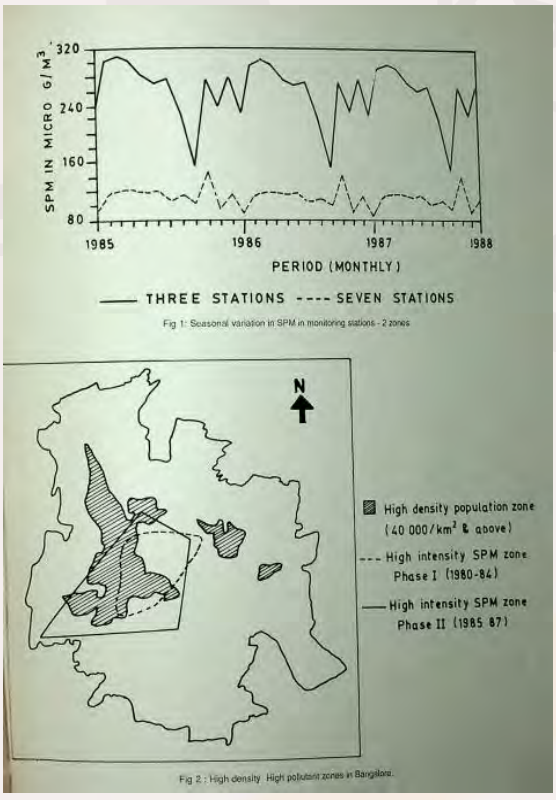
16) Development and Field Testing of New Building Technologies

KSCST initiated this project in 1987 under Prof. K.S. Jagadish (IISc) to evolve low-cost housing technologies using local resources, energy conservation, and eco-friendly methods. Earlier developments included ASTRAM soil block press, soil stabilisation, rice husk/red mud cements, stabilised black cotton bricks, and lime-soil plasters. The new phase focused on prefabricated composite roofs and improved soil block presses, along with field testing of stabilised bricks, village cements, and roofing systems. Two experimental buildings at Ungra were constructed with RCC beam–panel roofs and trussed beam–panel roofs, costing Rs.100/m² and Rs.115/m² respectively. Initial monitoring showed deflections within permissible limits, indicating feasibility for affordable rural housing applications.



17) Air Pollution and Incidence of Morbid Conditions in Bangalore City

A pilot study by IISc (1978–86) reviewed vehicular emissions (HC, CO, NOx) and revealed that several key city zones already exceeded critical exposure levels, a trend likely to worsen without preventive measures. To assess the link between air quality and health, the project analysed data on SPM, NO, and SO_2 from pollution monitoring agencies. Results showed NO and SO_2 within limits, but SPM exceeded permissible levels (200 µg/m³) in 28 divisions, with Gandhinagar recording 360 µg/m³. High-density, high-SPM zones covering ~9 km² were identified as risk-prone areas, with SPM consistently above limits except during August–September. Plans were made to conduct morbidity checks in these identified zones to evaluate health impacts and define city-specific standards.



18) Evaluation of Copper/Silver Coated Materials as Low-Cost Purifiers of Drinking Water

KSCST initiated a project with IISc to develop low-cost metal-coated bed materials for disinfecting rural drinking water, particularly in Kumta taluk where dug wells are the main source. The objectives included microbial and chemical analysis of well water, testing copper/silver-coated substrates (plastic, coal, wires, turnings, oxides), and designing beds capable of purifying 20 litres/day for a year. Preliminary trials showed successful copper coatings on non-porous substrates, though oxidation effects on bactericidal properties required study. Field surveys of 12 villages showed unexpectedly low contamination, leading to extension of the survey to other sites for further validation.

19) Student Projects Programme

KSCST launched the Student Projects Programme (SPP) in 1977 to support final-year students with financial and academic assistance, extending later to agricultural, fisheries, medical, and polytechnic institutions. The programme encourages students and faculty to apply technical knowledge for developmental needs of Karnataka, with annual seminar-cum-exhibitions awarding prizes and certificates. Publications titled *Perspectives in Technology* document outcomes in solar energy, housing, and other areas. In Engineering Sciences, 1648 projects have been completed; the Tenth Series (1986–88) funded 187 projects in 24 institutions (Rs. 5.23 lakhs), with 53 exhibited and 5 adjudged best. The Eleventh Series (1987–89) has 126 projects underway in 21 institutions (Rs. 3.6 lakhs). In Life Sciences, 39 projects were sanctioned in 1987–88 across fisheries, agriculture, and medical

sciences, with cumulative completions reaching 90. The programme continues to stimulate innovation, rural-oriented solutions, and interdisciplinary growth.

Manual Ragi and Rice Transplanter

Numerically Controlled Drafting Machine

20) Cell for Renewable Energy Dissemination Activities (CREDA)

CREDA, established in 1987, coordinates R&D, dissemination, and popularisation of renewable energy technologies in Karnataka. Key programmes include solar water heaters (industrial and domestic), windmills (25 units), biomass gasifiers (75 units, achieving up to 85% diesel replacement), and improved chulhas (monitoring 2 lakh Astra Oles, launching SWOSTHEE demos across 50 sites). Proposals submitted to DNES include a 10 kW solar thermal pilot plant, 10-ton solar-powered cold storage, and a wind monitoring programme. Demonstrations of solar cookers at 50 centres were conducted, and surveys are underway to establish Urja Grams in each parliamentary constituency. CREDA thus acts as a nodal agency for renewable energy adoption and field implementation across Karnataka.

List of Solar Water Heating Systems installed during 1987-88

Sl. No	Name of the beneficiary	Capacity (LPD)	Temperature (C)	Remarks
1.	J.S.S. Medical College, Mysore	1,000	60	Completed
2.	N.T.T.F, Bangalore	1,000	60	"
3.	Government Mini Silk Filature, Gulbarga	1,500	65	"
4.	Nanjappa Trust, Shimoga	3,000	80	"
5.	C.B.C.I. Society, Bangalore (13 systems)	6,000	65	"
6.	NGEF Limited , Bangalore	2,000	60	"
7.	National College, Gauribidanur	1,500	60	"
8.	Ratnamma Hostel, Davanagere	8,000	60	"
9.	Karnataka Agro Industries , Bangalore	8,000	70	"
10.	Indian Institute of Science, Bangalore	7,000 3,000	70 70	" "
11.	Hindusthan Aeronautics Limited, Bangalore	2,000	65	"
12.	Hotel Aradhana, Bagalkot	1,500	70	"
13.	Sandhya Lodge, Bangalore	5,000	70	"
14.	Rajata Complex, Bangalore	4,000	60	"
15.	Pancharatna Industries, Mangalore	2,000	60	"
16.	Tata Electronic, Bangalore	4,000	70	"
17.	J.S.S. Medical College, Mysore	1,500	60	"
18.	ADE, Bangalore	2,000	70	Under Installation
19.	Airforce Technical College, Bangalore	3,000	60	"
20.	BIT, Bangalore	2,500 x 2	60	Completed
21.	Hotel Sharada International , Mangalore	2,000	60	"

KSCST Projects (1988-1989)

1) Dynamics of Solar Pond

To overcome the high cost and weather-dependence of flat-plate collectors, KSCST initiated a solar pond project at IISc in 1983 under Dr. J. Srinivasan. A 240 m² pond was built and monitored (1984–87) to study heat extraction, monsoon effects, rainfall, and bottom reflectivity. Studies showed that salt recycling requires an evaporation pond equal in size to the solar pond, while larger pond areas and steeper side slopes reduce heat losses and improve storage temperatures. A data acquisition system with 32 thermocouples was developed for continuous monitoring of temperature profiles and pond stability. The project provided detailed insights into solar pond dynamics and heat extraction techniques for renewable energy applications.

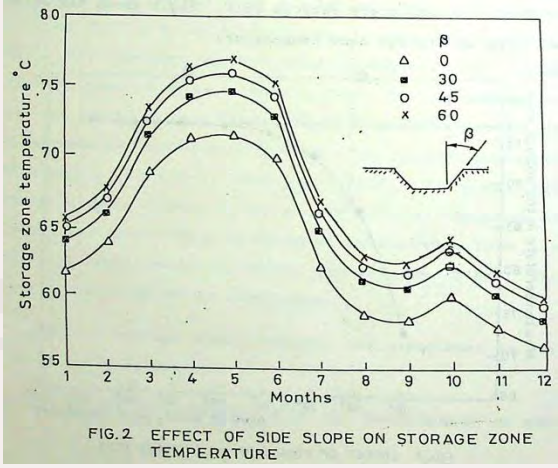


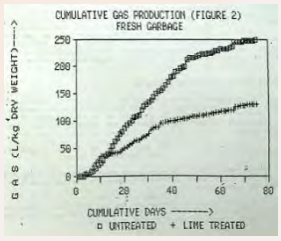
FIG. 2 EFFECT OF SIDE SLOPE ON STORAGE ZONE TEMPERATURE

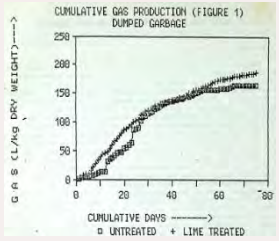
2) Dissemination of Large Woodstoves

Following the success of the Astra Ole domestic stove, KSCST initiated development of efficient large woodstoves for cooking, bath water heating, and arecanut processing under Dr. S.S. Lokras (IISc). During 1988–89, 64 stoves were constructed across Karnataka, including 14 cooking stoves, 30 areca stoves, 16 bathwater stoves, 3 for animal feed, and 1 industrial stove. Field trials showed fuelwood savings of 75% in areca stoves and 50% in bath stoves, though cooking stove performance varied due to user motivation. Fabricated items were provided by the project, while users supplied masonry. To meet the growing demand, local fabrication was successfully piloted at Tirthahalli. Future strategies include user education, commercial dissemination in high-demand districts, and further standardisation of cooking stoves for statewide adoption.

3) Evaluation of City Garbage for Power Generation

KSCST initiated a study under Sri P. Rajabapaiah (ASTRA, IISc) to assess Bangalore's garbage for energy generation through anaerobic digestion and incineration. A survey (Oct 1987–Jan 1988) showed the city generates about 650 MT/day, of which 51% goes to dumping pits, 35% for manure, and 14% to KCDC, with 78% vegetable matter. Tests on garbage samples revealed an average net calorific value of 940 kcal/kg and 36% moisture content. Biogas trials indicated that fresh untreated garbage produced about 250 litres/kg dry weight, performing better than cattle dung. However, handling problems like sedimentation and flotation were encountered. Ongoing research at ASTRA is exploring solid phase fermentation and two-stage digestion to overcome these operational difficulties.





4) Design and Development of 100 kW Wood Gasifier

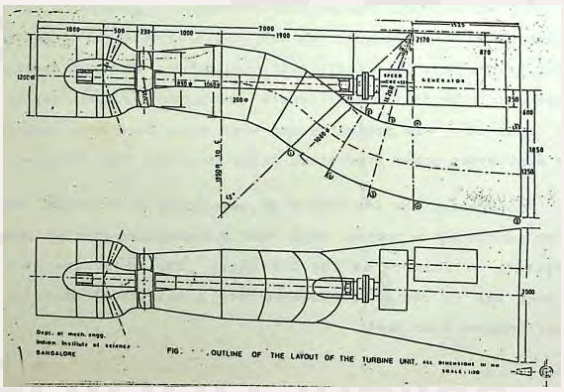
KSCST initiated a project at IISc to design a 100 kW wood gasifier-based power plant, building on earlier 3.7 kW models. The prototype SIGMA-100 was developed and installed at Andaman & Nicobar Islands' Chatham Power House in 1989, using sawmill waste as fuel. The system incorporated a wood chipper, hopper with limit switches, cooling towers using seawater, specialised valves, sensors, and a PC-based monitoring system. Tests showed up to 70% diesel replacement, with generation costs ranging from Rs.0.87–1.72/kWh, depending on wood cost and system life, with payback in 2–5 years. Further work is underway on corrosion control, gasifier geometry, dual-fuel efficiency, and advanced automation. Public response is encouraging, with interest from industries and institutions in Karnataka.

5) Development of Gasifiers to Use Pulverised Biomass

KSCST initiated a project at IISc to design gasifiers using pulverised biomass like sawdust, rice husk, coir pith, and twigs, addressing shortages of hard woody fuel. A cyclone gasifier prototype with a water-spray cooler was fabricated and tested, achieving satisfactory gas quality at ~1 g/sec fuel rate. Studies highlighted the key role of char consumption in efficient operation, leading to a dedicated experimental rig. Preliminary results were promising, and a proposal for larger power rating gasifiers was submitted to DNES. The project was completed in March 1989, with the final report under preparation.

6) Demonstration of Microhydroelectric Unit

KSCST initiated a project with IISc to design and demonstrate a 40 kW microhydel unit for canal drops of 2.5 m head. An axial flow turbine was designed with specifications: 2 m^3/s flow, 300 rpm speed, 0.8 m runner diameter, 5 blades, and 86–88% expected efficiency. A site near Keregodu village on the Visvesvaraya branch canal was selected, with adequate discharge for over 300 days a year. Karnataka Power Corporation Limited (KPCL) is providing financial assistance and managing civil works. KSCST is supplying hardware including ducts, blades, gearbox, and alternator. Fabrication of ducts and machining of blades at IISc is in progress, with completion expected after canal off-periods.



7) Energy Survey for Industries in Karnataka

KSCST initiated an energy audit of small-scale industries in Karnataka, which account for nearly 50–60% of energy use but lack access to professional guidance. Ten industries were studied, with focus later narrowed to tile, khandasari sugar, dyeing, lime, captive generation, and cashew processing units. In the tile industry, kiln modifications showed potential 25% fuel savings. In sugar units, heat exchangers and wet bagasse furnaces

could eliminate firewood use, saving nearly ₹1 lakh annually. Foundries showed limited economic feasibility due to irregular operation, while lime kilns could be improved using KVIC's higher-efficiency designs. Dyeing units using inefficient stoves (20%) could adopt ASTRA stoves (45% efficiency). Captive power generation data revealed significant diesel and steam-based outputs, highlighting scope for conservation. Overall, the survey provided practical recommendations for reducing energy consumption in key sectors.

8) Manufacture of Pregnon from Hecogenin

KSCST identified sisal (Agave vera cruz) as a potential rural agro-industry resource, yielding fibre, hand-made paper, and hecogenin, a steroid precursor. A demonstration unit at Ungra showed feasibility of extracting hecogenin, priced around ₹800/kg, but with limited buyers. To enhance value, IISc researchers-initiated work (1987) on converting hecogenin to pregnon (16-DPA), a key intermediate for synthesising hormones like testosterone, progesterone, cortisone, and andrastanolone. A multi-step process involving acetylation, Wolf-Kishner reduction, acetolysis, and oxidation was standardised at laboratory scale, with consistent results verified through IR, TLC, and melting point tests. Pilot-plant equipment is under fabrication to establish scale-up feasibility and process economics. This technology could generate high-value steroid intermediates for pharmaceutical use.

9) Genetic Improvement and Rapid Vegetative Propagation in Tamarind and Pomegranate through Tissue Culture

KSCST initiated a project in 1988 at UAS, Bangalore to develop tissue culture techniques for rapid clonal propagation of tamarind and pomegranate, both valuable drought-tolerant fruit trees. Conventional propagation is slow and genetically variable, while tissue culture offers uniform, large-scale multiplication of elite selections. Preliminary studies showed that pomegranate shoot tips proliferate well on woody plant medium with low salts, with rooting favoured by Indole Acetic Acid (IAA) and citric acid effective against phenol toxicity. In tamarind, systemic bacterial infection was observed, and antibiotics are being tested; callus induction was achieved from tender leaves. Media supplemented with IAA (2 mg/L) and kinetin (0.2 mg/L) supported shoot proliferation. Work is ongoing on embryogenesis, hormonal standardization, and survival of plantlets for field-level application.

10) Irrigation Scheduling

KSCST initiated a project at IISc, Bangalore (1988) to evolve a low-cost irrigation scheduling technique by preparing small plots that indicate moisture stress earlier than the main field. Analytical studies showed that 10% soil compaction or 50% sand substitution in root zones could signal stress 2–3 days in advance, independent of rainfall. Experimental trials with ragi and groundnut in treated and untreated 2m × 2m plots confirmed theoretical predictions, with neutron probe and leaf temperature measurements validating results. Treated plots consistently showed earlier wilting,

enabling timely irrigation without yield loss. Crop harvesting and dry matter analysis are under progress, demonstrating the practical feasibility of predictive irrigation scheduling for water conservation in drought-prone areas.

11) Immunisation of Cultivable Fish Against Aeromonas hydrophila Infection

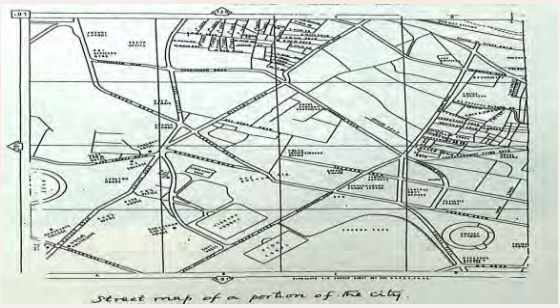
A project was initiated in 1987 at the College of Fisheries, Mangalore, to evaluate hemolysin-negative derivative strains of *A. hydrophila* for vaccine development in major carps. Pathogenicity tests confirmed the parent strain as more virulent than its derivatives. Immunisation trials in Catla fingerlings using injection, immersion, and hyperosmotic infiltration with strain AB 3-15 showed high antibody titres, with 100% survival in immunised fish versus 30% in controls; immersion was found most practical for farmers. In Rohu, both live and killed vaccines induced only low titres and conferred partial protection (50% survival), indicating species variation.

12) Eco-Development in Selected Micro-Catchments of Bidthi–Aghanashini River Basins, Uttara Kannada

The Planning Commission identified Bidthi–Aghanashini valleys as ecologically sensitive zones requiring integrated watershed-based development. KSCST with Prof. Madhav Gadgil initiated the project to reorient land use, vegetation, animal husbandry and biomass utilisation through interdisciplinary action research. Five catchments (400–700 ha each) were studied with resource surveys, household interviews, field data and folk knowledge documentation. Imbalances like soil erosion, silted tanks and overharvest of *soppinabetta* lands were traced to socio-economic changes. Action plans for Sirsi-Makki and Masur proposed interventions in habitation, animal resources, water, forest, paddy, garden and gajni lands, and processing industries. Local task forces, workshops and state-level committees ensured coordination with government schemes. Initiatives included fuel-efficient chulhas, gobar gas, cattle health, water conservation, composite farming, coir and lime industries, with environmental mapping and monitoring for long-term impact.

13) House Numbering System for Bangalore City

The house numbering system introduced in Bangalore in the 1970s was illogical, causing difficulties for citizens and service departments. KSCST initiated a project (1976–77) under Dr. S.R. Valluri to design a rational system based on zones, cross-road coordinates, and odd–even house alignment, supported by city maps at 1:10,000 scale. Though implemented, rapid urban growth demanded updated mapping, leading to a Government-appointed Standing Committee with KSCST as member-convener. An aerial survey of 50 km × 50 km was completed, with 46 detailed street maps (2 km × 3 km each) under preparation. The next phase includes street naming, renumbering ~2.5 lakh houses, and publishing an indexed road map for public use by December 1989.

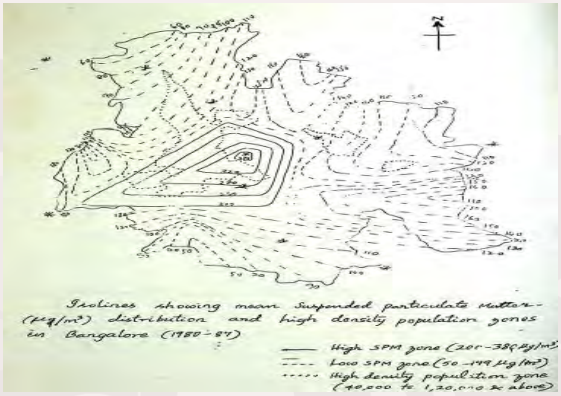


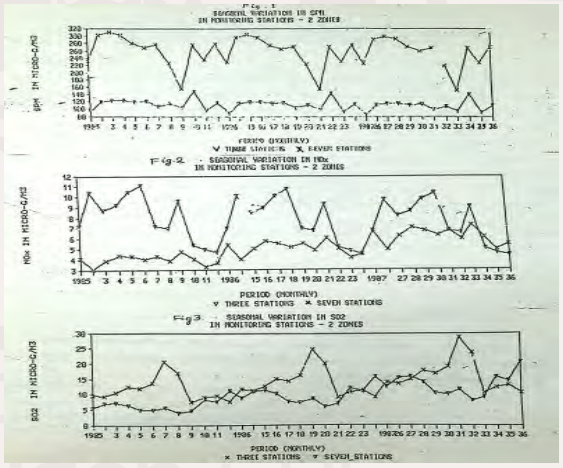
14) Development and Field Testing of New Building Technologies

To address India's housing shortage, KSCST supported low-cost building technologies maximizing local resources, energy conservation and eco-friendliness. Under Prof. K.S. Jagadish, new efforts focused on developing prefabricated composite roofs and an improved soil block press, while field-testing rural cements, stabilized bricks and roofing alternatives. The new press ITGEVOTH showed 50% higher compaction and has been transferred for commercial manufacture. Lime-stabilized adobe training was conducted in Dharwar, while rice husk ash cement trials at Ungra achieved promising mortar strengths, with regular production planned. Roofing innovations included composite T-beam, jack-arch, ferrocement rafters and channels, and sisal fibre corrugated sheets, several already demonstrated in field sites, proving cost-effective and technically viable.

15) Air Pollution and Incidence of Morbid Conditions in Bangalore City

A study by IISc (1985–86) revealed that hydrocarbons, CO and NOx levels at critical points in Bangalore exceeded safe limits, with projections indicating worsening trends. To assess links between pollution and health, a prospective epidemiological study was initiated in Cottonpet and Chamrajpet, high-density areas with high SPM levels. About 1,500 subjects from 350 households were clinically examined between Oct 1988–Jan 1989, with exposure estimated from activity zones (travel, work, recreation, stay) and domestic fuels. Two 24-hour monitoring stations were set up, supplemented with data from 10 KSPCB stations. Medical diagnoses were coded as per the International Classification of Diseases. Monitoring continues, with a follow-up survey planned (Nov 1989–Jan 1990) to compare morbidity trends with cumulative pollution exposure.





16) Evaluation of Copper/Silver Coated Materials as Low Cost Purifiers of Drinking Water

In Kumta taluk, Uttara Kannada, most people depend on dug wells, often leading to contaminated drinking water and waterborne diseases. A project was initiated with Prof. K.S. Gandhi (IISc) to analyse water quality and develop copper/silver coated bed materials for low-cost purification. Field studies in 24 wells across 12 villages showed wide variation in

dissolved solids but no bacterial contamination so far. Laboratory trials indicated copper coatings on non-porous substrates are feasible, though oxidation is a concern. Copper wires immersed in water develop surface coatings, but their microbicidal effect is yet to be proven. Future work includes microbial assays at IISc to test efficacy, followed by long-term field trials.

17) Student Projects Programme (SPP)

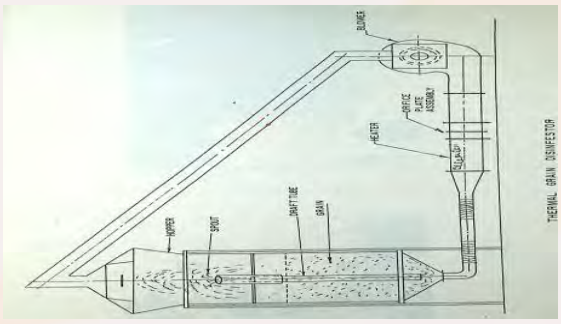
KSCST initiated SPP in 1977-78 to support final-year students in engineering, agriculture, fisheries, medical, and polytechnic institutions with financial and academic guidance. The programme encourages problem-solving for Karnataka's developmental needs and includes an annual seminar-cum-exhibition where selected projects are showcased and awarded. KSCST also publishes manuals titled *Perspectives in Technology* on key themes. By 1989, 1830 engineering projects had been completed, with grants averaging Rs.2,500. The 11th series (1987-89) supported 153 projects (Rs.4.34 lakh) with best awards given for silver recovery, tamarind seed oil extraction, and a linear induction motor. The 12th series (1988-90) sanctioned 120 projects with Rs.3.34 lakh. In life sciences, 125 projects were completed, with Rs.29,500 granted in 1988-89. Projects span innovations in engineering, agriculture, fisheries, and health sciences, highlighting SPP's role in applied research and local problem-solving.

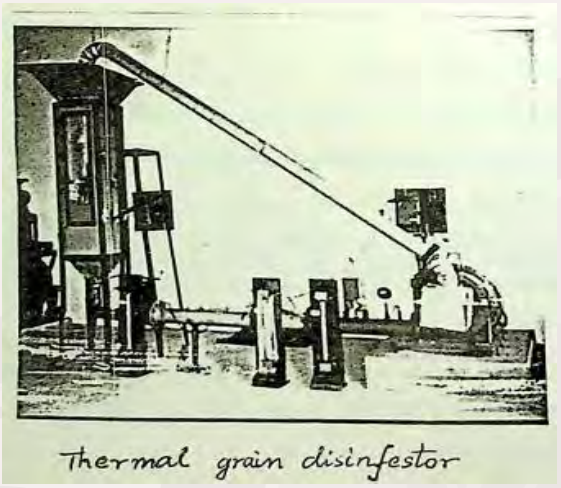
18) Environment Education and Information Service (ENVIS)

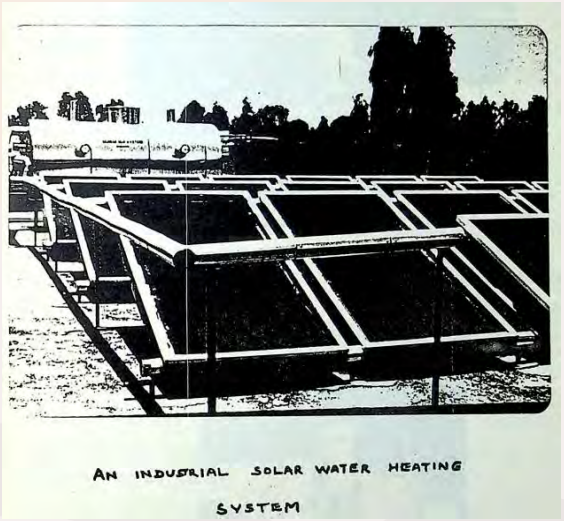
The ENVIS programme was initiated in 1986 at KSCST on the suggestion of the Department of Ecology and Environment, GoK, to study dryland ecosystems neglected in earlier research. Its objective was to develop simulation-based models for user awareness and dryland planning. A rainfall simulation package was created to expose users to crop-yield responses under varying sowing, irrigation dates, and farm pond use. The programme also addressed irrigation tank silting, analysing alternatives of desilting or constructing new tanks. A cost-benefit study on Kerbeddur tank (Raichur) showed mechanical desilting preferable, with higher break-even discount rates than manual methods.

19) Product Development Programme

The Council initiated the Product Development Programme to commercialise promising prototypes from the Student Projects Programme (SPP), as student graduation limited continuity. A Product Development Centre was first established at SJCE, Mysore, later extended to other engineering colleges. Products developed at SJCE include a cordless audio system, electronic ballast, lighting controller, burglar deterrent, gas detector, and water level controller. MCE, Hassan developed four agro-oriented devices: maize corn desheller, mini pulveriser, pedal-operated arecanut leaf cup machine, and pneumatic coffee seed separator. RVCE, Bangalore worked on a cricket bowling machine and an automatic lubricating oil dispensing system. At Ghousia College, Ramanagaram, a grain disinfestor using heated air (spouted bed) was developed to control pests without chemicals; tests on paddy and sorghum showed complete pest control with >95% germination retained. A second mobile, engine-driven version is under progress for village-level use.







20) Solar Thermal Extension Programme (STEP)

The STEP programme, launched in 1984 by DNES and managed by KSCST since 1985-86, promoted solar devices such as water heaters, timber kilns, air heaters and desalination units in Karnataka. By 1988-89, 198 non-domestic hot water systems and 42 timber kilns were installed with subsidies released. Ten manufacturers participated, with a total installed capacity of 3.42 lakh LPD. Monitoring of selected systems revealed wide variations in efficiency: at Bangalore Dairy, efficiencies ranged from 23–65% across different models, while at KIMS Hostel the efficiency was 38.2% with an average 23.1°C rise. The programme provided valuable field data on performance and adoption of solar thermal technologies.

21) Solar Powered 10 Tonne Capacity Cold Storage Unit

KFDC, in collaboration with DNES and KSCST, initiated a project to establish a solar-powered cold storage unit for preserving and distributing fish in North Karnataka, where electricity supply is unreliable. A vapour compression refrigeration system (VCR) powered by 4 kW peak photovoltaic modules with battery and grid backup was selected over VAR due to higher efficiency. The walk-in cooler (4.6m × 2.5m × 2.5m) will store 10 tonnes of frozen fish at –20°C, with 1.5-tonne refrigeration capacity and 6-hour daily operation. BHEL supplied 132 PV panels, and key components like compressor, DC motor, and control panels

are ready. System integration and commissioning were targeted for July 1989.

22) Solar Cooker Demonstration

Solar cooker demonstrations were conducted in Raichur, Gulbarga, Tumkur, and Mandya during March–May 1988 with active participation from KRVP volunteers. Each session attracted 30–150 people, where rice, dhal, and vegetables were cooked in 30–60 minutes (clear sky) and 1–2 hours (cloudy). Charts, sketches, and pamphlets explained cooker working, cost, safety, life, and feasibility. The demonstrations helped create awareness about solar cooking technology and its advantages. However, high cost, bulkiness, inability to make chapathis/curries, and dependence on sunlight limited acceptance.

23) Technical Backup Unit

The Technical Backup Support Unit was set up at KSCST in 1989 to provide technical knowhow for wood-burning devices under the National Programme on Improved Chulhas. Tests on 2 kW and 4 kW metallic Swosthee stoves and pottery models showed efficiencies up to 40%, while a silk cocoon cooking stove achieved 49.9% efficiency with 50% firewood savings. Field trials of the redesigned 2+1 Astra stove and hybrid Swosthee were also conducted. The unit trained artisans, supported large-scale construction of Astra stoves, and initiated development of tobacco curing furnaces, jaggery stoves, arecanut/cardamom driers, and large Astra models for rural applications.

24) Biomass Gasifier Programme

The Biomass Gasifier Programme was launched in Karnataka in 1986, and by 1988-89, 68 wood gasifier systems (3.5 kW) were installed for irrigation pumps, lighting, and submersible pumps. About 80% of the systems are in regular use, with quarterly monitoring of performance and user feedback. Training camps were organized for users to ensure proper operation and maintenance. An additional 21 sites were cleared for installation, and higher capacity gasifiers of 20 kW, 40 kW, and 100 kW are under consideration for wider applications.

25) Wind Energy Programme

KSCST has been actively promoting wind energy through projects on water pumping windmills, wind mapping, wind monitoring, and large-scale power generation. About 24 windmills were installed across Karnataka for irrigation and drinking water, though initial failures led to design improvements. A wind mapping project with 30 stations (at 5m height) was initiated in 1988 to record reliable wind data across the state. For large-scale generation, 9 wind monitoring stations (10m & 20m heights) are being set up to identify high-potential sites. Promising regions include Katpada Gudda near Gadag and Gokak Falls, showing windspeeds above 25 kmph. A high-level committee has been formed to explore windfarms with assistance from DNES, World Bank, and DANIDA.

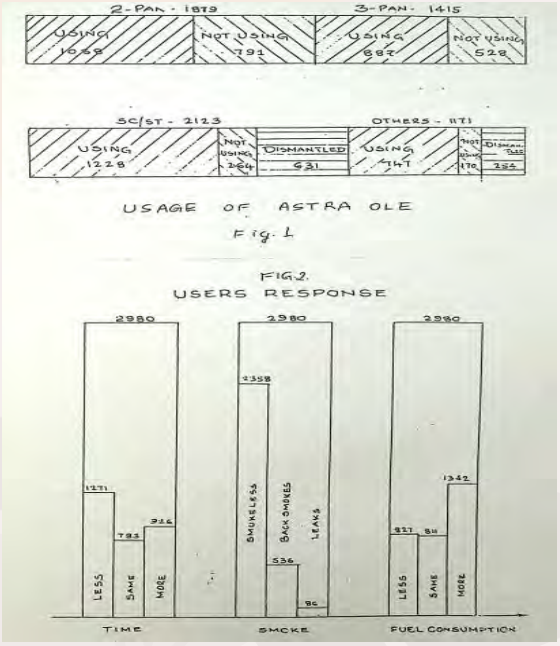
26) Urja Gram

The Urja Gram scheme aims to develop villages where most energy needs are met through local, renewable resources. Under DNES, 33 villages were selected across Karnataka, with surveys completed in 25, ongoing in 7, and pending in 1. A structured questionnaire-based survey collects data on demographics, energy use in households, agriculture, dairy, rural industries, and renewable energy

adoption. Data is stored in dBase III+, with energy plans prepared by analysing usage, prioritising needs, and maximising local resources. After planning, devices are commissioned and local operators trained for sustainable management.

27) Astra Ole Demonstration Programme

KSCST, under Prof. R. Kumar (IISc), developed the 3-pan high-efficiency 'Astra Ole' stove, later disseminated under the National Programme on Improved Chulhas (NPIC) and other rural schemes. Over 2.4 lakh stoves have been constructed in Karnataka with technical support from KSCST/ASTRA. In 1988-89, 48,856 stoves were built, and 709 artisans trained through 37 camps. A state-level survey across 40 talukas showed an overall 60% acceptance, higher for 3-pan models; SC/ST acceptance was 57% compared to 63% in others. Users largely burn twigs, branches, and crop residues rather than wood. Despite higher fuel use in some cases, the stove remains popular due to smokelessness and comfort, highlighting a need for design adaptations based on fuel types.



ASTRA OLE PROGRESS - 1988-89

Sl. No.	District	Target	Achievement
1.	Bangalore (R)	4000	4915
2.	Belgaum	3000	750
3.	Bellary	2000	3216
4.	Bidar	2000	1313
5.	Bijapur	3000	2305
6.	Chickmagalur	2000	2523
7.	Chitradurga	3000	242
8.	Coorg	1000	2004
9.	Dharwad	3000	2283
10.	Gulbarga	3000	2319
11.	Hassan	2000	3142
12.	Kolar	2000	3728
13.	Mandya	2000	2604
14.	Mysore	3000	5014
15.	N.Kanara	3000	2350
16.	Raichur	2000	552
17.	Shimoga	2000	642
18.	S. Kanara	4000	1050
19.	Tumkur	4000	4567
		50000	48856

KSCST Projects (1989-1990)

1) 10 kW Solar Thermal Power Plant

KSCST initiated a project to develop a 10 kW Organic Rankine Cycle (ORC) solar thermal plant at the Silk Weaving Factory, Mysore, using parabolic trough collectors and ORC technology developed at NAL. The ORC system, operating with R113 fluid, includes turbine, vaporizer, condenser, preheater, regenerator, and subcooler. Detailed thermodynamic studies were carried out to match collector performance with engine efficiency. The existing collector could only generate steam sufficient for ORC, forcing alternate operation with factory needs. To ensure uninterrupted steam supply, KSIC proposed extending the collector field, and efforts are underway to implement this.

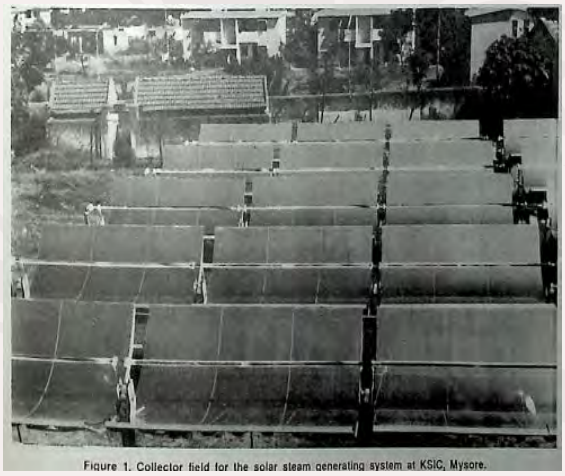
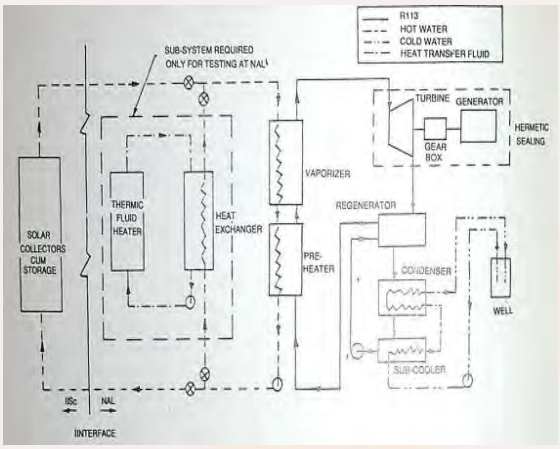


Figure 1. Collector field for the solar steam generating system at KSIC, Mysore.



2) Demonstration of Microhydroelectric Unit

KSCST initiated a project to design and demonstrate a 40 kW microhydel unit for low canal drops of 2.5 m head, with Prof. S. Soundranayagam (IISc) as Convener. A site near Keregodu village on Visveshwarayya branch canal was selected, ensuring adequate discharge for over 300 days annually. The unit uses an axial flow turbine (runner dia 0.85 m, 5 blades, 2 m^3/s flow, 300 rpm). KPCL financed and executed civil works, while KSCST managed turbine fabrication. Major civil works, turbine duct and draft tube installation are complete, with bearings, gearbox, and electrical equipment delivered. The unit is expected to be commissioned by December 1990, with power connected directly to the grid.

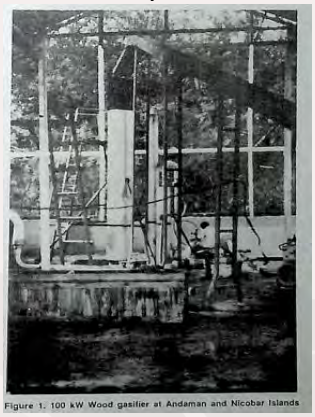


Figure 1. 100 kW Wood gasifier at Andaman and Nicobar Islands

3) Dissemination of Large Woodstoves

KSCST initiated dissemination of fuel-efficient large woodstoves for rural applications like cooking, silk cocoon boiling, jaggery making, bathwater heating, arecanut processing, and industrial canteens, under the convenership of Dr. S. S. Lokras (IISc). Between 1988–90, 120 stoves of various types (cooking, mid-day meal, areca, bathwater, animal feed, industrial) were built across Karnataka. The stoves showed 25–75% fuelwood savings, were smokeless, and reduced cooking time, saving an estimated 645 tonnes of wood annually (₹3.2 lakhs/year). Modifications like RCC slab replacement and finned

griddle designs were tested. Training of masons enabled limited independent construction, with areca and bathwater stoves showing strong commercial potential.

4) Design and Development of 100 kW Gasifier System

KSCST initiated a project at IISc in 1986 to design a 100 kW wood gasifier for captive power generation as an alternative to diesel, leading to the development of SIGMA-100. In 1989, the system was dispatched to the Andaman & Nicobar Islands for demonstration, utilizing abundant local waste wood. To enhance performance, wood chippers, a sand-packed bed filter for dust removal, and coir pith cartridges for moisture control were developed. The system achieved gas quality with <130 ppm tar and particulates and chipper output of 60–100 kg/hr. An automatic control system optimised diesel substitution by regulating gas-air mixture based on load and fuel flow. All subsystems have been shipped, with monitoring and trials planned by March 1991.

5) Design and Demonstration of Rural Energy Centres

A community biogas plant was set up in Pura village (Tumkur) in 1979 to meet cooking needs but was later redirected (1986) for electricity generation to pump drinking water and provide household lighting. The system comprises two biogas plants (750 cft/day each), a dual-fuel 7 HP–5 KVA genset (75% diesel replacement), water supply with a submersible pump, and lighting for 97 homes. Management is handled by the Pura Grama Vikas Sabha, with villagers contributing dung and small monthly fees. The scheme improved water access, health, lighting quality, and reduced kerosene costs, while creating local youth employment. Encouraged by success, four more villages were selected for replication, with plans to integrate energy forests and dairying for long-term viability.

6) Influence of Vermicompost on Growth and Yield of Cereals and Ornamental Plants

A project was initiated with Dr. Radha D. Kale (UAS, Bangalore) to evaluate the fertilizer quality of vermicompost against farmyard manure and chemical fertilizers. Field trials with paddy ("Hamsa") showed improved nutrient uptake (N & P), microbial load, and soil fertility when vermicompost replaced half the chemical dose. Earthworms from composting were processed into worm protein, tested successfully as aquarium feed for *Black molly*. Vegetables like brinjal, tomato, radish, and carrot were grown with vermicompost-fertilizer combinations, showing promising results. Ongoing trials are extending the study to ornamental plants, pulses, ragi, and jowar to assess broader applicability.

7) Genetic Improvement and Rapid Vegetative Propagation in Tamarind and Pomegranate through Tissue Culture

A project with Dr. D. M. Mahishi (UAS, Bangalore) was initiated to develop tissue culture protocols for rapid clonal propagation of drought-tolerant tamarind and pomegranate. Preliminary studies standardised explants and media compositions for shoot tip/auxiliary bud culture and callus culture. Protocols for in vitro propagation of pomegranate and bud sprouting in tamarind have been

established, with rooting media optimization underway. Callus induction was achieved in pomegranate from leaf and petal explants, leading to successful root-shoot differentiation. Tamarind leaf callus was initiated using woody plant media with IAA and kinetin, with differentiation studies in progress. The work aims at mass propagation for dry zone planting and future commercial applications.

8) Establishing Vegetation in Highly Eroded Lands under Dryland Conditions

Started in 1989 under Dr. P. Ramanagowda (GKVK), the project focused on upgrading biomass productivity of drylands through suitable species, planting methods, and seed pelleting. Field studies were carried out in Chokkanahalli watershed (378 ha) with benchmark data on soil, flora (50 species) and socio-economics. Seven silva species including *Grevillea robusta, Eucalyptus hybrid,* and *Acacia auriculiformis* were planted under varied trench and pit treatments. Planting was completed in October 1989 and results are under study. Designs of two seed pelleting machines were completed for future trials.

9) Energy Efficient Submersible Pumps for Irrigation

With the rising use of borewell-based irrigation, many submersible pumps in the market were found to be of poor energy efficiency. To address this, KSCST initiated a project under Prof. Rama Prasad (IISc) to identify causes of inefficiency and develop design software. A computer program was created to optimise impeller and diffuser design, predicting efficiency and head-capacity characteristics. Three pumps tested showed observed efficiencies (29–35%) much lower than attainable (47–50%). Analysis revealed major losses due to vane angle mismatches and shock losses. The study showed that design corrections, such as adjusting diffuser vane angles, could improve efficiency by about 5 percentage points.

10) Impact Assessment for Karnataka Tea Project

The Karnataka Forest Development Corporation (KFDC) proposed a 1,800 ha tea plantation in Coorg, but concerns arose on its ecological, hydrological, and socio-economic impacts. At the request of the Department of Ecology & Environment (GoK), KSCST formed a working group under Prof. M.V. Nadkarni to assess the project. Separate study groups evaluated each impact, supported by field visits, community consultations, and expert inputs. The group prepared detailed reports and submitted recommendations to minimise adverse effects while ensuring economic benefits.

11) Evaluation of Western Ghats Development Programme

The Western Ghats Development Programme, aimed at long-term sustainable development and conservation, was reviewed by KSCST under Prof. Madhav Gadgil. The study sought to assess ecological imbalances, hydrological, socio-economic impacts, and programme outcomes, while suggesting guidelines for sustainable policies. Two task groups were formed, and surveys in 30 representative Mandals were initiated with support from local colleges and voluntary organisations. An interim report with preliminary recommendations was submitted to the Government of Karnataka for use in annual planning.

12) Use of Quarry Wastes in Block Making

Stone quarrying generates nearly 25% rejects in the form of rubbles, gravel, and dust. To utilize this waste, a project was initiated to develop low-cost cement concrete blocks with up to 30% savings. Tests on quarry waste blocks (39.5 × 23 × 14 cm) showed a 14-day strength of 20 kg/cm², comparable to hand-moulded bricks, and about 40% cheaper. Field trials are in progress with Ramakrishna Ashram constructing houses using these blocks.

13) Development and Field Testing of New Building Technologies

To address housing shortages, KSCST initiated research on low-cost, eco-friendly building technologies using local resources. Technologies developed include the ASTRAM soil block press, soil stabilization methods, rice husk ash/red mud cements, lime-soil plasters, and prefabricated clay tile roofs. An improved soil block press with 50% higher compaction was designed, and pozzolana production was started at Ungra. Field trials were conducted on fibre-cement roofing tiles, ferrocement channel roofs, and stabilized adobe bricks, with demonstration units built for performance testing.

14) Air Pollution and Incidence of Morbid Conditions in Bangalore City

A pilot study by IISc examined air pollution levels (SPM, SO_2, NO_x, hydrocarbons, CO) in Bangalore (1985–87) and projected rising trends without preventive action. Two high-risk areas, Cottonpet and Chamarajpet, were selected for epidemiological investigations covering 350 households (~1500 subjects). Air quality monitoring and clinical surveys (1988–89 and 1989–90) revealed that a significant proportion of residents experienced exposures above permissible limits, with respiratory illnesses strongly linked to high pollutant concentrations. Cumulative and acute exposures to SPM showed clear association with morbidity. Further detailed analysis is underway, and a comprehensive report is being prepared.

Statistics of morbid conditions
Division: Chamarajpet Year: 1988

Personal characteristics		Normal	Morbid (total)	Respiratory	Circulatory	Others
	Frequency	337	160	79	15	66
	Percent	68	33	16	3	14
Age (Yr)	Mean	28.15	35.43	30.56	51.46	37.39
	(SD)	12.95	15.19	14.59	7.20	13.80
Body weight (kg)	Mean	47.82	52.31	51.01	59.33	52.30
	(SD)	12.09	11.88	11.47	6.18	12.79

Year: 1989

Personal characteristics		Normal	Morbid (total)	Respiratory	Circulatory	Others
	Frequency	256	238	134	20	84
	Percent	52	48	27	4	17
Age (Yr)	Mean	28.20	34.19	29.89	49.5	39.86
	(SD)	13.20	15.60	14.58	10.43	15.04
Body weight (kg)	Mean	47.90	52.06	50.20	56.33	54.47
	(SD)	13.03	12.24	12.34	5.79	11.77

Table 1B

Statistics of morbid conditions
Division: Cottonpet Year: 1988

Personal characteristics		Normal	Morbid (total)	Respiratory	Circulatory	Others
	Frequency	348	221	90	25	104
	Percent	62	39	16	5	18
Age (Yr)	Mean	216.00	33.64	30.62	49.09	32.48
	(SD)	12.30	15.63	16.30	8.99	13.98
Body weight (kg)	Mean	47.20	51.12	46.58	59.67	52.66
	(SD)	13.90	15.42	14.95	8.28	14.94

Year: 1989

Personal characteristics		Normal	Morbid (total)	Respiratory	Circulatory	Others
	Frequency	366	202	103	15	84
	Percent	64	36	18	3	15
Age (Yr)	Mean	27.59	34.54	31.46	47.09	36.31
	(SD)	13.05	15.64	15.55	8.80	15.33
Body weight (kg)	Mean	48.32	52.48	49.92	57.00	54.08
	(SD)	14.73	15.39	15.05	12.63	14.78

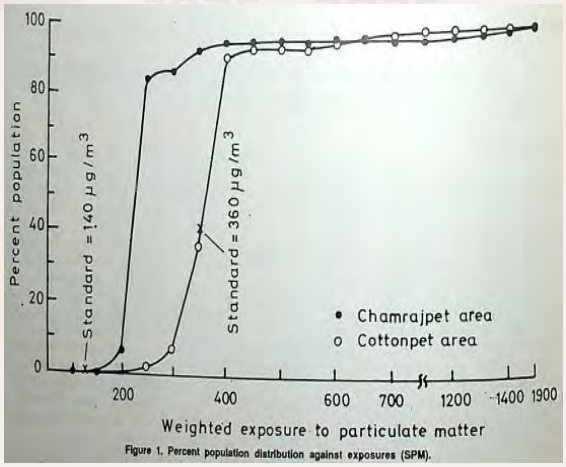


Figure 1. Percent population distribution against exposures (SPM).

15) Student Projects Programme

Over 1,989 engineering projects and 140 life sciences projects have been completed, with annual seminars, exhibitions, and awards encouraging innovation. Manuals on solar energy and mud block technologies were also published. Initiatives like 'Srushti' design competition further promote creativity, leading to prototypes with commercialization potential. Recent projects included local filter design, a kerosene reclamation device, a mobile flour mill, and textile sow-box development. The programme has become a key platform for low-cost innovation and technology dissemination in Karnataka.

Figure 1. Reclamation Device for used kerosene oil.

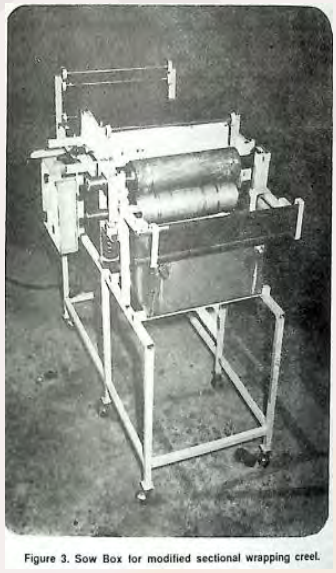


Figure 3. Sow Box for modified sectional wrapping creel.

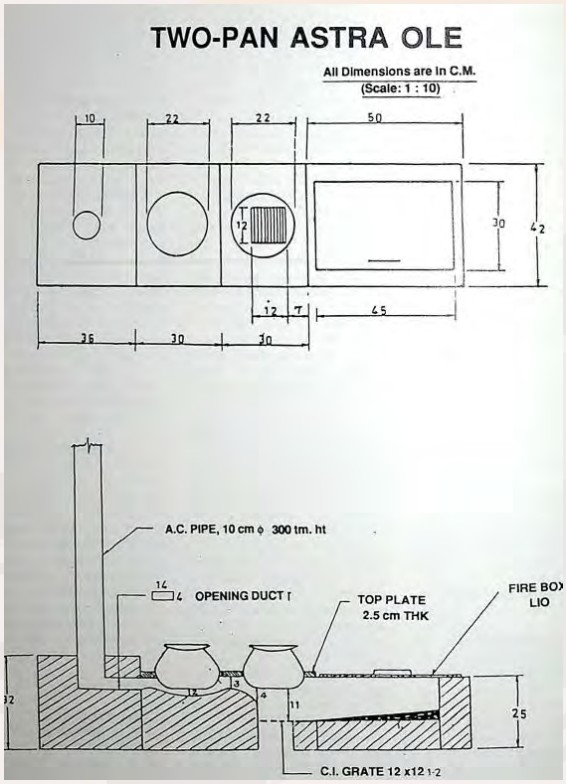
16) Solar Thermal Extension Programme (STEP)

The Solar Thermal Extension Programme (STEP), launched in 1984 and implemented in Karnataka since 1985-86 by KSCST (CREDA), promotes devices like solar water heaters, driers, timber kilns, cookers, and desalination systems. Solar water heaters are the most popular, with over 105 commercial/industrial systems installed totaling about 4 lakh LPD capacity, saving nearly six million units of electricity annually. A strict monitoring schedule (monthly to yearly based on system size) ensures performance, with CREDA handling minor repairs and manufacturers addressing major defects. Failures were mainly due to poor quality components and polypropylene absorbers, which have since been phased out. Issues like leakage, corrosion, and improper sealing have been addressed, and users are being motivated to maintain systems properly. Overall, the majority of systems are functioning satisfactorily and demonstrating significant energy savings.

17) Technical Back Up Unit for Improved Cook Stoves

KSCST established a Technical Back Up Unit (TBU) to support the National Programme on Improved Chulhas, focusing on research, design, training, and field trials. Major R&D work included pottery liners for Astra Stoves to maintain accuracy, standardization of 2-pan Astra Stove, and development of the portable metallic stove 'Swosthee' (approved with Rs.100 cost and Rs.50 subsidy). Pottery/ceramic-based portable stoves are also being explored for decentralized production. Field trials of 2+1 Astra Stove and silk cocoon boiling stoves showed promising results, with CSTRI adopting fixed models. Training

programmes were conducted for NGOs, potters, and rural artisans to enable large-scale dissemination and independent manufacture.



18) Solar Powered 10 Tonne Capacity Cold Storage Unit

To strengthen the fish cold chain in northern Karnataka, KSCST, IISc, and KFDC developed a solar-powered 10 tonne walk-in cooler for storing frozen fish at -20°C. The system uses a vapour compression refrigeration (VCR) unit powered by a 4 kW peak photovoltaic module with battery backup (180 AH, 90V) and grid support. Designed to store 10,000 kg of fish in a chamber of 4.6m × 2.5m × 2.5m, it operates 6 hours/day with a maximum 2°C rise in temperature. The compressor (3 kW DC motor) and cooling system (0.2 kW) are solar-driven. The unit has been commissioned, with initial trial runs conducted in Mangalore. Extensive trials and performance monitoring are planned from October under DNES support.

KSCST Projects (1990-1991)

1) Dynamics of Solar Pond

The project studied the performance of solar ponds under varying climatic conditions to evaluate their use in rural energy applications. A 240 m^2 pond was constructed at IISc and a 400 m^2 demonstration pond at Masur village, Uttara Kannada. Research focused on heat extraction, salt transport, and stability of the salinity gradient zone. Storage zone temperatures reached up to 80°C, proving high energy storage efficiency. The Masur pond demonstrated resilience during monsoons with natural gradient reformation. The study highlighted solar ponds as cost-effective and sustainable solutions for hot water supply and rural energy needs.

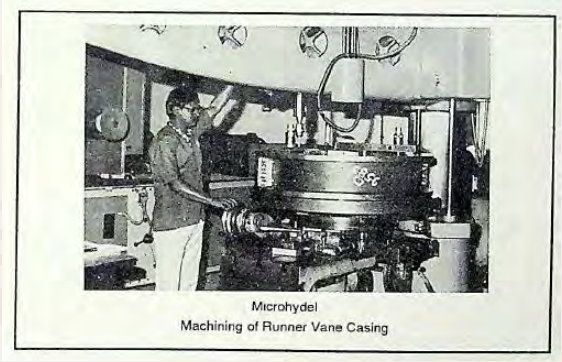
Solar pond technology demonstration at Hubli

2) Design and Development of 100 kW Gasifier System

KSCST and IISc designed and installed a 100 kW wood gasifier power plant at Port Blair, Andaman & Nicobar Islands. The system replaced up to 78% of diesel consumption with wood gas, saving significant fuel costs. Key innovations included custom diesel flow sensors, current transducers, and durable ceramic reactor shells. The modular package design allowed easier transport and installation in remote regions. At 75 kW load, wood consumption was about 1 kg/kWh with improved efficiency. The project proved the viability of decentralized renewable energy for diesel-dependent regions.

3) Demonstration of Microhydroelectric Unit in an Irrigation Canal

A 40 kW microhydroelectric unit was designed and demonstrated using a low-head irrigation canal at Keregodu village. The axial flow turbine operated at 2.5 m head with 2 m^3/s flow, connected directly to the grid. KPCL constructed the powerhouse while KSCST managed turbine fabrication and installation. The system effectively utilized irrigation canal infrastructure for renewable energy generation. Stainless steel runners and ducts ensured durability and efficiency under field conditions. This project proved the feasibility of low-cost hydropower for rural electrification using existing canal systems.



Microhydel
Machining of Runner Vane Casing

4) Development of Powdery Biomass Gasifiers

The project developed a multifuel gasifier to utilize agricultural residues like rice husk, sugarcane trash, and groundnut shells. Challenges of high ash content in fuels like rice husk were addressed using innovative pyrolysis and char oxidation methods. A charcoal bed was employed to crack tar, improving gas quality for engine use.

Continuous operation at 1000–1100 K demonstrated stable and efficient performance. Tar reduction and clean gas output made it suitable for rural applications. The work established the potential for 20–100 kW gasifier systems using powdery biomass without preprocessing.

5) 10 kW Solar Thermal Power Plant

A 10 kW solar thermal power plant using Organic Rankine Cycle (ORC) was developed and installed at the KSIC factory, Mysore. Parabolic trough collectors generated pressurized hot water at 170°C, which powered an R113-based ORC turbine-alternator system. Custom-designed heat exchangers enhanced efficiency through regenerative recovery. The compact, skid-mounted system occupied just 2.1m x 2.1m. The plant successfully demonstrated industrial-scale solar power integration. This project showcased the feasibility of solar thermal technology for decentralized, eco-friendly industrial energy supply.

6) Energy Efficient Submersible Pumps for Irrigation

The project optimized submersible pump designs to improve efficiency and reduce irrigation energy costs. Hydraulic losses were analyzed using computer models, and impeller geometry was modified for better performance. Prototype testing demonstrated a 5% improvement in pump efficiency. The computer-aided design method provided inexpensive ways to upgrade existing pumps. Field tests validated the efficiency gains and confirmed energy savings. This initiative demonstrated cost-effective solutions for improving pump efficiency in agriculture and rural water supply.

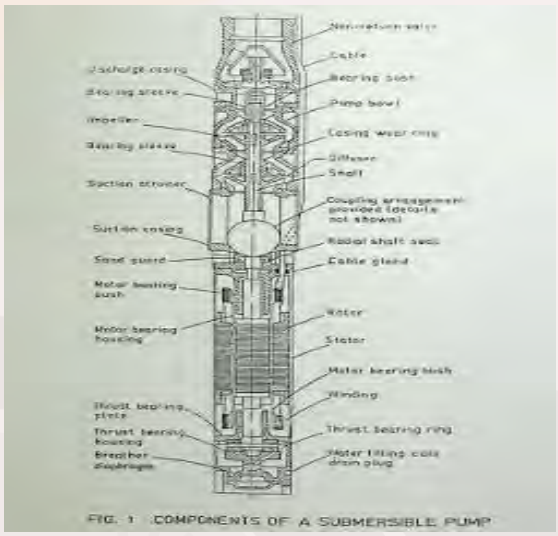
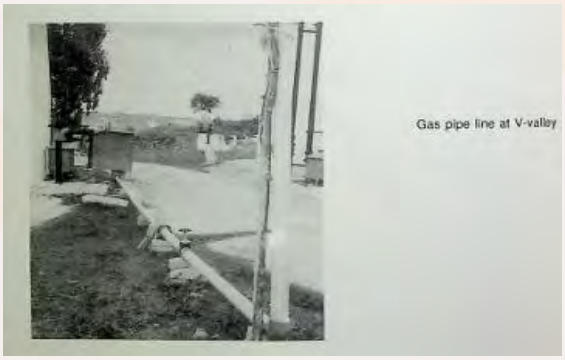


FIG. 1 COMPONENTS OF A SUBMERSIBLE PUMP

7) Studies on Sludge Gas Generation and Utilization

The project explored the potential of using sludge gas from sewage treatment plants at Vishabhavati Valley and Koramangala-Challaghatta. Average gas production was about 3,000 m^3/day, peaking at 7,500 m^3/day, with methane content of 60–70%. Pipelines were installed to transport gas to nearby facilities for domestic cooking demonstrations. The study confirmed sludge gas as a renewable energy source, reducing methane emissions and energy costs. Plans were made to extend supply to staff quarters, ensuring scalability. The project proved the feasibility of sewage-to-energy conversion with environmental benefits.


Gas pipe line at V-valley

8) Design and Demonstration of Rural Energy Centres

Rural Energy Centres were established in villages like Pura, integrating biogas-based power generation and water supply. Biogas plants powered dual-fuel engines, replacing 75% of diesel and supplying electricity for household lighting and water pumping. Community committees managed operations, with villagers contributing dung and paying nominal fees for usage. Around 97 households and eight streetlights were electrified, and 10,000 liters of water supplied daily. Local youth were trained to operate and maintain the systems, ensuring sustainability. The project showcased community-led, replicable models for rural energy and water needs.

9) Rural Energy Centre Based on Energy Forest Wood Gasifier System

The project at Hosahalli village integrated an energy forest with a wood gasifier-diesel engine to provide rural energy services. A two-hectare plantation of six tree species supported sustainable fuelwood supply for the gasifier. The system powered a 3 HP submersible pump delivering 10,000 liters of water daily, provided lighting to 43 households and eight streetlights, and operated a flour mill processing 120 kg of grain daily. A three-phase electricity system was installed to handle multiple uses. Community management ensured operation, fee collection, and protection of the energy forest. The project demonstrated sustainable, low-cost, multi-utility rural energy solutions.

10) Solar Photovoltaics

This project demonstrated the use of SPV systems for rural applications such as lighting, water pumping, and refrigeration. Installations included SPV lighting at seven railway stations, streetlights and a community TV in Bollapura village, and a French SPV pump at Teklahalli providing 30,000 liters of water daily. A prototype SPV vaccine refrigerator was tested at Malur for rural healthcare applications. Integration with wind chargers ensured reliability and scalability. These systems reduced fossil fuel dependence and carbon emissions while improving village infrastructure. The project highlighted the versatility of SPV in addressing rural energy needs sustainably.

11) Technical Back-up Unit for NPIC

The Technical Back-up Unit (TBU) supported the National Programme on Improved Chulhas (NPIC) through R&D, training, and monitoring. Fuel-efficient stoves were developed, including a 20 kW portable metallic stove, a 4 kW powdery biomass stove, and improved designs for cashew processing units, achieving 40–45% fuel savings. Pottery components for Astra stoves improved ease of construction and performance. Training programs equipped masons for large-scale stove dissemination. Adoption studies revealed that over 55% of Astra stoves were still in use by 1990–91. The initiative reduced fuel use, improved efficiency, and promoted eco-friendly cooking solutions.

12) Integrated Rural Energy Planning Programme – Technical Back-up Unit

The IREP-TBU aimed to support taluka-level rural energy planning using renewable sources like wind, solar, and biogas. It conducted surveys, training, and evaluation of systems in Karnataka. Studies identified design and maintenance issues in windmills

and solar PV systems, such as rotor stress, short battery life, and sensor failures. Solutions included modifications and introducing hand pump backups. Training programs were held for engineers and project officers on biogas and renewable energy. The unit improved efficiency, reliability, and community involvement in rural energy planning. Its findings guided future energy system designs and policy.

13) Manufacture of Pregnone from Hecogenin

This project developed processes for converting hecogenin from sisal into steroid intermediates like pregnonolone and andrastanolone. Laboratory methods such as Wolf-Kishner reduction, acetylation, oxidation, and Beckmann rearrangement were optimized for yield and cost. Pilot trials scaled production to 75–100 grams per batch, addressing challenges like foaming, sticky intermediates, and low yields. Use of cheaper solvents and de-waxing improved economic feasibility. The project demonstrated the potential for large-scale production of steroid intermediates. This work highlighted commercial opportunities for hecogenin-based pharmaceuticals, expanding markets for sisal byproducts.

14) Green Manure for Paddy Crops of Karnataka-Investigation of the Effectiveness of Stem Nodule Legume (Sesbania rostrata)

The project evaluated Sesbania rostrata, a stem-nodulating legume, as an effective green manure for paddy fields. Field and laboratory studies showed nitrogen fixation up to 147 mg per plant, equivalent to 65–100 kg of fertilizer nitrogen per hectare in 45–50 days. Efficient inoculation with Azorhizobium caulinodans and use of rock phosphate enhanced performance. Incorporation of 7–8 tonnes of biomass per hectare matched yields from 100 kg of fertilizer nitrogen. Mixed cropping with Azolla further increased nitrogen input. The crop proved cost-effective, eco-friendly, and suitable for small and marginal farmers.

15) Genetic Improvement and Rapid Vegetative Propagation in Tamarind and Pomegranate Through Tissue Culture

The project standardized tissue culture methods for rapid vegetative propagation of tamarind and pomegranate, crops difficult to propagate conventionally. In tamarind, shoot bud culture and optimized auxin-cytokinin media enabled rapid clonal multiplication, overcoming poor rooting in traditional methods. In pomegranate, both tissue culture and optimized hardwood cuttings improved rooting success and propagation. Tissue-cultured plants were acclimatized for field planting, producing true-to-type clones. Air layering with hormones further improved success rates. The project proved scalable, commercially viable, and suitable for expanding drought-tolerant fruit crops in arid regions.

16) Influence of Vermicompost on Growth and Yield of Cereals and Ornamental Plants

This project evaluated vermicompost as an alternative to chemical fertilizers for cereals, vegetables, root crops, oilseeds, and ornamentals. Trials on ragi, paddy, brinjal, tomatoes, radish, carrots, sunflower, and marigolds showed improved growth, yield, and soil fertility.

Vermicompost enhanced microbial activity, nutrient mobilization, and soil conditioning compared to farmyard manure. Mixing with chemical fertilizers reduced input costs while maintaining yields. Ornamental plants exhibited improved flowering and aesthetic value. The study highlighted vermicompost as a sustainable, eco-friendly fertilizer enhancing productivity while reducing dependence on chemicals.

17) Western Ghats Development Programme (WGDP)

The WGDP was initiated during the Fifth Five-Year Plan to integrate environmental protection with rural development in the ecologically sensitive Western Ghats. Led by the Department of Rural Development and Panchayat Raj with expert inputs from Prof. Madhav Gadgil's group at IISc, the program assessed environmental status, community involvement, and developmental priorities. Surveys with 284 groups identified roads, irrigation, and drinking water as top priorities. The program adopted a watershed-based, participatory approach linking ecology with livelihood activities. Case studies showed improvements in water levels, soil conservation, and employment opportunities. The initiative became a model for balancing ecological conservation with sustainable development.

18) Environmentally Sound Siting of Industries

This project, led by Sri H.C. Sharatchandra, aimed to identify suitable industrial sites in Hassan district while minimizing environmental impacts. Using GIS-based analysis, factors such as land use, water availability, forest cover, and infrastructure were mapped and evaluated. A zoning atlas was developed to guide policymakers in selecting sites, ensuring harmony between industrial development and ecological protection. The methodology considered both upstream resource availability and downstream pollution effects. Critical ecological areas were marked for protection, while optimal sites were identified for industry. The atlas provided a replicable model for sustainable industrial planning in other districts.

19) Environmental Impact Assessment of Mining in Bellary District

This study assessed the impact of iron ore and manganese mining in Bellary using satellite remote sensing (LANDSAT MSS and IRS-1A) and field surveys. Results showed severe deforestation, with dense forest cover decreasing by 169 sq. km and thin forests by 338 sq. km between 1983 and 1991. Mining and dump areas expanded by 82 sq. km, while degraded forests and fallow lands also increased. The project quantified land-use changes and proposed an Environmental Management Plan for the Bellary-Hospet mining belt. By integrating remote sensing with field data, it provided a baseline for monitoring and informed policy on sustainable mining.

Eroded Mine Dumps in Bellary District

20) Use of Quarry Wastes for Block Making

This project explored using quarry waste—up to 25% of quarried material usually discarded—as raw material for cement concrete blocks. Laboratory and field tests by KSCS&T and NAL confirmed adequate compressive strength of manually made blocks. The blocks were competitively priced compared to bricks and soil-cement blocks, reducing construction costs. Ramakrishna Ashrama applied the blocks in building houses in an adopted village, demonstrating practical viability. The initiative promoted waste utilization, local employment, and cost-effective housing. It showcased quarry waste as a sustainable building material with strong economic and environmental benefits.

21) House Numbering System for Bangalore City

To resolve inefficiencies in Bangalore's haphazard house numbering, KSCS&T developed a logical and uniform numbering system supported by aerial photography and detailed mapping. The city was divided into zones, with multi-digit numbers assigned based on road intersections and building positions, using odd-even conventions. The "Bangalore A-Z" atlas was published with detailed maps covering 276 sq. km, benefiting citizens and service providers. This system improved navigation, utility service delivery, emergency response, and urban planning. The project involved multiple agencies, including BDA, City Corporation, and postal services, ensuring wide adoption. It laid the foundation for future GIS-based urban management.

22) Building Technology Dissemination Programme

This program, led by Prof. K.S. Jagadish at IISc, aimed to train engineers, architects, and masons in alternative, eco-friendly building technologies. Training covered stabilized mud blocks, alternative cements, waterproof coatings, lintels, and ferrocement roofing. Hands-on field sessions, exposure visits, and training capsules for contractors ensured practical adoption. Over 45 professionals were trained, along with 20 masons at Nirmiti Kendra, Chitradurga, while 300 house owners attended awareness programs. The initiative encouraged cost-effective and sustainable construction practices across Karnataka. By building local capacity and promoting adoption, the program significantly advanced eco-friendly housing technologies.

23) Solid Waste Management – A Pilot Project at Jayanagar, Bangalore

This pilot project in Jayanagar IV Block demonstrated decentralized waste management with strong community participation. About 400 households were educated to segregate waste into recyclable, compostable, insanitary, and toxic categories. Waste retrievers collected the waste daily using pedal carts and processed it systematically. Compostable waste was converted into vermicompost, recyclables sold to industries, insanitary waste incinerated, and toxic waste handled per protocols. The project created sustainable jobs for rag pickers while improving sanitation. It became a model for decentralized solid waste management in urban areas.

24) Utilization of KGF Rock Dust for Building Blocks

This project explored the feasibility of using Kolar Gold Fields (KGF) rock dust to produce eco-friendly, cost-effective building blocks. Rock dust samples were tested and mixed with 3–5% cement, soil, sand, or gravel to form blocks, which achieved compressive strengths of 9–21 kg/cm². Over 600 blocks were produced and used to construct a storage shed at Ramakrishna Ashrama, Shivanahalli. The blocks were found cheaper than conventional bricks and soil-cement blocks, while being strong enough for two-storey structures. The project reduced environmental hazards from waste rock dust dumps. It highlighted sustainable construction solutions for rural and low-cost housing.

25) Ecosystem Study of Uttara Kannada

This study assessed the ecological impacts of hydropower and mega-projects in Uttara Kannada district. Using remote sensing, field observations, and stakeholder inputs, the team documented changes in land use, biodiversity, and community livelihoods. It revealed a forest loss of 971 sq. km since 1956, including 136 sq. km submerged by hydropower projects. Surveys highlighted dependency on forests for fodder and fuel due to a livestock population of 4.17 lakh. The study recommended afforestation and soil conservation to mitigate hydropower impacts. It provided policymakers with a comprehensive ecosystem profile balancing development and conservation.

26) Nutrition and Health – A comprehensive assessment of Programmes for Women and Children

This study evaluated ICDS and mid-day meal programmes in Raichur and Gulbarga districts. Surveys, clinical assessments, and stakeholder consultations were conducted across Anganwadi centres and schools. Results showed lower malnutrition (27%) in areas with long-running ICDS compared to newly initiated ones (43%). High immunization rates for children were noted, but antenatal care for mothers was poor. The mid-day meal programme reduced school dropouts but dietary deficiencies in protein, iron, and vitamins persisted. Recommendations included fuel-efficient stoves in Anganwadis and promoting nutrient-rich kitchen gardens. The study provided valuable insights for improving health and nutrition services.

27) Dissemination of Information on KSCST Activities

KSCST launched newsletters and films to share technologies and activities with diverse audiences. The newsletter *SNAPSHOT* enabled inter-state exchange of S&T activities, while *STAK* focused on Karnataka-specific projects. A film on solar steam generation at Mysore Silk Weaving Factory was produced and telecast on Doordarshan. These efforts promoted awareness of renewable energy and sustainable technologies. SNAPSHOT and STAK reached government departments, institutions, and the public, while video films reached households and industries. This initiative enhanced collaboration, knowledge sharing, and adoption of KSCST's innovations at state and national levels

28) Natural Resources Management Information System

This programme developed software-based decision tools for sustainable land and water management. Modules like CASMIT identified sites for irrigation tanks, ICSS simulated crop growth in drylands, and RDP analyzed rainfall data. The system integrated ecological and economic data, generating contour maps, 3D terrain models, and crop yield predictions. It helped optimize irrigation tank locations, improve agricultural planning, and mitigate drought impacts. Tested in micro-watersheds, it supported district administrators and farmers in resource planning. The project showcased technology-driven solutions for effective natural resource management in Karnataka.

29) Student Projects Programme

The Student Projects Programme harnesses student talent to address developmental challenges in Karnataka through practical, innovative projects. Since its inception in 1977, over 2,161 projects have been supported with financial and technical assistance. Students from engineering, medical, agricultural, fisheries, and science colleges receive funding of about ₹2,500 per project. Selected projects are showcased in annual seminars, with "Project of the Year" awards for excellence. Many innovations, such as arrhythmia monitoring systems, groundwater zone identification, and mini car prototypes, have emerged. The programme fosters hands-on learning, innovation, and community impact, becoming a cornerstone of KSCST initiatives.

30) Student Training Programme

The Student Training Programme provides hands-on exposure to students by engaging them in real-life KSCST projects. Trainees are assigned tasks aligned with their academic background and supervised by experts. Projects span renewable energy, water purification, agriculture, waste management, and software development. Over 70 students have been trained since 1978, contributing to grain disinfestors, water testing systems, and biogas experiments. Trainees gain practical skills in research, design, and analysis, improving employability and research potential. The programme nurtures young talent while enabling meaningful contributions to developmental challenges.

31) Product Development Programme

This programme supports promising student innovations by bridging the gap between prototypes and commercialization. Projects from the Student Projects Programme are refined with technical and financial assistance, followed by field trials. Developed products include maize corn deshellers, mini pulverizers, LPG-based mopeds, and lubricating oil dispensing systems. Collaborations with industry partners, such as Indian Oil Corporation, enabled commercialization of certain products. The programme promotes entrepreneurship, cost-effective technologies, and sustainable solutions for rural and urban needs. It has transformed innovative ideas into practical solutions, benefiting industries, communities, and the environment.

32) Biomass Gasifier Programme

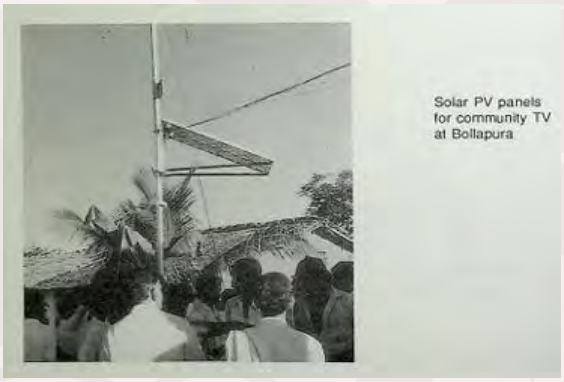
The Biomass Gasifier Programme promotes renewable energy by converting biomass into combustible gas for rural applications. Developed at IISc and disseminated with DNES support, the systems replace 65–85% of diesel fuel. They are used for water pumping, electricity generation, and mechanical applications like grinding and chaff cutting. By 1990, 149 installations were completed across Karnataka, including water pumping and power generation units. The programme reduced diesel costs, created rural employment, and minimized emissions. It successfully demonstrated the economic, environmental, and social benefits of renewable energy in rural development.

33) Wind Energy Programme

The Wind Energy Programme assessed Karnataka's wind potential for power generation and rural applications. Wind speed data from 30 stations was analyzed, leading to the creation of a wind atlas and identification of promising sites. Installations included 2 kW wind turbines at Chitradurga and B.R. Hills, and 50W wind chargers in villages like Bollapura. These powered TVs, streetlights, and small appliances, often integrated with solar panels for hybrid use. The programme reduced grid dependency, promoted clean energy, and improved rural connectivity. It demonstrated the potential of wind energy for sustainable rural development.

34) Urjagram

The Urjagram initiative created model villages demonstrating integrated renewable energy systems. Technologies included solar PV for lighting and community TVs, wood gasifiers for pumping, Astra Oles for efficient cooking, and community solar cookers. The first Urjagram was established in Bollapura village, Davangere Taluk, covering lighting, cooking, and irrigation needs. The programme reduced firewood and diesel use, enhanced awareness of clean energy, and improved villagers' quality of life. Local personnel and Panchayats were trained for system operation and monitoring, ensuring sustainability. Sanction was received to replicate Urjagrams in other Karnataka villages.



Solar PV panels for community TV at Bollapura

35) Solar Thermal Extension Programme

The Solar Thermal Extension Programme (STEP) promoted solar water heaters, timber kilns, and air heaters through subsidies and awareness campaigns. By 1990, 147 non-domestic systems (490,500 LPD) and 362 domestic systems (39,900 LPD) were installed. Large systems, such as a 25,000 LPD heater at Bharat Electronics Ltd., consistently delivered water at 60–95°C. Applications in hotels, hospitals, and industries reduced energy costs and electricity use. The programme demonstrated environmental sustainability, durability, and scalability of solar thermal systems. It proved effective in promoting energy conservation across Karnataka's domestic, commercial, and industrial sectors.

KSCST Projects (1991-1992)

1) Design and Demonstration of Rural Energy Centres

This programme, led by IISc and local village committees, established rural energy centres using biogas-based dual-fuel engines to supply power and water. Community participation was key, with households contributing cattle dung and receiving sludge for agriculture. The system provided electricity for 103 fluorescent tubes and pumped 6,000–8,000 liters of water daily for 43 households. It demonstrated economic viability with income exceeding operational costs. Local youth were trained for maintenance, ensuring sustainability. The successful Pura village model was replicated in other villages of Tumkur district.

2) Development of Powdery Biomass Gasifiers

The project developed multi-fuel gasifiers to utilize powdery biomass such as rice husk, sugarcane trash, and groundnut shells. Innovative reactor designs and charcoal beds reduced tar content, producing clean combustible gas for engines. Systems were designed for 20kW and 100kW scales, suitable for rural electrification and industrial use. Field experiments achieved consistent gas quality even with high-ash fuels like rice husk. The technology demonstrated scalability, efficiency, and environmental benefits. It showcased the potential of agricultural residues as renewable energy resources.

3) Total Energy Conservation measures in Dairy and Sericulture Industries

This study focused on energy audits in dairy and sericulture units to identify and reduce wastage. Recommendations included fluidized bed combustion boilers, economizers, and improved insulation to enhance efficiency. In dairies, optimizing boilers and refrigeration reduced coal and electricity consumption by up to 30%. In sericulture, energy-efficient boilers and high power-factor motors significantly lowered fuel and power use. Field tests confirmed substantial energy savings across both industries. The programme highlighted low-cost, practical measures for sustainable industrial energy management.

4) Solar Pond at B.V.B. Engineering College, Hubli

A solar pond was constructed at B.V.B. Engineering College to provide hot water for hostel use, reducing firewood consumption. The 20m x 20m pond used LDPE liners, bentonite insulation, and 100 tonnes of salt to create a heat-trapping gradient. Temperatures in the storage zone exceeded 50°C, demonstrating effective heat retention. Hot water was supplied directly to hostels, meeting daily needs sustainably. The project showcased low-cost renewable energy for institutions. It proved solar ponds as a viable energy conservation model for large campuses.

5) Solar Photovoltaic Water Pumping System with UV Purification

This system combined solar photovoltaic technology with UV purification to provide safe drinking water. Six SPV modules powered a DC motor-driven reciprocating

pump with battery backup for uninterrupted use. On average, it delivered 3,020 liters of water daily over a 50-foot head. The integrated UV tube eliminated bacterial contamination while retaining essential minerals. Installed at Shree Ramana Maharshi Academy for the Blind, Bangalore, it ensured reliable and hygienic water supply. The project highlighted renewable energy's role in safe and sustainable water management.

6) Studies on Sludge Gas Generation and Utilisation

This project assessed sludge gas potential at Bangalore's V-Valley sewage treatment plant in collaboration with BWSSB. Gas analysis showed methane-rich sludge gas with 3,000 Nm^3 produced daily and potential for 15,000 Nm^3. A pilot pipeline system was installed to supply gas for cooking, successfully demonstrated at the BWSSB office. Industrial applications for heating and electricity generation were also evaluated. The project highlighted cost-effective renewable energy from waste, reducing methane emissions and fuel dependency. It demonstrated adaptability for both domestic and industrial uses.

7) Gasifier-Based 100kW Power Plant at Navodaya Vidyalaya near Tumkur

A 100kW gasifier-based power plant was installed at Navodaya Vidyalaya to demonstrate biomass-based electricity generation. The system used a ceramic shell gasifier with dual-fuel operation, replacing up to 78% of diesel with producer gas. A low-cost mud block powerhouse was built, and waste heat was utilized for hot water and steam. Grid integration with KEB ensured reliable power supply for the campus. Field trials recorded 300 hours of operation, 1 kg wood/kWh consumption, and 26% efficiency. The project proved cost-effective, sustainable, and replicable for institutions and rural electrification.

8) Sisal Technology

This project developed integrated processes for complete utilization of Sisal leaves for fiber, Hecogenin extraction, and handmade paper. Laboratory studies and pilot plants at Ungra demonstrated rope making, derivative production, and paper manufacture. Yields included 3.5% fiber and 8 kg crude Hecogenin per batch, with high-value derivatives like Androstanolone priced at ₹22,500/kg. The project showed economic viability through rural industries and employment generation. Market surveys confirmed demand for Sisal derivatives in pharmaceuticals and paper products. It provided a replicable model for small-scale agro-industries in Karnataka.

9) Pulp and Paper from Horticultural Wastes through organosolv delignification process

The study explored the use of horticultural residues such as arecanut husk, banana stems, and bagasse for pulp production. Using an organosolv delignification process with ethanol and ethylenediamine, sulfur-free pulping was achieved, reducing pollution. Pulp strength tests showed suitability for brown wrapping paper and file boards. Arecanut husk yielded pulp with breaking length of 1.9 km and burst factor of 10.35. The process demonstrated sustainable use of waste and reduced

dependency on bamboo and eucalyptus. It offered both environmental and economic benefits for rural pulp industries.

10) Field Testing of Semi-Automatic Looms for Silk Weaving

Semi-automatic looms were tested at weaving centres in Mudigundam, B.R. Hills, and Basrur to enhance silk weaving productivity. The MECO and TARA looms reduced physical strain through pedal mechanisms and improved weaving speed. Productivity ranged from 0.6 to 1 cm/min, achieving 50–70 picks per minute. Performance varied with humidity, with higher warp breaks in coastal Basrur. Weekly benchmarking provided insights into idle time, breaks, and efficiency. The trials showed that semi-automatic looms could modernize rural silk weaving, improve productivity and reduce drudgery.

11) Establishing Vegetation in Highly Eroded Lands under dryland conditions

This programme tested planting techniques and species suitable for dryland reclamation in the Chokkanahalli watershed. Species such as Acacia, Eucalyptus, Grevillea, and Dalbergia showed high survival rates under water harvesting measures like trenches and V-ditches. Seed pelletization using cow dung and red earth improved germination and vigor. Fertilizer application (DAP 40g/plant) enhanced growth in degraded soils. Mixed silvi-pasture systems yielded greener biomass and better land productivity than monoculture forestry. The project demonstrated effective strategies for restoring eroded lands and supporting sustainable dryland agriculture.

12) Agricultural Utility of Fly Ash

Field trials at Raichur evaluated fly ash as a soil amendment for improving physical and chemical properties. Applied at 20 tons/ha, fly ash reduced crust strength from 2.38 to 0.98 kg/cm², improving soil friability. Crop yields increased significantly, with sunflower by 33% and groundnut by 25%. Post-harvest soil analysis showed higher nitrogen, phosphorus, and potassium availability. Application once every two years was found optimal for sustaining soil quality. The study highlighted fly ash as a sustainable amendment that improves productivity while addressing disposal challenges.

13) Screening Pigeon Pea Genotypes for Disease Resistance through cell and tissue culture technique

This project used cell and tissue culture to identify pigeon pea genotypes resistant to Fusarium wilt. Callus tissues were induced from cotyledon and leaf explants and exposed to Fusarium culture filtrates containing fusaric acid. Resistant genotypes showed less browning and survived filtrate exposure. Pathogenicity tests confirmed that filtrate produced wilt-like symptoms, validating the method. Eight genotypes were screened initially, with plans to expand to 50. The study demonstrated an innovative, rapid, and reliable in-vitro technique for breeding disease-resistant pigeon pea.

14) Enumeration of Native Rhizobium Strains for Red Gram

Native Rhizobium strains were isolated from soils and root nodules across Gulbarga district. From 28 isolates, 10 were

screened using biochemical tests such as Congo red, sugar utilization, and reserve food material analysis. Greenhouse trials confirmed their infectivity and nitrogen fixation ability on red gram plants. Soils showed high pH (7.8–8.7) and low nitrogen levels, emphasizing the need for bioinoculants. Effective native strains enhanced growth and reduced fertilizer dependence. The project demonstrated the potential of locally adapted Rhizobium strains for sustainable red gram cultivation.

15) Prawn Culture Technology

A demonstration project near Honnavar developed hatchery and grow-out systems for tiger, white, and banana prawns. Hatcheries produced quality seedlings under controlled conditions, ensuring high survival rates. Grow-out ponds maintained optimal salinity, with supplementary feeding using urea and oil cakes. Filtration tanks improved water quality and reduced environmental impact. Training programmes introduced farmers to intensive prawn culture techniques. The project proved the economic feasibility of prawn farming, generating income and supporting sustainable aquaculture in coastal Karnataka.

16) Immunological Memory in Indian Major Carps to Aeromonas Hydrophila vaccination

This project studied the immune response of catla, rohu, and mrigal to vaccination against Aeromonas hydrophila. Vaccines included hemolysin-negative mutants and killed strains, administered by immersion, injection, and infiltration. Immersion with booster doses proved most practical, producing high antibody titers and homologous protection. Thymectomy studies confirmed the role of T-helper cells in immunity. Vaccinated fish showed 100% survival compared to controls, with mortality reduced significantly in field trials. The study provided an effective vaccination protocol to control bacterial infections in aquaculture.

17) SEMI-perennial plant species (pigeon pea and Castor) as an Alternative for drought prone, Rain fed areas of Karnataka

This project assessed perennial pigeon pea and castor as alternatives for rain-fed, drought-prone regions. Both crops, with deep root systems, extracted moisture from 1–3m soil depths, ensuring survival in dry summers. They provided multiple outputs—grain, fodder, and fuel—enhancing farmer income. Soil moisture studies using neutron probes showed efficient water use. Pruning improved regrowth and productivity, optimizing land use under stress conditions. Field trials confirmed their adaptability, proving them sustainable crops for drought-prone Karnataka.

18) Environmental Suitability for Siting Polluting Industries - A pilot study for Hassan District

This pilot study developed a model to identify suitable zones for polluting industries in Hassan district. Using environmental data on air, water, land use, and human settlements, areas were classified as highly suitable, suitable, limited, or unsuitable. Exclusion zones included forests, irrigated lands, monuments, and water bodies. Multi-colored maps were prepared, showing corridors for siting 11 categories of polluting industries. The study minimized

environmental conflicts, ensured compliance with the Environment Protection Act, and guided industrial planning. It provided a replicable model for sustainable industrial development.

19) Solid Waste Management – A Pilot Project at Jayanagar, Bangalore

This pilot project in Jayanagar, Bangalore, demonstrated decentralized solid waste management with active community participation. Waste was segregated at source into recyclable, compostable, insanitary, and toxic categories. Daily collection by waste retrievers enabled recycling, vermicomposting, and safe disposal of sanitary and toxic waste. About 220–250 kg of waste was processed daily, providing employment to ragpickers and generating income from compost and recyclables. Vermicompost was sold locally and used in gardens, showcasing waste-to-resource conversion. The project highlighted sustainable, community-based urban waste solutions.

20) Environmental Impact Assessment of Mining in Bellary District

This study assessed the environmental effects of open-cast mining in Bellary district and prepared a regional management plan. Satellite imagery showed dense forest cover reduced by 72% and mining areas nearly doubled in eight years. Air quality monitoring revealed SPM levels exceeding 4000 µg/m³, while water bodies showed high siltation and turbidity. Noise pollution exceeded permissible limits, affecting local communities. Recommendations included revegetation of waste dumps, improved water management, and pollution control. The project provided a comprehensive framework for sustainable mining practices in the region.

21) Air Pollution and Incidence of Morbid Conditions

This project studied the relationship between air pollution and health conditions in Bangalore city. Monitoring of SPM, SO_2, and NO_x in high-traffic zones was correlated with hospital morbidity data. SPM exceeded 200 µg/m³ in polluted areas, with respiratory and cardiovascular diseases reported more frequently. About 56% of the population remained healthy, while 15% suffered upper respiratory problems and 5% lower respiratory illnesses. Urban planning issues, including traffic congestion and tall buildings restricting airflow, were identified as contributing factors. Policy recommendations focused on improved traffic management and building regulations.

22) Traditional Architecture of South Canara – Case Studies and Inferences

This study documented traditional domestic and institutional buildings in South Canara, analyzing their climate-responsive and cultural features. Case studies of 12 buildings highlighted courtyards, thick mud walls, sloping tiled roofs, and intricate wooden carvings. Courtyards enhanced ventilation and light, while mud walls provided thermal insulation. Wooden components reflected craftsmanship and cultural richness, adding both function and aesthetics. The study emphasized the relevance of these practices for modern sustainable housing. Documentation preserved traditional

knowledge and demonstrated its adaptability in contemporary contexts.

23) Effect of Cement Dust on Rhizosphere, Phyllosphere, and Water Body Microbial Flora

The study investigated the impact of cement dust on soil, plant, and water microbial communities in Gulbarga district. Water samples near cement plants showed increased pH, hardness, and alkalinity, with reduced microbial diversity. Crop leaves (red gram, jowar, and groundnut) exposed to dust exhibited decreased epiphytic microbial populations. Soil microbial activity was similarly reduced, affecting fertility and crop health. Seasonal monitoring revealed fluctuations in microbial populations linked to cement dust deposition. The findings underscored the need for pollution control and sustainable agricultural practices near industrial zones.

24) Use of Quarry Wastes for Block Making

This project tested the feasibility of using quarry waste to produce low-cost cement concrete blocks. Blocks cast in both laboratory and field conditions achieved compressive strength of 10.5 kg/cm², suitable for single-storey construction. Quarry waste blocks were cheaper than bricks, costing ₹64.50/m² compared to ₹100/m² for brick walls. Over 600 blocks were used to construct a storage shed and a small temple at Ramakrishna Ashrama, proving practical viability. The project demonstrated strength, cost-effectiveness, and sustainability by utilizing waste materials. It highlighted potential for wider adoption in rural construction.

25) Artificial Fracturing and Recharge in Hard Rock Aquifers

This project evaluated artificial fracturing and rainwater recharge in hard rock aquifers near Ungra. Open wells, borewells, and a bund were developed to store rainwater, with filtration through a rapid sand bed system before recharge. Pumping tests showed recharge rates of 1,800–4,000 gallons per hour, confirming efficiency. Chlorination ensured safe water quality, and monitoring wells tracked water levels. The system enhanced groundwater availability and quality, benefiting agriculture and domestic needs. The study demonstrated the economic viability of this method for drought-prone regions with hard rock terrains.

26) Energy Efficient Submersible Pumps for Irrigation

This project aimed to improve irrigation pump efficiency through optimized hydraulic design. Tests on five commercial pumps identified inefficiencies, leading to the design of improved impellers using computer-aided methods. New impellers enhanced efficiency by 5% and reduced energy losses, meeting international standards. Field tests confirmed better head capacity and performance with minimal cost modifications. Manufacturers adopted the redesigned impellers, proving large-scale applicability. The project highlighted significant energy savings and cost reductions, promoting sustainable irrigation practices for farmers.

27) Approximate Proportional Linear Orifice

A novel orifice formed by two circle quadrants was designed to give a near-linear head–discharge relationship,

simplifying field measurements. A theoretical head–discharge equation was derived and validated by experiments on four fabricated orifices. Tests confirmed the near linearity of the curve and produced an average coefficient of discharge of 0.633. A field trial in the Malaprabha Canal (radius 15 cm, top width 0) demonstrated practical performance. The device removes complex field calculations and is easy to fabricate. Its cost-effective, linear behavior makes it useful for irrigation engineers and water-management applications.

28) Demonstration of Nutritional Health Programme

The programme targeted malnutrition among children under five and women in B.R. Hills using locally available foods and community mobilisation. A baseline survey informed training of three local youths and design of a supplementary feeding menu. Growth charts and regular health checkups were used to monitor impact in selected hamlets. The Soliga Abhivriddi Sangha played a key role in community participation and ownership. The approach emphasised sustainability, low cost and local capacity building. Results showed improved child growth and reduced malnutrition in the targeted villages.

29) Epidemiological Dimensions of Head Injuries

A hospital-based epidemiological study of 2,897 head-injury patients across eight Bangalore hospitals examined causes, outcomes and helmet effects. Data from hospital records, police reports and public surveys were collected using structured questionnaires and analyzed for trends. Findings showed helmet use substantially reduced mortality (6.8% with helmets vs 13.5% without) and reduced severity of injuries. The study also quantified economic burden, with many families incurring significant medical costs. Recommendations included better ambulance services, road safety education and stronger helmet laws. The results informed public awareness campaigns and policy discussions on trauma prevention

30) Student Projects Programme (SPP)

The SPP promotes student research across engineering, agricultural and life sciences, funding selected projects and showcasing them at an annual seminar-exhibition. Since 1977–78 the programme expanded to many colleges and supported undergraduate through postgraduate projects. Grants average Rs.2,500–3,000 per project and outstanding work receives certificates and cash awards. Typical projects include renewable energy, materials testing, food processing and small-scale devices. The scheme encourages practical innovation and local problem solving. It also helps students gain experience in applied research and potential commercialization.

31) Student Training Programme (STP)

STP places selected students on short, practical projects under faculty mentors to provide hands-on experience and bridge theory with practice. Projects cover renewable energy, biogas, water disinfection (silver), and rural transport planning among others. Training periods range from two to six months and students from across India participate. The programme supplied technical support to KSCST work while building trainee skills. In 1990–91, 82 students contributed to ongoing research and development

activities. STP strengthens student capability and institutional technical capacity.

32) Product Development Programme

This programme supports student projects that show commercial potential, helping move prototypes toward market readiness. College centres (SJCE, RVCE, MCE, SDM, etc.) developed items like cordless microphones, oil dispensers, solar audio caps, de-shellers and pulverizers. Collaboration with industry (for example trial orders from Indian Oil) demonstrated pathways to commercialization. The initiative promotes entrepreneurship, prototype refinement, and industry–academia linkage. Student teams gain exposure to product design, testing and small-scale manufacture. The programme helps translate student innovation into usable products.

33) CREDA — Cell for Renewable Energy Dissemination Activities (overview)

CREDA under KSCST promotes renewable technologies by combining R&D, dissemination, monitoring and training across Karnataka. Technologies include solar water heaters, wood gasifiers, windmills, PV cold storage and biomass gasifiers tailored to local needs. The cell emphasizes capacity building of technicians and regular monitoring to ensure systems remain functional. Reported impacts include over a thousand domestic SWH installations and hundreds of gasifiers with trained personnel statewide. CREDA links technical backup with stakeholder collaboration for rural renewable adoption. Its localized solutions and training improve sustainability and uptake.

34) Solar Powered Cold Storage Project at Mangalore

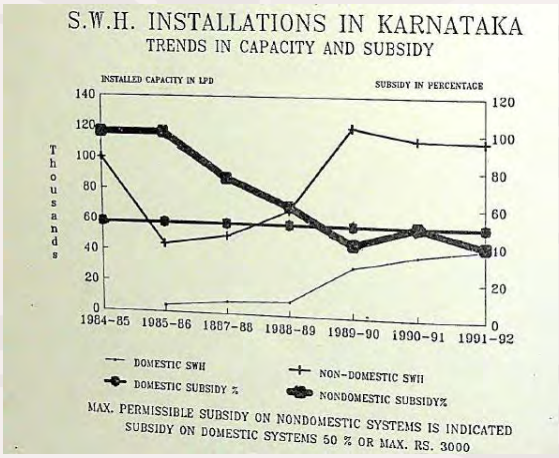
A solar PV-driven vapor-compression refrigeration system was designed to provide −20°C fish storage for KFDC, led by IISc faculty and KSCST. The system was fabricated, instrumented and commissioned for trial runs with plans for 2–3 months of monitoring before handover. Vapor-compression was chosen for higher efficiency versus absorption units to enable inland marketing of fish. Initial trials revealed component failures that required rectification before full monitoring. Once repaired and monitored, the system aimed to demonstrate replicable solar refrigeration for fisheries. Expected benefits included energy savings, improved fish preservation and expanded market reach.

35) Solar Radiation Monitoring Centres

KSCST and MNES set up pyranometer-equipped stations to record direct and diffuse solar radiation and fill data gaps across Karnataka. Site selection prioritized locations without existing stations within 100 km, and dual pyranometers plus data loggers ensured continuous, reliable records. Two initial stations at Davanagere and Halebeedu were commissioned to provide seasonal and diurnal insolation data. The collected data supports accurate sizing and feasibility studies for PV and solar thermal projects. Reliable local solar data aids policymakers, researchers and system designers. The monitoring centres underpin informed renewable energy planning.

36) Solar Thermal Extension Programme (STEP)

STEP, launched by MNES in 1984 and implemented by KSCST, subsidizes and promotes solar thermal devices such as SWHs, cookers and timber kilns. The programme combined financial subsidies, technical assistance, training and scheduled monitoring to ensure system operability. By the early 1990s hundreds of domestic and non-domestic SWH installations were recorded with high reported operational rates. Training created a support base of technicians and KSCST provided quality control and feasibility services. STEP reduced reliance on conventional energy and cut emissions while expanding district-level adoption. The programme demonstrated scalable solar thermal dissemination.



37) Wind Energy Programmes of Karnataka

A statewide wind mapping and monitoring effort deployed stations and advanced loggers to prepare a Wind Atlas and identify high-potential zones. Long-term measurements and data analysis located strong wind sites (e.g., Jogimatti and Challakere), informing project planning. Demonstrations included small wind generators and deep-well windmills for pumping and off-grid power. Jogimatti's high wind speeds prompted feasibility work for larger generation projects. The programme combined resource assessment, demonstration installations and capacity building for rural applications. It laid groundwork for expanding wind energy use in the state.

38) Strategies for Effective Dissemination of Gasifiers and Stirling Engines

A DNES-commissioned KSCST study evaluated why gasifier and Stirling engine programmes underperformed and proposed corrective measures. Surveys of nodal agencies, manufacturers and users revealed low operational rates, poor maintenance, and broken systems. Only a small fraction of installed units remained in productive use, while many were idle or irreparable. Recommendations emphasized improved maintenance regimes, user training, manufacturing quality control and better programme coordination. The study aimed to reorient implementation for higher reliability and user acceptance. Its goal was to strengthen dissemination and long-term functionality.

39) Biomass Gasifier Programme and Monitoring Report

The biomass gasifier programme installed 332 systems across Karnataka, mainly for water pumping, and monitored performance to assess diesel replacement. Monitoring showed mixed results: a portion of systems were in good use but many suffered breakdowns or reverted to diesel. Where functioning, average diesel replacement was about 51%, indicating substantial fuel savings. System types included 5 hp and 10 hp pump sets and small electrical generators up to 20 kVA.

The programme highlighted both the technology's potential and the need for maintenance, training and local service support. Continued monitoring and capacity building were recommended to improve outcomes.

40) Integrated Rural Energy Planning (IREP) — Technical Backup Unit

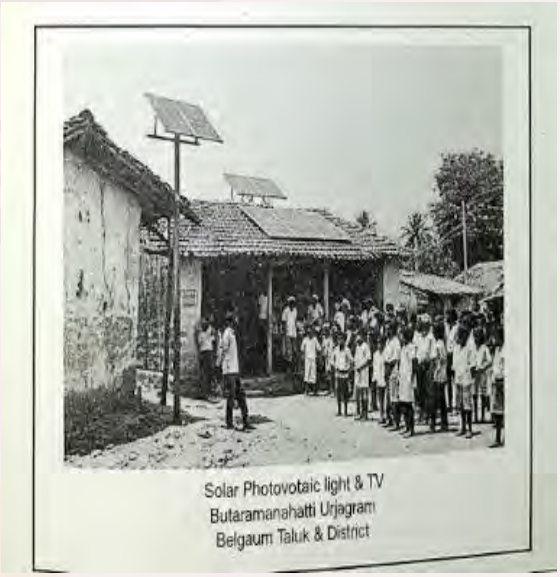
IREP promotes integrated local energy planning and KSCST's Technical Backup Unit provided technical support for ten designated IREP blocks. Activities included energy surveys, demonstration installations (windmills, SWHs, SPV lights, gasifiers) and computerization of data for village planning. The TBU organized training (e.g., biogas) and published the KIRANA newsletter to disseminate energy information. Demonstrations and surveys produced localized energy plans, built capacity and supplied technical backup for rural adoption. The unit's work aimed to mainstream decentralized renewables through planning, training and monitoring. IREP fostered community-focused, resource-based energy solutions.

41) URJAGRAM (Energy Villages) Project report

Urjagram sought to create energy self-reliant villages by integrating decentralized renewable systems under MNES funding and KSCST coordination. Detailed surveys in many villages informed selection, and six villages received integrated systems combining PV, wind, cookers, gasifiers and improved stoves. Operational success varied by local ownership and availability of funds for the non-subsidy portion; some villages advanced to second phases while others stalled. The project highlighted the importance of community management, upkeep and financing for sustained benefits. Demonstrations offered lessons on appropriate technology mixes for village needs. The initiative advanced replicable models for village energy planning.

42) Building Technology Dissemination Programme

Launched in 1989 to promote alternative building technologies, the programme combined training, demonstrations and market development to accelerate adoption. Training covered new mud blocks, stabilised construction and related techniques with hands-on fieldwork for 66 trainees. Awareness events and household surveys gauged acceptance and generated user feedback. Collaboration with contractor associations aimed to build market pull and entrepreneurial support for alternative construction methods. The programme focused on practical skills, demonstrations and stakeholder engagement to increase uptake. It sought to mainstream cost-effective, locally appropriate building technologies.



43) Technical Back-up Unit (TBU) for National Programme on Improved Chulhas (NPIC)

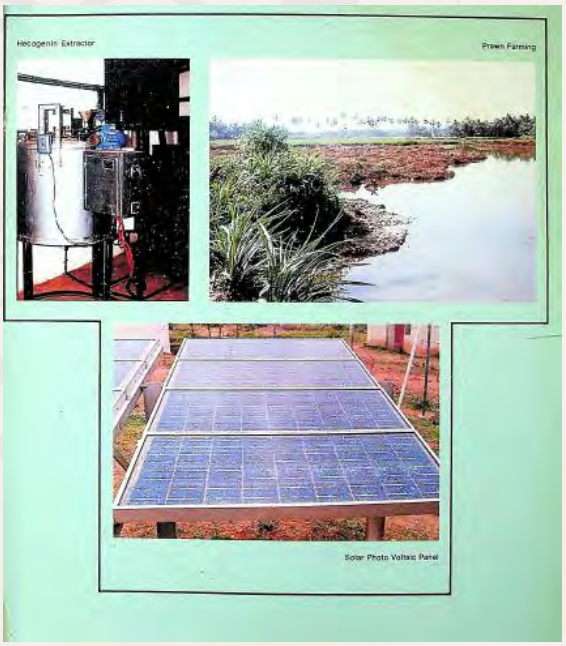
KSCST's TBU supported the National Programme on Improved Chulhas through R&D, field testing, training and evaluation of stove models. Innovations included high-power portable stoves, biomass driers and prefabricated ASTRA stove variants with improved efficiencies. Training programmes for masons and field workers sought to improve construction quality and user adoption. Stove promotion efforts (e.g., SWOSTHEE) distributed thousands of units but evaluations showed many ASTRA stoves fell out of use. Only a minority of surveyed units remained in service, revealing adoption challenges. The TBU combined technical development with capacity building and monitoring to improve dissemination outcomes.

44) District Committees for Science & Technology (DCST)

DCSTs decentralize KSCST's work to address district-level problems through demonstrations, training and collaborative projects with local stakeholders. Initial committees in Dharwad, Dakshina Kannada, Mandya and Belgaum initiated rural energy surveys, technology demonstration centres and local interventions. Dharwad DCST ran a large volunteer survey and created an Annigeri demo centre showcasing low-cost housing, gasifiers, solar devices and smoke-free stoves. A key project developed an ion-exchange defluoridation unit (250–300 L/hr) to reduce fluoride below 1 mg/L for affected villages. DCSTs aim to localize solutions, train personnel and fund voluntary agencies for science popularization. They strengthen grassroots application of technology and problem solving.

45) Rural School Science Centres

The initiative establishes rural science centres to promote experiential learning and improve science education quality in village schools. By the report, 26 centres across 18 districts were created with kits, AV equipment and testing tools, supported by NCSM and VITM training. Each centre receives a Rs.20,000 kit and an annual Rs.5,000 recurring grant, and a trained "leader teacher" is appointed. Centres run demonstrations, exhibitions and hands-on experiments linked to the school syllabus to spark curiosity. The programme expands access to practical science resources and continuous teacher support. It aims to build local capacity and sustain science education in rural areas.



KSCST Projects (1992-1993)

1) Demonstration of a Micro-hydroelectric Unit in an Irrigation Canal

KSCST with IISc designed a 40 kW axial-flow tubular turbine specifically for an ultra-low head of 2.5 m using 2 m^3/s flow. A suitable site near Keregodu on the Visvesvaraya branch canal (≥2 cusecs for >300 days/year) was selected. All turbine hardware — runner, guide vane and casings — were cast in ST-316 and machined at NAL, and auxiliaries (alternator, gearbox, bearings, couplings) have been procured. Civil works for the powerhouse and canal regrading downstream of the tailrace are complete and components have been moved to site. KEB provided a powerline to support erection and to export generated power to the grid via an induction generator. The project demonstrates the technical feasibility of micro-hydro power recovery from low-head canal drops.

2) Design and Demonstration of Rural Energy Centres

The Pura REC began with two biogas plants (22 m^3/day) and a 5 kVA dual-fuel genset that powered pumps, taps and lighting for households and community taps. Households contributed cattle dung and paid nominal transport fees, while lighting users donated Rs.5/month; the model emphasized local contribution and benefit sharing. The REC concept was chosen for replication in four villages (Suggenahalli, Ungra, Kagganahalli, Kodavathi) to integrate energy services and train local youth. Suggenahalli REC is operational with two 30 m^3/day digesters, an 8 hp genset, three public and 75 private taps, and routine performance metrics recorded. Ungra's civil works are nearing completion and Kagganahalli is developing people's forestry to supply future gasifier fuel. Village Grama Vikas Sabhas manage day-to-day operations and finances to ensure local ownership and sustainability.

3) 10 kW Solar Thermal Power Plant

KSCST proposed coupling an Organic Rankine Cycle (ORC) to the existing KSIC Mysore parabolic trough collector array (192 m^2) to convert pressurised hot water into about 10 kW electricity. The ORC design uses R-113 as working fluid and a single-stage partial-admission axial impulse turbine (6000 rpm) coupled to a standard alternator, with five TEMA/IBR-spec heat exchangers drawn for fabrication. Preliminary nozzle and rotor designs are complete and skid-mounted testing at NAL's ORC lab was planned using a thermic fluid heater and spray-pond cooling for condenser water. The silk-factory SSGS that supplies the thermal input is currently idle due to process changes, so project viability requires redefining end-use or integrating SSGS and ORC operation. Negotiations with collaborators and fabricators are ongoing to revive the SSGS and proceed to fabrication and testing. The scheme aims to demonstrate small-scale solar-thermal-to-electric conversion for meaningful end uses.

4) Development of Powdery Biomass Gasifiers (POBIG)

POBIG was started to create gasifiers that accept abundant powdery biomass (rice husk, sawdust) after earlier systems were limited to specific fuel forms. Initial trials revealed feed-system dust accumulation and high outlet gas temperatures; replacing the screw conveyor with a pneumatic conveyor smoothed fuel flow, improved

safety and reduced system cost significantly. An electronic fuel-consumption balance was added to monitor fuel rates precisely, and the filter was redesigned with double the sand-bed area to ease cleaning and reduce tar/dust problems. Current trial runs show negligible pressure drop and acceptable tar/particulate levels (TTP <450 ppm), though the cooling-cleaning train still needs improvement for lower exit temperatures. Work is underway on ceramic liners to prevent corrosion and long-duration runs to validate reliability. POBIG aims to deliver a cost-effective, robust powder-biomass gasifier suitable for field deployment.

5) Solar Pond at BVB Engineering College in Hubli

BVB Engineering College constructed a saline-gradient solar pond (16×16 m base, 2.5 m depth) with an adjacent evaporation pond to supply hostel hot water and reduce firewood use. Roughly 100 tonnes of salt established the gradient and produced a storage zone reaching 60°C, enabling heat extraction that delivered 51°C outlet from submerged copper-coil exchangers with 70% effectiveness. Over March–June 1992 more than 1000 MJ were extracted, demonstrating the pond's heating potential. The monsoon season eroded the gradient zone, requiring repeated salt additions and level management in 1993 to re-establish stratification. Geological checks found no leakage, but maintaining gradient stability during heavy rain and wind remains the main operational challenge. The pond proved feasible as a hot-water source but highlighted the need for seasonal mitigation strategies.

6) Solar Photovoltaic Water Pumping System with UV Purification

A field test at Sree Ramana Maharshi Academy for the Blind combined PV pumping and UV disinfection to deliver potable borewell water while retaining essential minerals. Six 35 W PV modules drive a DC motor and reciprocating pump, backed by a 36 V, 40 Ah battery that allows about two hours of operation without sun. Pumped water is prefiltered then passed as a thin film over a quartz-encased UV tube; limited tests showed nil coliforms including E. coli, demonstrating effective disinfection. Performance logs in 1992 show daily discharges from roughly 1,260 to 4,380 L/day depending on season, with stable panel and battery voltages. A student study is underway to analyse panel, battery and motor-pump performance and quantify system losses, with pump head ≈50 ft. The project demonstrates an integrated off-grid PV pumping plus UV purification approach for rural potable water supply.

7) 100 kW Gasifier-Based Power Plant at Navodaya Vidyalaya near Tumkur

IISc-developed 100 kW gasifier technology was selected for field trials at Navodaya Vidyalaya to supply campus loads and validate techno-economic performance and reactor longevity. An ASTRA-style building with split floors for fuel handling, ceramic-shelled reactor, insulation and cooling/filtration systems was constructed, and a 107 kW MWM diesel genset plus 125 kVA alternator were procured and commissioned. Integration with campus distribution required approvals and an automated relay to merge the new meter with existing KEB infrastructure. Fabricated

gasifier components are ready for installation while control systems for dual-fuel operation undergo laboratory testing prior to commissioning. Optimization goals include extending reactor life, substituting diesel with local oils where possible, and using waste heat for hot water/steam. The plant aims to demonstrate reliable, institution-scale gasifier operation and practical co-benefits.

8) Rural Energy Centre based on an Energy Forest Wood Gasifier at Hosahalli

ASTRA's Hosahalli REC uses a 2-hectare community energy forest to supply wood fuel to a dual-fuel wood-gasifier genset, producing electricity for households, street lighting and a borewell pump. The system operates roughly on 65% wood gas and 35% diesel and includes a flour mill that grinds 80 kg/day to generate modest income. A ceramic reactor replacement improved reactor life and the centre is managed by a village committee assisted by trained local operators who handle forest protection, collections and accounts. Monthly accounts show an operating deficit that the team hopes to eliminate by adding irrigation and other revenue-generating services. The project demonstrates integrated community fuel production, local management and diversification of services as pathways to REC sustainability. Long-term monitoring and economic adjustments are being pursued to achieve viability.

9) Field Trials of a 20 kW Biomass Gasifier

A 20 kW biomass gasifier genset, coupled to a 33 hp Ruston-Hornsby-Kirloskar unit, was installed at Ungra to power irrigation using mulberry prunings and other agricultural byproducts. Phase I completed installation, 1.2 km of water distribution piping, civil works, community management arrangements and fuel seed stocks, and logged about 3,000 hours of preliminary operation. Design modifications included adopting a ceramic shell and reinforcing the combustion-zone jacket to improve durability under field conditions. Irrigation presently covers about 10–12 acres with phased expansion planned as farmer demand rises and water scheduling is optimized. The village committee oversees operations, and backup arrangements were made to improve reliability during trials. The field trial aims to validate technical, managerial and ecological sustainability for biomass-powered irrigation.

10) Stirling Engines

Five Hamara ST-5 Stirling engines were procured for evaluation with powdered-biomass combustion and wood-gas feeds to explore decentralized renewable power options. With the original combustor the engines produced only 0.8–1.2 kW instead of the expected 3.75 kW due to poor built-in compression, insufficient heater heat transfer and working-fluid leakage past piston rings. A redesigned 60 kW powdered-biomass combustor shortened start-up to 10 minutes, produced smokeless combustion and increased output to 2.5 kW, yielding an overall system efficiency near 3%. The study recommends redesigning piston rings, improving the built-in compressor (non-return valve), and investigating regenerator improvements to boost pressure, heat transfer and efficiency. Current installation costs are high (Rs.30,000–35,000 per kW), so further cost and reliability optimization is required. The Stirling route remains promising for

biomass waste-heat utilization pending engineering improvements.

11) Stirling Engines Pulp and Paper from Horticultural Wastes through Organosolv Delignification Process.

KSCST investigated organosolv pulping using aqueous ethanol, ethylene diamine and anthraquinone to produce eco-friendly pulp from horticultural wastes. Arecanut husk gave weak sheets unless blended with hardwood, while agave sisalana produced strong pulp with about 95% solvent recovery. UV/IR spectroscopy showed the ethanol-lignin from wastes resembles hardwood lignin, and sugarcane leaves proved unsuitable for pulping. The team is also studying recovery of amorphous silica from black liquors and possible uses of arecanut residues for boards and plastics. Future work includes techno-economic feasibility studies, lignin valorisation for biodegradable plastics, silica-recovery experiments and trials on other agro-wastes. The project aims to develop a viable, environmentally preferable pulping route using local residues.

12) Development & Field Testing of the Direct Cottage Silk Reeling Machine (DCSRM)

BIET developed a DCSRM prototype that blends advantages of the traditional charkha and cottage basin to improve rural silk reeling quality and productivity. IISc, KSCST and BIET engaged stakeholders and reeling workers and modified the prototype for field readiness. Field trials and user-feedback sessions were scheduled for July 1993 to assess adoptability, training needs and performance under real conditions. Parallel development included a sow-box sizing machine and sectional warping design to strengthen pre-loom operations. Pedal and semi-automatic loom trials highlighted accessory gaps which the sow-box aims to fill. The programme targets practical, worker-friendly improvements to raise cottage silk production standards.

13) Transfer of Technology for Development [Technologic Overdracht Ontwikkelings Landen (TOOL)]

KSCST partnered with the Dutch NGO TOOL to identify technology-transfer priorities for Karnataka's tiny-sector industries. A rapid seven-day exercise surveyed district needs, product innovation opportunities, standardization/quality issues, raw material constraints, renewable energy and the role of women and training. A detailed report was prepared proposing district committees, capacity building and targeted dissemination through KSCST networks. The collaboration aims to diffuse simple, locally adapted technologies to create employment and strengthen small enterprises. Planned actions include training programs, technology assessment support and mechanisms for sustained TOOL–KSCST cooperation. The initiative seeks practical pathways to scale appropriate technologies into rural and small-scale industry.

14) Innovation in Electronics

KSCST launched an electronics innovation initiative led by Prof. D.K. Subramanian to create an Information Centre and award practical innovations. A feasibility study recommended focusing initially on medical electronic components and standards, and hospitals were contacted to contribute data. Major stakeholders (BEL, NAL, C-DAC, KEONICS, IISc and others) were engaged to shape the Centre's scope and services. An

awards campaign attracted 50 project proposals which an expert committee evaluated. Up to three awards of Rs.10,000 each will be given to socially relevant, practical electronic innovations. The programme aims to document standards and incentivize useful electronics solutions for healthcare and other sectors.

15) Online MIS for S&T Database

KSCST proposed an online Management Information System to centralize project, personnel and technology data and reduce duplication across agencies. The development plan covers data collection, conceptual and detailed design, codification, testing and reporting using Integra-SQL on AT-386 class hardware. The system is intended to avoid redundancy, enforce standards, apply access controls and provide centralized data management. Core modules include Data Entry, Query and System Administration, plus a reporting facility for stakeholders. The MIS will make S&T information searchable and usable for planning, monitoring and technology dissemination. The platform is meant to improve coordination and decision-making across state S&T activities.

16) Screening Pigeonpea Genotypes for Disease Resistance through Cell and Tissue Culture Technique

Gulbarga University used in vitro callus screening against Fusarium culture filtrate to rapidly identify pigeonpea lines with wilt tolerance. Five genotypes were compared for callus fresh/dry weight and responses to increasing FCF concentrations to rank tolerance. Biochemical assays showed tolerant lines accumulated proline and maintained higher peroxidase activity under FCF stress, suggesting biochemical bases for resistance. Local Gulal and ICPL-87 were relatively susceptible while Sujata-1-2 and others showed better tolerance and callus growth. Next steps are selecting resistant cell lines, characterizing them and regenerating plantlets for field evaluation. The method accelerates resistance screening versus conventional breeding approaches.

17) Enumeration of Native Rhizobium Strains for Red Gram.

Researchers isolated 28 native Rhizobium strains from Gulbarga red-gram soils to identify effective, locally adapted inoculants. The isolates were characterized morphologically, physiochemically and tested for sugar utilization and antibiotic response. Greenhouse screening measured nodulation, nodule weight, shoot/root biomass and total plant nitrogen to assess strain efficacy. The best strains will be advanced to field trials beginning July 1993 to validate on-farm performance. Plans include scaling up production strategies for the most effective indigenous strains as bio-inoculants. The project aims to boost red-gram yields sustainably using locally suited microbial inputs.

18) Prawn Culture Technology

A 0.33 ha trial stocked Penaeus monodon at 6/m² on 26 January 1993 and ran a 115-day culture using nursery and grow-out management protocols. Nursery preparation included pond clearing, predator eradication, fertilization and acclimatisation of 20,000 hatchery seeds; supplementary feeds sustained growth. Harvest (May 20, 1993) yielded 8,297 tiger prawns (287 kg) with 41.5% survival and mean weight 13 g; non-penaeid prawns and salinity/temperature swings limited

performance. Wastage causes included moulding, crab attacks and harvesting faults; post-harvest grading and iced packing were used for marketing. Conclusions called for improved feeding regimes, water exchange, seed uniformity, bund/sluice maintenance and better monitoring; plans were made for an improved demonstration (Oct 1993–Feb 1994) and farmer training. The trial highlighted management gaps and informed changes for more reliable semi-intensive production.

19) Immunological Memory in Indian Major Carps

The project evaluated an Aeromonas hydrophila vaccine in Labeo rohita to study protective immunity and the thymus's role in generating memory. Partially thymectomised fingerlings immunized by immersion showed lower antibody titres (128) and 70% survival after challenge versus non-thymectomised controls (titre 512, 100% survival), implicating T-like lymphocytes. Field pond vaccinations produced delayed primary responses but boosters at 30–90 days elicited strong secondary titres (up to 32), demonstrating memory persistence for at least 90 days. Antibiotic pretreatment (perfuran dip) markedly suppressed antibody responses, indicating prophylactic antibiotics can impair vaccine efficacy. The findings inform booster timing and caution on antibiotic use in vaccination programs for carp. The work supports practical vaccination strategies to reduce Aeromonas-related losses.

20) Semi perennial Plant Species (Pigeon pea and Castor) as an Alternative for Drought-Prone rain fed Areas of Karnataka

Trials tested perennial pigeonpea (V-1, V-2) and planned castor work to exploit deep soil moisture (1–3 m) and provide grain, fodder and fuel under alfisol rainfed conditions. Pruning substantially increased second-year seed and fodder yields (pruned V-2: 1061 kg/ha seed, 2273 kg/ha fodder) compared with unpruned plots. However, pruning raised disease incidence (sterility mosaic virus, powdery mildew) and caused about 20–25% mortality in pruned plants. Flowering showed two peaks (November and July) and soil moisture dynamics were monitored using a neutron probe. Future experiments will test multiple genotypes, pruning levels and disease-resistance screening to identify resilient, high-yielding perennial options. The research seeks sustainable perennial cropping systems suited to drought-prone rainfed landscapes.

21) Large Scale Multiplication of Disease-Free Plants of Commercially Important Varieties through Tissue Culture

Dr. K. Nataraja's team is developing in vitro protocols for anthurium, banana, jack, sapota, mango, tamarind and roses. Anthurium explants formed callus that produced pro-embryoids, which are being induced into plantlets. Banana explants were virus-affected, so sterilization and culture survival methods are being refined. Sapota and jack produced shoots on BAP media, while mango tissues browned due to polyphenol leaching. Antioxidant

preculture treatments are being tested to improve mango culture survival. The aim is to provide reliable tissue culture protocols for large-scale, disease-free propagation.

22) Solid waste management project - Jayanagar, Bangalore

A pilot project by Mythri, KSCST and BCC converted segregated household waste into vermicompost. Operations expanded from 75 to about 400 households and produced 1.5 tonnes of compost monthly. Revenue covered wages, supported waste pickers and improved community awareness. Constraints included small operational scale, incomplete segregation, waste picker turnover and site security. Despite problems, the project proved decentralized composting near source is feasible. Wider cooperation and scaling are needed for city-level impact.

23) Solid waste management in Panaji

KSCST's UNDP-supported study estimated Panaji's waste at 24 tonnes daily. Household and restaurant sources contributed about 70% of waste. Organic matter formed 60–70%, followed by paper, ash, glass, plastics and metals. Moisture ranged 65–75% and calorific value was around 3600 cal/g. Chemical analysis established baselines of C, N, P, K and salts. Findings support composting as the main treatment strategy for Panaji.

24) Reclaimability of wastelands

Dr. H.N. Chanakya found wastelands of the Deccan plateau suffer nutrient loss and poor synchrony between nitrogen release and rainfall. High nitrogen mineralisation occurs in dry months but is lost during early rains. Direct tree planting fails because grasses and annuals absorb nutrients first. A phased reclamation is proposed starting with hardy grasses. Later phases add legumes, soil-water conservation and finally trees. This sequencing restores fertility and makes reclamation sustainable.

25) Effect of Cement Dust on Rhizosphere, Phyllosphere and Water Body Microbial Flora

Studies in Gulbarga showed high dust near crushing, packing and loading sites. Air sampling confirmed the ACC Wadi plant had the highest particulate levels. Roof-top aquaria showed slight pH increases and reduced bacterial counts. In-vitro tests indicated rhizobium and azotobacter growth declined under dust exposure. Pot experiments showed negative impacts on crop leaves. Seasonal studies are planned to assess long-term ecological effects.

26) Artificial fracturing and recharge in hard-rock aquifers

IISc tested blasting with ANFO charges and managed recharge tanks at Ungra village. Well-2 yield doubled from 1200 to 2400 L/hr after fracturing. Recharge tanks filtered and chlorinated runoff before channeling it underground. Continuous pumping showed aquifer intake of 1800 gallons per hour. Observation wells and packer tests confirmed improved transmissivity. Further experiments and data analysis are planned before wider application.

27) Development of a potable water device for rural users

ASTRA designed low-cost packed columns of silvered copper wire for disinfection. About 35 runs showed silver at 200 ppb reduced coliforms to safe levels. Purification required 3–5 minutes contact and 40–60 minutes post-residence time. Operating costs were low at about 0.12–0.14 per litre. Prototypes are being optimized for continuous flow and rugged rural use. Next steps include packaging, long-term testing and economic studies. ASTRA designed low-cost packed columns of silvered copper wire for disinfection. About 35 runs showed silver at 200 ppb reduced coliforms to safe levels. Purification required 3–5 minutes contact and 40–60 minutes post-residence time. Operating costs were low at about 0.12–0.14 per litre. Prototypes are being optimized for continuous flow and rugged rural use. Next steps include packaging, long-term testing and economic studies.

28) Demonstration of nutritional health programme

KSCST and VGKK started nutrition centres in tribal hamlets to combat malnutrition. Two centres served children under five with locally designed menus. Weight gains met ICMR standards within six months of intervention. Vitamin-A deficiencies also improved significantly in enrolled children. Challenges included staffing issues and remoteness of forest locations. The programme showed measurable health benefits and recommends scaling up.

29) Defluoridation of drinking water

REC Hulkoti tested ion-exchange and activated alumina for removing fluoride. A scaled model of 250–300 L/hr was built using ion-exchange resins. However, resin scarcity, regeneration complexity and cost made it impractical. Activated alumina gave good performance in static and dynamic trials. A design was prepared for a population of 5000 people. More economic and health studies are needed before scaling.

30) Cerebral Seizure Duration during Electroconvulsive Therapy (ECT)

NIMHANS–IISc analysed EEGs from 12 patients undergoing ECT. All patients showed seizures lasting over 30 seconds. Bilateral ECT produced balanced hemispheric spectral power. Unilateral ECT showed reduced power on the unstimulated side. An AR filter sharpened spike detection for automated duration estimation. Results support DSP methods for reliable seizure monitoring in therapy.

31) Student Projects Programme (SPP)

The Student Projects Programme was launched in 1977-78 to support innovative student projects in Karnataka. It covers engineering, agriculture, medicine, fisheries, and science. Over 16 years, 2,489 projects were completed with grants of Rs. 2,500–3,000. Annual seminars and exhibitions showcase projects with prizes and certificates. In 1991-92, 164 projects from 31 colleges were funded with Rs. 5.84 lakhs. By 1992-93, 199 projects from 31 colleges and 2 polytechnics were supported with Rs. 6.62 lakhs.

32) Student Training Programme

The Student Training Programme began in 1978 to give students practical experience. Training lasts two to six months in real-world projects. Ninety-six students have

participated so far across disciplines. In 1992-93, six BITS Pilani students completed training and others followed. Projects included solar stills, CAD tools, MIS design, and renewable energy studies. Students also worked on handmade paper, air quality, and anaerobic fermentation.

33) Product Development Programme (PDP)

The Product Development Programme funds student projects ready for commercialization. It emerged from the Student Projects Programme in 1977-78. Bapuji Institute, Davangere, advanced three machines including a laminator and vacuum pump. KLE Belgaum developed a leather splitting machine with prototypes. An audiometer from SDM Dharwad is being considered for entrepreneurship. Colleges are encouraged to continue work on promising products.

34) Cell for Renewable Energy Dissemination Activities (CREDA)

CREDA was created in KSCST to focus on renewable energy promotion. It works with MNES and the state government as a nodal agency. Projects include solar ponds, biomass stoves, and solar water heating systems. It also undertakes wind mapping, wood gasifier promotion, and energy surveys. Wind monitoring identified Jogimatti and Chitradurga as potential wind farm sites. CREDA conducts training, workshops, and prepares project reports for agencies.

35) Solar Radiation Monitoring Centres

KSCST promotes renewable energy devices like solar water heaters since 1985. To collect reliable data, solar monitoring centres are being set up. These measure direct and diffused solar radiation using pyranometers. Sites are at Davanagere, Halebeedu, and Belgaum. The Hassan station is operational with trial readings. Equipment for other sites is under procurement and installation.

36) Solar Thermal Extension Programme (STEP)

STEP was launched in 1984 to promote solar thermal devices. The most successful device is the solar water heater. By 1992-93, Karnataka had 1,988 systems with 9,15,100 LPD capacity. Non-domestic systems are monitored regularly to ensure efficiency. KSCST provides technical support, evaluation, and training. About 80 trained personnel now support the program across Karnataka.

37) Solar Water Heater Demonstration

Since 1985, KSCST has promoted solar water heaters in Karnataka. Adoption was slow due to lack of awareness. A mobile demonstration unit was launched in 1992. It showed a working heater and distributed 4 lakh leaflets. The program covered 117 taluk headquarters by March 1993. Each event attracted about 3,000 visitors and boosted installations.

38) Wind Energy Programme of Karnataka

CREDA runs Karnataka's Wind Energy Programme with MNES. It includes wind mapping, monitoring, and utilization projects. Nine wind monitoring stations provided key data since 1989. Windmills were installed in several districts with subsidies. Two 2kW wind generators were commissioned at Chitradurga and B.R. Hills.

Small wind generators also powered lights and TVs in villages.

39) Biomass Gasifier Programme

KSCST introduced biomass gasifiers in 1986 for irrigation and energy. Producer gas replaces diesel in pumps and engines. By 1993, 450 systems were installed across Karnataka. Most were 5 HP and 10 HP pumps. KSCST monitors systems quarterly with local trained personnel. Beneficiaries receive training in operation and maintenance with manufacturer support.

40) Integrated Rural Energy Planning (IREP) State Technical Backup Unit (TBU)

IREP supports decentralized energy planning in rural Karnataka. KSCST set up the Technical Backup Unit in 1990. It works in 10 blocks, conducting surveys and evaluations. Energy demand and resource availability were studied for 1993–97. Training covered chulhas, windmills, SPV systems, and water heaters. A Regional Centre near Jakkur is planned for technical support.

41) Urjagram

Urjagram is an “energy village” concept funded by MNES. It integrates renewable energy for small rural communities. Villages are selected, surveyed, and databases are prepared. Implementation happens in three phases: awareness, training, and installation. Surveys were completed in Mysore, Dharwad, and 39 other villages. By 1993, three Urjagrams were set up at Bollapura, Heggevadi, and Bhutaramanahatti.

42) Building Technology Dissemination Programme

Launched in 1989, this program promotes alternative building methods. It trains young engineers, architects, and masons. Training covers stabilized mud blocks, roofing, plastering, and waterproofing. Five training batches with 91 participants were completed in 1992-93. A survey of 198 households using these technologies was conducted. Feedback highlighted the need for credit support and infrastructure.

43) Natural Resources Data Management System (NRDMS)

NRDMS was launched in Karnataka in 1992 with DST support. It aims to improve natural resource management through data centres. Five district centres are active in Mysore, Mangalore, Dharwad, Bijapur, and Gulbarga. Activities include resource mapping, atlas preparation, and groundwater studies. Special projects include runoff estimation and pollution monitoring. A state centre provides training, technical support, and model testing.

44) Technical Backup Unit for National Programme on Improved Chulahs (NPIC)

The NPIC promotes improved fuel-efficient chulhas across India. KSCST set up a Technical Backup Unit for R&D, testing, and training. New stoves like rice husk and powdery biomass models were developed. Large cooking stoves and boilers were also designed. About 2,600 Swosthee portable stoves were distributed with subsidies. Training camps, stove inspections, and publicity materials supported adoption.

45) District Committees for Science & Technology (DCST)

DCSTs in Karnataka promote local science and technology projects. Dharwad DCST focused on resource mapping and environment awareness. Dakshina Kannada DCST studied groundwater, sea erosion, and farming methods. Gulbarga DCST organized workshops and popularization lectures. Mysore DCST worked on biogas, tissue culture, and water solutions. All DCSTs engage schools, communities, and agencies for S&T development.

46) Information Dissemination

KSCST collects and shares knowledge on science and technology. It publishes three newsletters: SNAPSHOT, STAK, and Kirana. Films and fillers on renewable energy and water were shown on Doordarshan. Seminars covered young scientists, biomass gasification, and energy-efficient buildings. Workshops on IREP, NPIC, and ecology were also conducted. These efforts spread technology awareness statewide.

47) Workshop On R&D Programme on Ecology & Environment of Karnataka

A two-day workshop was held in March 1993 at IISc. It identified research gaps in ecology and environment. Keynote speakers stressed local participation and integrated approaches. The program outlined research areas in agriculture, climate, water, forestry, and energy. It also included habitat, pollution, GIS, and environmental education. The action plan guides future projects in Karnataka.

KSCST Projects (1993-1994)

1) Rapid purification of plant amylase by immobilised biocatalysts

The project developed a method to purify plant amylases using immobilized affinity adsorbents. Maltosylamine was synthesized by reducing maltose and converted to a stable N-acyl derivative for use as the affinity ligand. The N-acyl maltosylamine was coupled to activated Sepharose to make the adsorbent. Tests compared inhibition of plant amylases (barley, sweet potato, sorghum, wheat) with microbial enzymes. Preliminary results show specific inhibition of plant amylases and improved purification efficiency with immobilized biocatalysts. Further work on affinity chromatography setup and scale-up was recommended.

2) Productivity of sugarcane lines obtained through tissue culture under soil conditions of Karnataka

The Botany Department produced somaclonal variants of local sugarcane cultivars by tissue culture. Field trials in south Karnataka assessed performance under saline, disease-prone, and other problem soils. Somaclones were evaluated for photosynthetic efficiency, ion uptake, sucrose synthesis and morphological traits. Laboratory analyses complemented field trials to characterize physiological and biochemical responses. Selected lines showed enhanced resistance to stress, viral disease tolerance, and improved cane yield and juice quality. The study recommended further field trials and dissemination to farmers for larger-scale adoption.

3) Evaluation and standardization of vigour tests for predicting storage potential of seed lots

Five commercial seed lots (Jaya and Mangala rice) from three processing plants were sampled and subdivided into 80 sub-lots each. Sub-lots were stored in cloth (11% moisture) and polythene (8% moisture) bags at Raichur, Bangalore (GKVK) and Dharwad under ambient conditions. Initial seed quality was measured by germination, moisture, test weight, electrical conductivity, vigour index and field emergence. Samples were withdrawn bimonthly and tested at the Department of Seed Technology to monitor changes. The study included standardization of the accelerated ageing test to predict long-term storage potential. Results aimed to identify reliable vigour tests for seed storage management.

4) Enumeration of native Rhizobium strains for red gram.

Twenty-eight Rhizobium isolates from earlier work were screened and ten confirmed true-to-type strains were selected. These ten strains were evaluated in Leonard jars for biomass yield, nitrogen content and nitrogenase activity. Three strains from Gulbarga, Chittapur and Sedam outperformed others in efficiency and nitrogenase activity. The best strains were preserved on carrier materials and prepared as 450 g inoculant packets for farmers. Packets were supplied for field trials and to the Pulse Research Station, Gulbarga for corroboration. The work supports on-farm testing and potential inoculant deployment for red gram.

5) Fly ash-based building projects

Research focused on pozollana cement mixes using Raichur fly ash with lime and plaster of Paris following FalG recommendations. Mortars showed early strength gain, with six-month strengths lower than peak but in the range of 60–70 kg/cm² for some mixes. Addition of 5–15% plaster of Paris improved 28-day and six-month strengths, with some mixes reaching up to 110 kg/cm². Fly ash blends were investigated for soil stabilization and block making, achieving cube strengths suitable for construction. Demonstrations included low-energy bricks and ferroconcrete tiles with local fabrication to reduce costs and create employment. The programme explored practical fly ash applications in building materials and stabilization.

6) Development of 100 kW biomass gasifier system

A 100 kW wood gasifier was assembled at IISc with cooling, cleaning and instrumentation to evaluate performance and pollution levels. Online gas analysis and laboratory assays measured tar, particulates, COD and BOD; external agencies verified analyses. The outlet gas had tar 20±10 mg/m³ and particulates 70±20 mg/m³, within permissible engine limits over 33–100% loads. Measured gas composition was H_2 18–20%, CH_4 1–3%, CO 11–13%, CO_2 45–50%, and N_2 <0.6%, indicating >78% efficiency. Comparison with Swiss studies showed the IISc gasifier performed favourably. The results support gasifier viability for internal combustion engine use with further operational validation.

100 kW gasifier

7) Development of powdery biomass gasifier

The project designed a reactor to gasify powdery biomass (sawdust, sugarcane trash, groundnut shells, rice husk) with a cyclone reactor and insulation to retain heat. Rice husk, being high-ash, was chosen for trials and posed handling challenges due to ash content and structure. A pneumatically controlled fuel feed system was developed for faster response and finer air-fuel control to manage tar and gas quality. A powdery biomass combustor (cyclone chamber) was also built to process low-density agricultural residues and achieve high exit temperatures (1375°C). The metallic combustor was later replaced by a ceramic unit to extend life. Further testing and tuning were needed to optimize tar/particulate levels for engine use and industrial applications.

8) Water conservation in Bidar taluka

Bidar taluka, a semi-arid area with 749.9 mm annual rainfall concentrated in the monsoon, was studied to conserve surface

runoff and augment groundwater recharge. The project collected maps, geology, topography, drainage, village-wise population and climate data to identify villages facing acute drinking water problems. Information from agriculture and forest departments on soil conservation and afforestation methods was collated. The assessment used surface water bodies, major streams and rainfall data to propose recharge measures and storage interventions. Emphasis was on directing valley runoff into underground reservoirs and check-dam/site selection. The work aimed to enhance local water security through targeted conservation planning.

9) Survey of the menace of wax moth

Field surveys (Nov–Dec 1993 and Apr–May 1994) across multiple Karnataka locations documented high wax moth infestation in Apis species, with mean infestation 79.7% (Nov–Dec) and 49.74% (Apr–May). Infestation declined during honey flow seasons when colonies were stronger, but remained severe in areas like Bhagamandala and Virajapet. Desertion and comb destruction rates were high; larval/pupal loads varied widely among species and sites. Natural enemies (Apanteles galleria, a chalcidid, and two ichneumonids) were recorded with parasitism varying by area. Stored combs and wax were often damaged, causing economic loss to beekeepers. Ongoing laboratory studies aimed to quantify damage and economic impacts and explore control measures.

10) Development of fuel-efficient driers

Large boilers and stills were used to test vegetable and fruit drier efficiency, with the highest recorded thermal efficiency ~8% in 1992–93. Heat losses from the rear flue wall were reduced by replacing the clay pipe duct with a rectangular galvanized M.S. duct to improve heat exchange. Additional vents and a 10 cm × 1 m plastic pipe were added to enhance ventilation and heat retention. Design adjustments reduced rear wall temperatures and aimed to raise overall efficiency. The work combined field testing with iterative design changes to improve performance. The project targeted affordable, locally appropriate drying technology improvements.

Fuel efficient drier

11) Development of Fuel-Efficient Driers Design and Demonstration of Biogas Rural Energy Centres

Community-scale biogas systems in Pura village replaced traditional fuel practices, supplying gas for cooking, lighting and

running an engine-generator for water and illumination. The community scheme improved hygiene and convenience and achieved strong cost recovery (94% due collection). A modified 1.1 kW SI engine-generator was tested on biogas and delivered 688 VA while consuming 0.77 l/hr of biogas, with biogas efficiency at 86% relative to original fuel. Operational issues included rpm drop, voltage and frequency fluctuation at higher loads. The study suggested biogas enrichment or CO_2 reduction as remedies and recommended economical methods to improve gas quality. The demonstration highlighted practical benefits and technical challenges for rural electrification using biogas.

12) Student Project Program

The Student Project Programme (SPP) was started in 1977–78 to promote student innovation across Karnataka through financial support for meaningful projects. Since inception, more than 2,520 projects have been supported with an average grant of about Rs. 3,000 per project. In 1992–93, a seminar-cum-exhibition was held at Kalpataru Institute of Technology, Tiptur, where 60 projects were showcased. Several were awarded “Project of the Year,” including works on induction motors, polygon turning attachments, CAD drafting and non-woven materials. The Student Training Programme also provided opportunities for practical experience, benefitting over 100 students from institutions across the country. A Product Development Programme continued, though some projects faced delays due to technical problems.

Unbalance supply voltage detector, JNNCE, Shimoga

Lime Juice Extractor, BLDEA's College, Bijapur

Mechanical type evenness tester, BIET, Davangere

13) Wind Energy Programme

The Cell for Renewable Energy Dissemination Activities (CREDA) leads KSCST’s efforts in renewable energy technology promotion. The Wind Energy Programme includes wind resource assessment using data loggers at 12 stations and applications such as installing turbines and wind pumps. Jogimatti station in Chitradurga recorded the highest wind speed in the country, highlighting Karnataka’s wind potential. Two 2-kW wind generators and five 50-kW capacity units were installed for power generation at institutions and rural centres. Wind pumps with 3-metre rotors capable of lifting water from 250–275 feet were promoted with subsidies. These efforts combine data collection, field testing, and financial incentives to encourage wind-energy adoption.

14) Solar Projects

Solar projects included a demonstration solar pond at Hubli, photovoltaic water pumping, and radiation monitoring. The solar pond at BVB College of Engineering supplied hot water to hostels but later faced deterioration due to suspected brine leakage. At Bangalore, a photovoltaic system with six 35W modules pumped 3,700 litres of water daily, supported by battery backup for cloudy periods. KSCST also set up three solar radiation monitoring stations to build a statewide solar-energy database. A solar-powered cold storage project was initiated with the Fisheries Development Corporation to store fish at -20°C in interior Karnataka. These projects aimed to demonstrate feasibility and generate data for solar technology dissemination.

15) Biomass and Other Programs

Biomass and other renewable energy initiatives were also advanced through multiple programmes. The Biomass Gasifier Programme began in 1986–87 and has led to the installation of more than 522 systems for water pumping and power. Community biogas plants of varying capacities were built at Mysore Polytechnic to serve hostels and later expanded for larger applications. The Solar Thermal Extension Programme (STEP) provided subsidies for solar cookers, heaters and other devices, achieving over 2,200 domestic installations and many institutional uses. A Technical Backup Unit supported the National Programme on Improved Chulhas, inspecting nearly 1,000 stove designs in one year. These programmes highlighted KSCST's role in monitoring, supporting and scaling renewable energy in Karnataka.

16) Sisal Technology

Sisal technology promotion was undertaken to produce rope and hecogenin from Agave vera-cruz at a demonstration unit in Tumkur district. The unit was reactivated to supply hecogenin requested by an industrial laboratory in Hyderabad. About 5–6 tonnes of sisal leaves were processed through decortication for product extraction. This yielded coffee grounds, 2 kg of hecogenin, and 50 g of hecogenin acetate. The authenticity of the materials was verified using infrared spectroscopy against standard samples. The project demonstrated successful agro-based industrial production and supply linkage with pharmaceutical industries.

17) Natural Resources Data Management System (NRDMS)

The Natural Resources Data Management System (NRDMS) was launched to provide planners with spatial and socioeconomic data at the district level. Centres were established at Mysore, Dharwad, Dakshina Kannada, Gulbarga, Bijapur and Uttara Kannada. These centres produced atlases, thematic maps and databases on resources, infrastructure, demography and environment. Completed outputs included decision support systems for water supply, road mapping, and water-harvesting surveys. Each centre also initiated district-specific studies such as diabetes occurrence, borewell mapping, and groundwater recharge. NRDMS strengthened decentralized planning through accessible digital data for decision-makers.

18) Activities of District Committees

District Committees for Science and Technology organised a wide range of outreach activities across Karnataka. Dharwad district held environmental camps, groundwater discussions and released a resource book. Mysore hosted exhibitions on pedal-operated tools, established biogas plants and set up a vermicompost unit at Mandya. Dakshina Kannada organised science workshops, quizzes and waste-management seminars with local collaboration. Gulbarga held popular lectures, seminars on technology and earthquake awareness, and distributed posters in rural areas. These committees also promoted vocational training, de-fluoridation projects, fish-kill investigations and school science centres to strengthen science education.

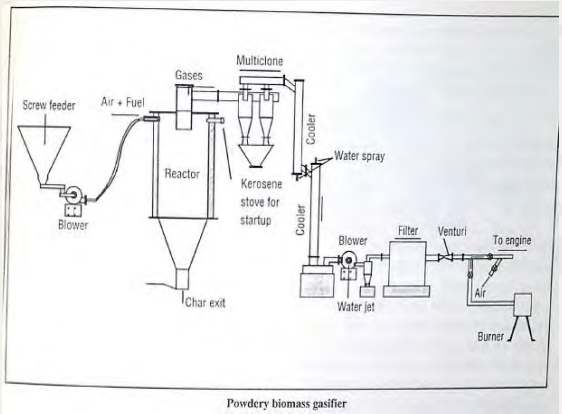
19) KSCST Cooperation Network

KSCST built a strong cooperation network at state, national and international levels to support its programmes. National partners included DST and MNES, while international collaborations involved organisations in the Netherlands on waste management projects. State-level partners included rural development agencies, electricity boards and universities across Karnataka. Nearly 40 new projects were taken up in 1993–94 across energy, agriculture, environment and fisheries. Publications during the year documented applied research on gasifiers, microhydel systems, sisal technologies and improved cookstoves. Key milestones from 1975 to 1993 chart KSCST's steady growth into a catalyst for applied science and technology dissemination.

KSCST Projects (1994-1995)

1) Development of Powdery Biomass Gasifier

This project, convened by Prof. H.S. Mukunda at IISc, focused on perfecting a biomass gasifier design capable of utilizing sawdust, sugarcane trash, groundnut shells, and rice husk. The reactor was built using a combination of ceramic and metal, with brick and ceramic linings to withstand high temperatures. Tests were conducted with various biomass fuels, and problems related to fuel feeding, air–fuel ratio, and cooling systems were gradually resolved. A screw feeder with pneumatic conveying and an agitator ensured smooth fuel flow, while a redesigned cooling system with water spray and sand bed filter enabled longer runs. Engine trials with sawdust and rice husk showed promising diesel replacement results. The project demonstrated technical feasibility and contributed to improving biomass gasifier efficiency for rural applications.



Powdery biomass gasifier

2) Productivity of Sugarcane Lines Obtained Through Tissue Culture Under Problem Soil Conditions of Karnataka

Convened by Dr. G.R. Naik, this project at Gulbarga University explored the use of tissue culture to develop sugarcane variants resilient to soil salinity and disease stress. Field trials were conducted in South Karnataka to evaluate yield, stress resistance, and juice quality of somaclonal variants. Laboratory analyses supported the findings, showing improved photosynthetic efficiency, ion uptake, and sucrose synthesis in selected lines. The somaclones exhibited higher productivity and resistance to viral diseases compared to conventional varieties. These results demonstrate the potential of tissue culture technology for sustainable sugarcane production in adverse agroclimatic conditions. The project offers a practical solution to declining sugarcane yields and highlights the scope for large-scale adoption of improved lines.

3) Evaluation and standardization of Vigour tests for predicting the storage potential of seed lots in some field corps economically feasible biomass energy for water system and electrification and sustainable development of villages

This project, convened by Dr. N.H. Ravindranath at IISc, demonstrated the feasibility of using biomass energy systems for rural electrification and water supply. A 20-kW wood gasifier was installed at Hosahalli, Kunigal taluk, to provide power for domestic lighting, flour milling, and water pumping. The system operated efficiently with locally sourced wood from energy forests, consuming about 35 kg daily. Borewells were drilled to support irrigation, and submersible pumps are being planned for integration with the

system. Local youth were trained to manage operations, ensuring sustainability and community participation. The project proved that decentralized biomass energy can effectively meet multiple rural energy needs while promoting self-reliance and sustainable development.

4) Micro-Hydel Demonstration Unit in Irrigation Canal

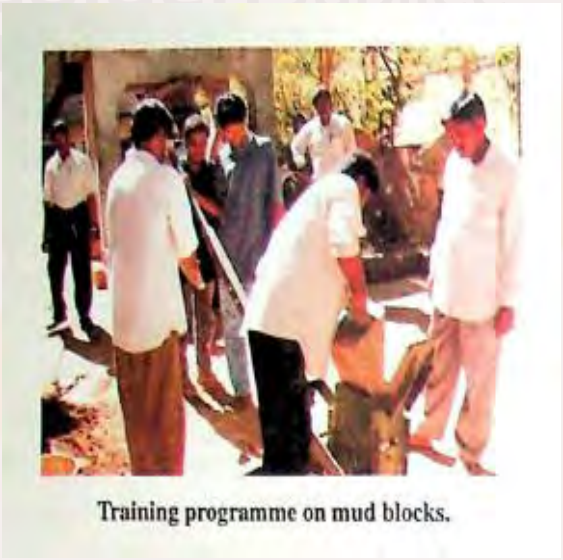
Convened by Prof. S. Soundaranayagam, this project aimed to harness ultra-low head irrigation canal flows for power generation. A site was selected on the Visvesvaraya branch canal near Mandya, where a turbine was designed to generate 40 kW using a 2.5-meter head. The system was developed with IISc and KSCST technical support and financial assistance from the Karnataka Power Corporation Ltd. On commissioning, it generated 24 kW due to incomplete downstream works but was capable of achieving the full 40 kW at design head. The turbine's performance validated its technical feasibility and potential for replication in similar rural canals. This demonstration highlights sustainable hydropower opportunities for rural electrification.

5) Development of a Potable Water Device for Rural Areas

This project, also convened by Prof. S. Soundaranayagam, developed a low-cost water purification device using silver-coated porcelain beads. The device released bactericidal silver in safe concentrations and purified highly contaminated water within an hour. Laboratory and field tests confirmed effectiveness, with activity partially restorable after bead re-firing, though coating durability requires improvement. Surveys revealed strong demand among rural families due to the potential reduction in medical costs from cleaner drinking water. The device's simplicity, affordability, and effectiveness make it highly suitable for rural households. The project demonstrated a practical solution for improving rural health and hygiene through access to potable water.

6) Energy Efficient Building Materials and Components

Convened by Prof. K.S. Jagadish of IISc, this project developed sustainable building materials to reduce energy consumption in construction. Lime-pozzolana cements using fly ash achieved good strength, though excess plaster of Paris reduced durability. Stabilized blocks incorporating fly ash and soil showed potential for cost-effective construction. Ferroconcrete tiles were successfully demonstrated, with cost-effective roofing solutions at ₹150 per square meter. A new kiln was built to produce low-energy bricks, with trial burning planned to test efficiency. The project showcased innovative building materials that can significantly lower construction costs and environmental impact, offering scalable solutions for sustainable housing.



Training programme on mud blocks.

7) Development of Agricultural Pumps for Small Farmers

This project, convened by Prof. S. Soundaranayagam (IISc), aimed to design affordable, high-performance agricultural pumps suited to small farmers' irrigation needs. Surveys established duty ratings for three prototype pumps, and drive motors were procured to begin development. Computational tools including a vortex panel program and a meridional flow solver were developed and validated to assess blade pressure distribution, cavitation susceptibility, and inlet geometry. Using these computational results, prototype impeller and pump designs were finalized with attention to castability and dimensional accuracy. Test pumps were fabricated with reliable sealing arrangements and underwent performance evaluations to confirm improved efficiency. The project demonstrated practical, scalable pump designs ready for further field testing and potential production scaling.

8) Productivity of Sugarcane Lines Obtained Through Tissue Culture under Problem Soil Conditions of Karnataka

Convened by Dr. G.R. Naik (Gulbarga University), this project used tissue culture to develop somaclonal sugarcane variants tolerant to salinity, disease, and other problem-soil stresses. Field trials in South Karnataka evaluated yield, juice quality, and stress resistance, while laboratory studies examined photosynthesis, ion uptake, and sucrose synthesis. Selected somaclones (e.g., GS-3, GS-4, GS-5, GS-12) showed superior yield, tillering, chlorophyll content, and keeping quality compared to conventional lines. The lines exhibited better resistance to viral diseases and efficient utilization of natural inputs, making them suitable for adverse agroclimatic conditions. Ratoon performance trials and further seasonal evaluations were planned to confirm long-term benefits. Overall, the study indicates strong potential for wide adoption of tissue-culture-derived lines to restore and boost sugarcane productivity.

9) Paper and Pulp from Horticultural Wastes through Organosolv Delignification Process

Led by Prof. A.K. Shenvi (Bangurnagar College, Dandeli), this project investigated organosolv delignification to convert horticultural wastes and bagasse into pulp with reduced pollution and improved yields. Ethanol was used as the solvent and flash distillation achieved solvent recovery rates of about 92–93%. Reductive bleaching of organosolv pulp produced satisfactory brightness while lowering BOD and COD in effluents. Spectroscopic and chromatographic analyses characterized lignins from arecanut husk and Agave sisalana, which were then valorized into lignin-phenol-formaldehyde resins and other derivatives. The work demonstrated efficient pulping, solvent recovery, and lignin utilization routes that add value and lower environmental impact. The project shows promise for developing sustainable, commercially viable pulp and paper processes from horticultural residues.

10) Insecticide Resistance in Helicoverpa armigera in Cotton

Convened by Dr. S. Lingappa and Dr. K. Basavana Goud (UAS, Dharwad), this study monitored resistance of Helicoverpa

armigera to common insecticides across six locations in North Karnataka. Resistance levels varied spatially, with Raichur showing the highest overall resistance (62.5%) linked to heavy pesticide use, while Mundgod recorded much lower resistance (30.69%). Among insecticides tested, fenvalerate showed the highest resistance incidence, followed by cypermethrin and endosulfan, whereas quinophos exhibited the least resistance. Temporal patterns indicated resistance built up through the season, peaking in January and declining from March as pesticide applications tapered. The findings underline the urgent need for integrated pest management, insecticide rotation, and reduced reliance on single chemistries. The study provides actionable data to design sustainable pest-management strategies and slow resistance development.

11) Semiperennial Plant Species (Pigeonpea and Castor) as an Alternative for Drought-Prone Rainfed Soils of Karnataka

Convened by I.S. Aftab Hussain (UAS, Bangalore), this project evaluated perennial pigeonpea genotypes and castor as resilient crop alternatives for semi-arid, drought-prone rainfed areas. Field trials tested two perennial pigeonpea genotypes and two population densities, monitored pruning effects, regrowth, flowering, and soil moisture dynamics during rain-free periods. Perennial pigeonpea showed vigorous growth, accessed deeper soil moisture over summer, and produced useful quantities of grain, green fodder, and fuelwood, with leaf litter contributing significant nitrogen. However, perennial types experienced somewhat higher pest and disease incidence and notable mortality after pruning, indicating genotype and protection challenges. The work suggests perennial pigeonpea can be grown on bunds to provide multiple benefits if disease-resistant genotypes and adequate protection are available. Continued research is recommended to optimize management and fully realize the crop's potential in rainfed systems.

12) Student Projects Programme

The Student Projects Programme, launched in 1977–78, has encouraged innovation among higher-education students and completed 2,885 projects over 18 years, with 170 projects in 1994–95. The programme culminates annually in a seminar-cum-exhibition showcasing standout work, and several exemplary projects were selected for "Project of the Year" awards across institutions. Highlighted student innovations ranged from a scalable coherent distributed shared memory multiprocessor and rope-and-washer pumps to CAD tools for fashion design and railway signalling systems. Other notable student projects included practical rural technologies such as dough pressers, rotary cleaners, and solar meal cookers that demonstrate applied impact. The initiative strengthens student-industry-academia linkages and provides hands-on experience in design, fabrication, and field testing. Overall, the programme fosters grassroots technological solutions and builds capacity among future engineers and technologists.

Dough pressing machine, KVGCE 1994-95, Sullia

Rotary cleaner and grader, SJCE 94-95, Mysore

Solar meal maker in kitchen, BVBCE, Hubli 94-95

13) Technology Demonstration and Dissemination

Under the convenorship of Sri M.S. Rama Prasad (KSCST), technology demonstration and dissemination activities covered wind mapping and monitoring, development of fuel-efficient devices, and support for decentralized renewable energy programs. Wind mapping established stations statewide in coordination with IITM, supporting wind-farm siting and micrositing studies that led to projects like the Kapatagudda and proposed Jogimatti farms. Demonstrations included a fuel-efficient crematorium, dehydration driers, an efficient steam generator, solar tobacco driers, and Technical Backup Units for IREP to support site selection and training. State Centre activities expanded district centres, trained personnel on GRAM GIS and image processing tools, and documented limitations in data digitization and plotting infrastructure. Energy surveys and dissemination newsletters (KIRANA) helped guide subsidies, demonstrations, and capacity-building for rural energy and NRDMS implementation. These combined efforts advanced renewable energy adoption, resource mapping, and practical rural technologies across Karnataka.

KSCST Projects (1995-1996)

1) Powdery Biomass Gasifier

The Powdery Biomass Gasifier project led by Prof. H.S. Mukunda at IISc, Bangalore focuses on developing a field version of biomass-based gasifier tested with agro-residues. Initial trials involved a fluidising column for tar reduction, and further tests confirmed its efficiency in lowering tar concentration. The field version consists of a reactor, cyclone with water jacket, cooler, blower, oil bath filter, and a diesel engine generator set. The reactor uses ceramic lining and insulation to minimize heat loss, while cyclone, cooler, and blower systems aid in dust removal, cooling, and gas flow. Additional features like water spray washing, a moisture trap, and an oil bath filter ensure clean and safe gas output. Scaling efforts have advanced from 100 kWe and 500 kWth systems to a vertical cyclone design capable of producing around 625 kWh, incorporating feed, ignition, char handling, oxidation, dust extraction, and combustion systems.

100kW Biomass Gasifier System

2) Design & Demonstration of Biogas Rural Energy Centres

Since 1987, the traditional system of obtaining water, illumination, and fertilizer in Pura village was replaced with a community biogas plant-based electricity system using bovine dung. The clean gaseous fuel produced has been effectively utilized to run engines and generate shaft power for electricity to meet village drinking water and home illumination needs. A comparison with traditional systems shows that the biogas system improved hygiene, convenience, and revenue collection, achieving a 95% success rate by Grama Vikasa Sabha. Encouraged by this success, ASTRA and KSCST initiated projects to design and demonstrate Rural Energy Centres in nearby villages such as Sugganahalli, Ungra, Kagganahalli, and Doddakoppalu. The response from villagers was highly positive, with training provided for construction and establishment of centres, generating valuable data for large-scale replication. The International Energy Initiative (IEI) has already expanded the concept to nine villages in Tumkur district, demonstrating reliable energy for drinking water, home illumination, flour mills, and self-sustained operational costs.

Rural Energy Centre at Sugganahalli

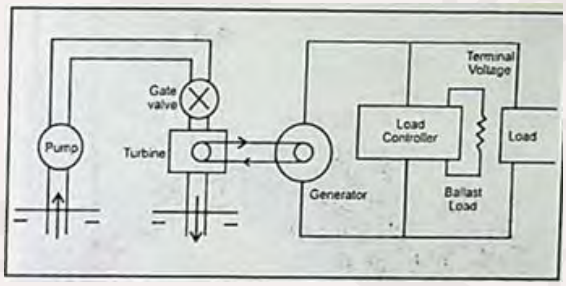
3) DST Project: Further Development of Cross-Flow Turbines

The project continues earlier work on the development of cross-flow turbines, focusing on microhydel power packs ranging from 500 to 2000 watts. A key component is the design of electronic load governors to integrate with microturbines

and form portable sets. Progress included testing a mini cross-flow impeller of 100 mm diameter and 50 mm width, capable of producing 100–500 watts depending on flow conditions. An electronic load controller of 500 watts was fabricated and tested, employing a pulse-width modulation strategy to manage ballast loads and ensure stable generator operation. Test results with a 500W turbine showed stable voltage output with smooth operation under varying loads, including cold start conditions. Future work involves site assessments of microhydel schemes, analysis of damaged impellers, and development of higher-capacity load controllers of 2 kW and 10 kW for expanded applications.

Table 1: (500 W)

Sl. No.	Load power (Watt)	Load voltage (volt)
1.	0	210
2.	160	210
3.	260	209
4.	360	209



4) KPC Project: Demonstration of a Microhydro Electric Unit in an Irrigation Canal

The project aimed to design and demonstrate a microhydel unit suitable for a 2.5 m canal drop in Karnataka, where 50% of the hydro potential lies in low head sites. A 40 kW axial flow turbine was developed with specifications including a 0.85 m runner diameter, five vanes, and 300 rpm speed. The unit was installed at Keregodu canal near Mandya, with KPC funding and IISc fabricating turbine components, while KSCST managed civil works. Initial trials in 1994 showed vibrations that were later reduced, and by March 1995, the turbine was successfully synchronized with the grid, delivering around 20 kW power. Issues of frequent tripping due to low voltage and frequency were noted, with braking devices and hydraulic systems planned as solutions. This experimental unit demonstrated the feasibility of ultra-low head turbines and indicated potential expansion to 120 kW capacity at the site, with scope for wider use in minor irrigation canals across the country.

5) Biomass Energy Systems to Enhance Rural Employment and Sustainable Development (Phase-II)

This project aimed to improve rural employment by integrating irrigation for perennial crops, supporting mulberry cultivation, and utilizing biomass energy. Mulberry farmers contributed pruned stalks as fuel for a wood gasifier, which generated electricity to pump irrigation water, ensuring stability of crops and employment. The system was tested near Ungra village with a 20 kW agro-residue-based power generation setup that supported irrigation and year-round silk worm rearing. Training was provided to local youth for operating and maintaining the gasifier and irrigation systems, while issues like pipeline damages and high diesel

consumption were addressed. Flexible piping and improved engine options were explored to ensure efficient irrigation and reduce costs, with promising results in employment and income generation. Future work will focus on providing centralized housing for the gasifier and power units, and supplying emergency power to the Ungra Extension Centre for improved reliability.

6) Demonstration of Cross-Flow Turbine Based Microhydel Power Projects in Karnataka

A microhydel project was proposed at Elaneer village near Samse, located 15 km from Kudremukh, based on a perennial flow of 45 litres per second at a net head of 67 m. The expected output was about 20 kW, and DST sanctioned Rs. 10,42,600 for setting up the power plant. Later, it was observed that utilization could be improved by upgrading the capacity to 40 kW since a higher flow of 90 litres per second was available for about six months annually. A suitable 40 kW cross-flow turbine was designed, and detailed design drawings and tender specifications were prepared. Tenders were invited and technical discussions were held to finalize the scheme. DST has since been approached for approval of the revised 40 kW proposal along with additional funds for implementation.

7) Evaluation and Development of Mini Axial-Flow Tubular Turbines

This project continues earlier work on a 40 kW ultra-low head axial-flow tubular turbine installed in an irrigation canal at Keregodu village near Mandya, Karnataka. The main objectives are to fully commission the turbine-generator by grid connection, operate it for 18–24 months to assess performance, and resolve issues linked with small grid-connected units. A 20 KVAR capacitor bank was installed, enabling successful synchronization, and the turbine generated about 20 kW under a 1.75 m head compared to the design head of 2.5 m. To manage overspeeding during grid failures, an automatic hydraulic actuating system for guide vane closure has been designed and is under installation. Future work will involve measuring velocity, pressure, and angle distributions at various points to validate the turbine design. These efforts, combined with operational experience, aim to improve and develop more efficient low-head tubular turbine schemes.

8) Economically Feasible Biomass Energy and Water System for Electrification and Sustainable Development of Villages

This project addresses rural electricity shortages and unreliable supply by developing decentralized biomass gasifier-based power systems. Implemented in Hosahalli village, Tumkur district, the initiative began with a 3.7 kW gasifier in 1988 for lighting, drinking water pumping, and flour milling, later expanding to a 20-kW system in 1994. The system also promoted energy forest development and agro-processing to generate employment and income. By 1997, irrigation support was extended to farmers through borewells, submersible pumps, and piped water distribution networks. Farmers agreed to share irrigation water equitably, paying commercial charges, with biomass feedstock supplied from mulberry stalks and other sources. Operated by trained villagers, the system demonstrates how

biomass energy can support sustainable rural electrification, irrigation, and livelihood development when integrated with local management.

9) Technical Backup Support Unit for NPIC

The Technical Backup Support Unit (TBU) at KSCST, established in 1988–89, provides R&D support, field testing, training, and demonstrations under the NPIC programme. During 1995–96, the fuel-efficient ASTRA drier was successfully tested for drying whole coconuts into copra, capable of processing 5000 coconuts per batch. A large-scale fuel-efficient steam curing system for lime-stabilized compressed mud blocks was also developed, demonstrating cost-effective brick production with lower energy use. Improvements were made to the steam generator by fitting a spiral baffle, enhancing thermal efficiency up to 58 percent. The ASTRA drier design was further modified with stainless steel trays, ferrocement ducts, and baffles to improve capacity and thermal efficiency. Additionally, prefabricated ferrocement ASTRA stoves were developed and successfully tested in both laboratory and field conditions, with large-scale trials planned.

10) Field Activities, Training, and Evaluation of ASTRA Stoves

During 1995–96, the TBU at KSCST carried out several field activities, including surveys on Swosthee portable metallic stoves and technical assistance in constructing biomass stoves, crematorium beds, and fuel-efficient boilers. Field testing of improved biomass-fuel devices and trials of ASTRA stoves with prefabricated ferrocement tops and SARALA stove components were conducted. Training programmes were organized on management exposure, construction of bathwater heating wood stoves, puffed rice industry stoves, and fuel-efficient driers. Regular inspections of 102 ASTRA stoves in Mysore district showed that 52 were used regularly, while others were rarely used, altered, or dismantled. The TBU also tested and certified 12 portable metallic stoves for ISI marks and evaluated ASTRA/SARALA stove components from manufacturers. These activities ensured quality control, improved stove performance, and enabled manufacturers to participate in government tenders, promoting large-scale adoption of fuel-efficient cooking technologies.

11) Availability of Rice Husk and Sugarcane Trash in Mandya District

KSCST conducted a survey in Mandya district commissioned by Netpro Renewable Energy (India) Ltd., Bangalore, to assess biomass resources for power generation. The study covered 110 rice mills across the taluks of Mandya, Maddur, Malavalli, Krishnarajpet, Srirangapatna, and Pandavapura. Data was collected from multiple official sources including the Directorate of Economics and Statistics,

agricultural officers, electricity board, land records, water board, zilla panchayat, and census reports. The findings indicated that rice husk availability in the district is about 72,000 tonnes per annum. Additionally, sugarcane trash availability was estimated at approximately 200,000 tonnes per annum. The final report was submitted to Netpro Renewable Energy Ltd., and the project has been completed successfully.

12) Brick Vaulted Buildings for Solar Passive Cooling

A three-year MNES-funded project was initiated in 1995–96 to study brick vaulted buildings for solar passive cooling. The primary objectives are to assess the thermal performance of vaulted buildings and to develop passive cooling systems based on this concept. Phase I involves studying selected vaulted buildings in Tamil Nadu and Karnataka to collect data on diurnal temperature variations and correlate them with location, orientation, and thermal behavior. Phase II focuses on designing and constructing a new vaulted building with integrated passive cooling features, for which preliminary plans and sections have been prepared. Phase III will involve monitoring temporal and spatial temperature distributions in walls, roofs, corners, and air spaces over a one-year period. The project has commenced with Phases I and II already underway, laying the groundwork for energy-efficient building design.

13) Wind Monitoring

MNES initially sanctioned 9 wind monitoring stations in Karnataka in 1988, with 6 more added in 1992, installed by KSCST and IITM between 1989 and 1993. These stations were mostly located on hill ridges and followed MNES guidelines for monitoring durations based on annual average wind speeds. Wind speed and direction were recorded using automatic data loggers, with data collected every two months through EPROM chips and analyzed by computer. Karnataka's first wind farm was attempted at Galibeedu in Coorg district with 110 kW machines, but it failed due to technical and coordination issues. A 4.5 MW demonstration wind farm was later initiated at Kappatagudda in Gadag taluk, while Jogimatti in Chitradurga showed high potential but faced infrastructure challenges. Further studies by KSCST and NAL identified more promising sites, with about 12 new monitoring stations planned, and the project was transferred to Karnataka Renewable Energy Ltd. for continued implementation.

14) Power Generation from Biogas

A novel method for cleaning biogas of hydrogen sulphide has been developed, which operates at ambient temperature and pressure. The process uses a cleaning solution sprayed from the top of a tower while sour gas enters from the bottom, converting hydrogen sulphide into elemental sulphur. This method is advantageous over combustion techniques as it prevents the formation of sulphur oxides, making the gas suitable for engines without corrosion or pollution issues. Tests showed that hydrogen sulphide content could be reduced from over 5% to below 100 ppm. A pilot system was built to energize a 500 kW diesel engine genset after scrubbing, using a PP lined FRP tower and solution tanks. An MoU has been signed between MNES, BWSSB, and IISc to use this system at the K&C Valley effluent treatment plant for power generation.

15) Rapid Purification of Plant Amylase by Immobilised Biocatalysts

The project aims to purify plant amylases such as sorghum and sweet potato beta amylase using affinity chromatography, beginning with the synthesis of maltosylamine. Characterization of maltosylamine was carried out using IR, UV, and NMR, and its inhibitory effect was studied on amylases from barley, wheat, sorghum, sweet potato, and bacterial sources. Results confirmed that maltosylamine inhibits amylases derived from plant sources. The synthesis involved reducing maltose with liquid ammonia, followed by conversion to N-acyl maltosylamine and further derivatization steps. The final product was coupled to sepharose, making it an affinity ligand for purifying beta amylase. Current work focuses on applying affinity chromatography for efficient purification of plant amylases.

16) Evaluation and Standardisation of Vigour Tests for Predicting the Storage Potential of Seed Lots in Some Field Crops

The project evaluated five commercial seed lots of Jaya and Mangala rice varieties produced in 1992 and stored under different moisture levels in cloth and polythene bags across Raichur, Bangalore, Dharwad, and Mangalore. Seed quality was assessed using parameters such as germination, moisture content, test weight, electrical conductivity, vigour index, and field emergence. Results showed that seed lots maintained high germination up to 12 months, though germination and vigour index gradually declined with longer storage. Storage location and container type significantly influenced germination, with Raichur polythene bag storage showing the highest performance. Accelerated ageing tests confirmed that 8 days of ageing equaled 12 months of natural storage in Bangalore, Dharwad, and Raichur, and 8 months at Mangalore. Overall, high vigour seeds had better seedling length, growth rate, and germination, proving vigour tests effective in predicting seed storage potential.

17) Survey of Menace of Waxmoth

A survey was conducted across several districts of Karnataka to study the incidence of waxmoth in Apis cerana colonies. The infestation was highest between November–December (79.7%) and lower between April–May (49.74%) due to stronger colonies during the honey flow season. However, in areas like Bhagamandala, Virajpet, and Sakleshpur, infestation remained high (60–72.7%) due to sac brood disease, which weakened colonies. Waxmoth infestation was recorded in A. cerana, A. dorsata, and A. florea, with deserted colonies showing large numbers of larvae and pupae. Infested A. dorsata and A. florea colonies served as breeding sites that spread infestation to A. cerana colonies, where waxmoths hibernated in larval and pupal stages. Natural enemies such as Apanteles galleria, species of Chalcididae, and Ichneumonidae were identified, and ongoing studies on economic losses and management solutions are expected to provide control measures upon completion.

18) Productivity of Sugarcane Lines Obtained through Tissue Culture under Problem Soil Conditions of Karnataka

Sugarcane is a major crop in Karnataka, but productivity has been declining due to varietal deterioration, salinity, and diseases. To address this, Gulbarga University developed somaclonal variants through cell and tissue culture technology, supported by KSCST for field trials under different agroclimatic conditions. These somaclones were evaluated for traits like photosynthetic efficiency, ion uptake, sucrose synthesis, and morphological characteristics. Results showed that tissue culture-derived subclones utilize natural inputs efficiently, making them suitable for rapid screening to improve sugarcane productivity in local conditions. At Mysore farm, Gulbarga Selection (GS) somaclones such as GS-3, GS-4, GS-5, and GS-12 showed superior performance in yield, tillering, chlorophyll content, and sugar quality. Field trials at Gulbarga, Belgaum, and Gangavati further confirmed the potential of these somaclones for enhancing sugarcane production across Karnataka.

19) Semiperennial Plant Species (Pigeonpea and Castor) as an Alternative for Drought-Prone Rainfed Soils of Karnataka

The project was initiated to explore perennial pigeonpea and castor as alternatives for drought-prone rainfed soils due to their deep root systems. Objectives included studying growth and productivity, soil moisture depletion, effects of pruning, summer survival, plant-water relations, and fodder palatability. Field experiments with pigeonpea genotypes ICPL 11298 and ICPL 8094 showed vigorous growth, high grain yield, green fodder production, and potential for fuelwood and nitrogen addition through leaf litter. However, challenges included higher disease incidence, greater plant mortality after pruning, and pest susceptibility. Conclusions indicated that perennial pigeonpea can utilize deeper soil moisture effectively, but its success depends on disease and pest-resistant genotypes. Future work focused on selecting medium-duration annual pigeonpea lines and extending similar experiments with castor under irrigated and moisture-stress conditions.

20) Genetic Improvement of the Medicinal Plant Catharanthus roseus (L.) G. Don for its Alkaloid Contents and Yield

The project aimed to develop a high-alkaloid yielding variety of *Catharanthus roseus* suitable for commercial cultivation by farmers. Mutations were induced in the high-yielding, die-back resistant variety Nirmal using chemical mutagens like ethyl methane sulphonate and N-ethyl-N-nitroso-urea. Several mutants with altered morphology and growth traits were isolated and 20 were characterized for phenotype, anatomy, cytology, and alkaloid content. Morphological trials showed considerable variation in plant height, leaf size, floral traits, pollen fertility, and germination among 13 mutants. Cytological studies identified abnormalities, including a mutant with a chromosome number 2n = 14. Mutants with high alkaloid content in leaves and roots have been hybridized, and F1 plants are being raised for combining superior traits.

21) Insecticide Resistance in Helicoverpa armigera in Cotton

The project focused on studying resistance development in *Helicoverpa armigera*, a major pest of cotton and other crops in North Karnataka, which has become difficult to control with commonly used insecticides. Objectives included assessing resistance levels, studying the rate of resistance build-up, testing the role of synergists, and analyzing cross-resistance across insecticide groups. Results showed high resistance levels, with Raichur strains recording the maximum (62.5%), while Kalghatgi and Mundgod strains showed the least (41.6–30.7%). Among insecticides, highest resistance was recorded to fenvalerate (60.6%) followed by cypermethrin and endosulfan, while quinophos showed the least. Studies revealed that piperonyl butoxide (PB) as a synergist enhanced the effectiveness of pyrethroids, especially cypermethrin. Cross-resistance studies indicated that resistance development followed the order fenvalerate > monocrotophos > endosulfan > carbaryl, highlighting the urgent need for resistance management strategies in cotton pest control.

22) Biodiversity Conservation Prioritisation Project

This project addresses the challenge of assigning conservation priorities by documenting biodiversity in a transparent and locally relevant manner. It emphasizes the need for proper documentation of bioresources in the context of Intellectual Property Rights and the Convention on Biological Diversity. The aim is to prepare an unbiased record of ecological changes, community perceptions, and strategic options for biodiversity conservation under varied socio-economic and ecological conditions. Objectives include assessing ecological changes, understanding community views, identifying driving forces of change, and suggesting biodiversity-friendly measures at multiple governance levels. In Karnataka, nine sites have been identified, with six completing the initial steps of selection, mapping, and user group identification. Fieldwork now involves interviewing households and groups in villages such as Kigga, Neeralakoppa, Mala, Subramanya, Halanagadde, Neggu, Pavagada, Kamadodu, and Gandlahalli to gather detailed data for conservation strategies.

23) Zoning Atlas for Siting of Industries

The Zoning Atlas for Siting of Industries project was initiated by the Central Pollution Control Board in 1994, with Karnataka State Council as the nodal agency in the state. Its objective is to identify areas suitable for industrial siting based on environmental features to simplify decision-making and reduce risks. The current practice of industries choosing sites without earmarked zones causes problems such as higher pollution control costs, investment in sensitive sites, scattered development, and ineffective pollution control measures. The atlas provides suitable industrial locations considering environmental parameters, complementing economic suitability. In the first phase, a zoning atlas was prepared for Mysore district at 1:2,50,000 scale, identifying suitable areas for industrial establishment, with micro-level studies planned at 1:50,000 scale. The second phase will extend similar studies to priority districts experiencing rapid

industrialisation or environmental pollution concerns.

24) Natural Resources Data Management System (NRDMS)

The NRDMS, launched in Karnataka in 1992 by DST with GoK support, aims to assist district administrations in planning and managing natural resources using GIS concepts. KSCST has established district centres across the state, located in Zilla Panchayat or DC offices, with coordinators from educational institutions providing technical support. Activities include computerization of spatial and non-spatial data, preparation of databases, digitization of maps, and application of decision support systems like GRAM and IDRISI for planning exercises. District centres have supported zilla panchayats in projects like locating schools, water body preparation, and election-related mapping. The State Centre at KSCST coordinates NRDMS activities, provides technical support, and facilitates interactions with DST and other institutions across the country. New centres have been established at Kolar, Belgaum, Hassan, and Shimoga, supported by training in GIS, while a documentation cell maintains repositories of maps, reports, and technical resources for future use.

25) Student Projects Programme

The Student Projects Programme (SPP) of KSCST, initiated in 1977-78, engages students and faculty of engineering colleges in solving developmental problems, especially in rural areas. Over the years, it has achieved substantial qualitative and quantitative growth, encouraging students to apply their knowledge for improving their surroundings. The programme has been strongly supported by the faculty of the Indian Institute of Science, particularly ASTRA, along with engineering colleges across Karnataka. Seminars and exhibitions have been held annually at various institutions, with thousands of projects presented since inception. By 1995-96, about 3122 projects covering sectors like agriculture, water, energy, health, and industry had been supported with a funding of Rs. 7.27 lakhs.

26) KSCST Co-operation Network

Since its inception, KSCST has played a catalytic role in solving developmental problems through science and technology with strong support from national and state agencies. It has established offices in major institutions like IISc, University of Agricultural Sciences, Bangalore, and Gulbarga University, which provide expertise and manpower for its activities. With continuous support from DST, Government of India, and the Government of Karnataka, KSCST has implemented important projects such as NRDMS, National Programme on Improved Chulhas, and Integrated Rural Energy Programme. In partnership with agencies like the Central and State Pollution Control Boards, it has also worked on cleaner technologies and pollution control initiatives. The Student Projects Programme has been a unique initiative linking science with rural development, engaging students and faculty across the state. KSCST's effective collaborations with premier organizations, universities, and government departments demonstrate its role as a key facilitator of science-based solutions for Karnataka's development.

KSCST Projects (1996-1997)

1) Evaluation and Development of Mini Axial Flow Turbines

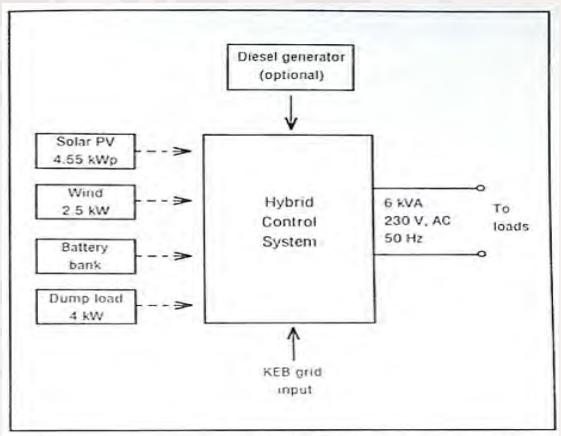
A 40 kW ultra-low head axial flow turbine was designed, installed, and tested in an irrigation canal at Keragodu village, Mandya, under a joint IISc–KPC–KSCST project. The objective is to grid-connect the turbine, operate it for 18–24 months, and establish validated design and field experience for future prototypes. Methodology includes capacitor banks for excitation, braking devices, and safety mechanisms. The hydraulic control system was tested and installed at site in 1996, with fabrication of guide vane linkages completed in January 1997. However, canal closure halted turbine testing. Once water flow resumes, commissioning of the hydraulic power pack, alignment, and overhaul of turbine–generator components will be undertaken.

2) Solar Photovoltaic Power Plants at Handral Village, Hassan District.

A 1 kWp solar PV plant was installed at Handral village, Hassan district, with a 24 V, ~450 Ah battery backup. The system powers 23 indoor lights, 7 street lights, and a community hall TV, consuming 2.13 kWh/day. Panels (25 in total) are roof-mounted, with charge controllers, inverter, and control circuits housed indoors. The system generates 5 kWh/day, ensuring surplus energy for storage and up to 5 days' autonomy without sunshine. Blocking diodes prevent reverse flow and controls ensure regulated charging/discharging. The project has been functioning successfully since installation, demonstrating decentralized solar energy use in villages.

3) Solar Photo-voltaic Wind Hybrid Power Project at Kemmangundi

A 7.5 kWp solar–wind hybrid system (5.25 kWp solar + 2.5 kW wind) was initiated at Kemmangundi hill station to provide year-round power. The project also included a 500 L/day solar water heating system. The hybrid design ensures solar generation during sunny months and wind support during cloudy monsoons, making supply reliable. The system powers 310 CFL lamps (220 indoor, 90 outdoor), matching load to generation capacity. A hybrid control system with bi-directional inverter, battery charger, and smart bypass reduces battery dependency and cost. Funded by GoK and MNES, with wind generator support from Athreyonix, the project is scheduled for completion by June 1998.

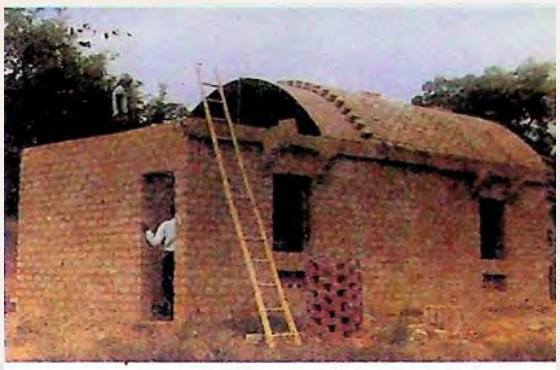


Block diagram of solar PV/Wind hybrid system at Kemmangundi

4) Brick vaulted buildings for Passive Solar Cooking

At Sidaganahally, Bangalore district, a demonstration project on brick-vaulted passive solar cooling buildings was launched by IISc. The purpose was to showcase low-cost, energy-efficient construction using stabilised mud bricks and traditional vault designs. Construction began in June 1996, with foundations laid using stone and mud mortar, followed by walls using stabilised mud blocks. By early

1997, the walls reached lintel level, with further progress planned for completion by December 1997. The design makes use of solar passive principles, reducing heat load and improving thermal comfort. This project highlights sustainable rural building practices using locally available materials.



Solar passive cooling - Brick Vaulted Building

5) Community Biogas project at Giriyapura

KSCST initiated a 270 m^3 community biogas project at Giriyapura, Kadur Taluk, Chikkamagalur district, comprising six digesters of 45 m^3 capacity each. The KVIC drum-type digesters are designed to provide cooking fuel to 200 households. Mechanical mixers ensure proper slurry preparation, improving efficiency. By the report date, three digesters were complete, supplying gas to 100 households. Funding support came from MNES and Zilla Panchayat, Chikkamagalur. A village committee will manage dung collection, supply, maintenance, and revenue generation from gas use, ensuring local ownership. The project demonstrates sustainable, community-based energy for rural households.

6) Power Generation from Biogas

IISc (CGPL) initiated power generation from biogas using the ISET sulphur-extraction process to scrub H_2S from gas streams. Trials at KCP Vayyuru showed biogas composition of CH_4 (55–65%), CO_2 (35–45%), and H_2 (5–7%). A plant was set up to scrub 200 m^3/hr of sour gas, which performed satisfactorily after adjustments. A larger 300 m^3/hr scrubbing unit was designed and fabricated for installation at Ganga Action Plan STPs in Kanpur and Allahabad. The project demonstrates the technical feasibility of converting biogas into clean fuel for power generation. Fine-tuning of regenerating modules is ongoing.

Power generation from biogas

7) National Programme on Improved Chulhas (NPIC) for the year 1996–97.

Launched by DNES, the NPIC aimed to conserve fuelwood, prevent deforestation, and promote smoke-free kitchens through improved stoves. KSCST's Technical Backup Unit (TBU), established in 1988–89 in partnership with IISc's ASTRA, provided R&D, field testing, training, and demonstrations. Work focused on developing efficient wood stoves for domestic cooking, jaggery making, bath water heating, and arecanut boiling. This created rural livelihoods, empowered women, and improved health by reducing indoor smoke. R&D achievements included efficient driers, prefabricated stove components, and improved steam systems. The programme significantly boosted rural

energy efficiency and sustainable cooking solutions.

8) Biomass-Based Irrigation for Rural Development

A biomass gasifier-based irrigation project was launched under IISc to support rural employment and income. The system served ~80–100 families through equitable access. Technical improvements included ceramic gasifier lining, upgraded Kirloskar engine, improved grate, cooling, and cleaning systems. Four modes of operation were tested, ranging from full management provision to farmer-managed fuel supply. Benefits included longer gasifier life, reduced costs, better efficiency, and lower maintenance. This model showcased sustainable irrigation energy, combining local management with technological refinement for rural development.

9) Productivity of Sugar cane lines obtain through tissue culture under problem soil conditions of Karnataka

Gulbarga University conducted studies on sugarcane tissue culture lines to improve yield in problem soil conditions. Ratoon performance trials were carried out at Aland Sugar Factory and Ugar Sugar Works, while salt tolerance screening began at Gangavathi (UAS). Results showed genetically selected lines had superior growth, yield, and sugar recovery compared to the parent clone CO 740. Recovery rates were notably better during February–March compared to local cultivars such as CO c671. The trials demonstrated tissue culture's potential to enhance sugarcane productivity under stress conditions, offering promise for widespread adoption.

10) Bio-Diversity Conservation Prioritisation Project

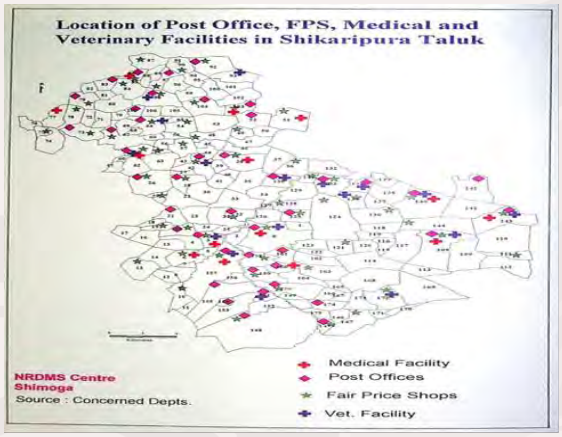
Led by IISc and KSCST, this project examined ecological changes, their impact on biodiversity, and community perspectives across Karnataka. Nine villages in varied ecological and social settings (coastal, malnad, industrial, dry zones, pilgrimage areas) were studied. Local knowledge, conservation strategies, and aspirations were documented through People's Biodiversity Registers (PBRs). These registers, maintained at panchayats, record biodiversity use, conservation, and ecological knowledge. The project aimed to integrate biodiversity-friendly practices at village, district, state, and national levels. Finalisation of PBRs in English and Kannada was targeted by October 1997, ensuring community ownership.

Weavers: Biodiversity dependent people.

11) Natural Resources Data Management System Project

NRDMS, launched in Karnataka in 1992, aimed to improve natural resource use through GIS-based databases and planning. Supported by DST (GoI and GoK), centres were established in 12 districts by 1996–97. Each centre provided data on resources, socio-economic indicators, and maps to support Zilla Panchayat planning. Applications included watershed mapping

(Bijapur), election maps (Shimoga, Belgaum), industrial site atlas (Mysore), and dam site selection (Dakshina Kannada). The State Centre at KSCST provided training, software support, and monitoring. NRDMS improved local-level planning by filling gaps in service distribution and enabling evidence-based decision-making. Expansion to Tumkur and Raichur was planned.



12) Development of Potable Water Device

IISc (ASTRA) initiated the design of a low-cost, passive potable water purifier for rural households using silver-coated surfaces. Initial tests with silver-coated copper wires showed strong bactericidal effects, later improved with silver-coated ceramic beads, which were regenerable through heating or oxidising agents. Two prototypes were developed: Version-1 using plastic containers with ceramic beads, and Version-2 using silver-coated ceramic filter candles. Lab and limited field trials confirmed effective bacterial reduction from 10^5 CFU/ml to ≤100 CFU/ml. Cost analysis showed potential reduction from Rs. 645 to Rs. 200 using clay and village kilns, enabling rural potters to participate. Future plans include field deployment of 100 prototypes and comparative testing of both versions against multiple pathogens.

Batch operated water purifier

13) Fabrication of the five silk reeling machines and field testing at different silk reeling centers in Karnataka

At BIET, Davangere, students developed a foot-operated Direct Cottage Silk Reeling Machine to improve traditional reeling methods. Field trials at Vijayapura showed high user satisfaction, with inputs from reelers and experts at CSTRI and Dept. of Sericulture. Based on feedback, modifications were made including height reduction, lighter frame, smoother traversing arrangement, ball bearings, and easy hank removal features. The machine's weight was reduced to 100 kg, with added charcoal drying provision for improved utility. Modified prototypes were tested at CSTRI Bangalore, BR Hills, and Davangere taluk centres. The improved machine is lighter, easier to operate, reduces worker strain, and enhances productivity for rural silk reelers.

KSCST Projects (1997-1998)

1) Further Development of Crossflow Turbines

The Department of Science & Technology (DST) and IISc have been developing crossflow turbines for microhydel projects over the last decade. These Banki-type turbines are simple, rugged, and suitable for semi-skilled operation in the 10–100 kW range. Demonstration units were set up across states, with KSCST managing Karnataka projects. In 1997–98, a 50 kW turbine for Tirbin (Arunachal Pradesh) was designed for 328 L/sec flow at 21 m head and displayed in Delhi before installation. Electronic load diverters of 500 W and 2 kW were also developed with IISc's Electrical Engineering Department. The 500 W unit was tested with a small crossflow turbine, showing its potential for decentralized hydropower control.

Fig. 1: 50kW crossflow turbine for the microhydel plant at TIRBIN (Arunachal Pradesh)

2) Microhydel Demonstration Project Elneer

Elneer, near Kudremukh, was chosen from 10 identified Western Ghats sites for a microhydel demonstration project. The site design includes a net head of 57.85 m, discharge of 60 L/sec, and an output of 20 kW. Elneer village has about 33 houses with no electricity and difficult road access. Initial apprehensions about water diversion were addressed through community engagement, leading to full village support. Funding was shared between DST (80%), KSCST, and villagers through contributions and voluntary labor. Civil works for the project began in January 1998, marking a significant step in rural electrification.

Fig. 2: The power house under construction at Elneer

3) Solar Photovoltaic – Wind Hybrid Power Project at Kemmanagundi

KSCST initiated a 7.5 kW solar–wind hybrid power project at Kemmanagundi hill station, jointly funded by MNES and the Department of Horticulture, GoK. The installed solar PV array has a capacity of 25.5 kW, and foundation work for a 3.5 kW wind generator is complete. Once integrated, the hybrid system will reliably power about 220 indoor and outdoor lighting points. The system uses compact fluorescent lamps for energy efficiency. The hybrid design leverages solar power during clear months and wind energy during monsoons, ensuring year-round supply. This project highlights cost-effective renewable energy deployment in hilly terrains.

4) Community Biogas Project at Giriyapura

KSCST is implementing a 270 m^3 community biogas project at Giriyapura, Kadur Taluk, with support from MNES and the Panchayat Raj Department. The model comprises six digesters of 45 m^3 capacity each, supplying biogas for cooking to the entire village. By 1998, three digesters were completed, while three more were nearing completion. Villagers actively contributed through voluntary labor, demonstrating strong community participation. A village-level committee will manage dung collection, transport, maintenance, and tariff decisions. Revenue from gas supply will sustain wages, repairs, and plant upkeep, making this a community-managed clean energy model.

5) Biomass Gasifiers for Power Generation

IISc developed biomass gasifiers with ceramic-lined reactors and cooling-cleaning systems for decentralized power. A system was installed at Chatham Island in 1997 and another at Navodaya Vidyalaya, showing flexibility under varying loads and achieving 80–85% diesel replacement. The Vuyyuru plant included an H_2S scrubber tower, which performed successfully after trials. A larger scrubber handling 600 m^3/hr was installed at Raichur, designed to supply cleaned gas to four 250 kW engines. These advances demonstrate gasifiers' capacity for efficient, clean rural power generation. Continued improvements target reduced diesel consumption and reliable operation at lower load levels.

500 kW Biomass gasifier power generation system at M/s Senapathi Whitley Limited, Ramanagaram.

6) Brick Vaulted Buildings for Solar Passive Architecture

A solar passive brick-vaulted building was constructed at Sidanagahally, Magadi Taluk, with a plinth area of 35 m^2. The vaulted roof was completed in March 1998, with monitoring equipment installed by June for temperature and humidity studies. Initial results showed indoor temperatures 1.5°C cooler than peak outdoor levels, confirming passive cooling benefits. However, cracks developed due to faulty detachment of centering, requiring demolition and recasting of the roof with stronger double-T beams. The reconstructed roof was completed by December 1998. Monitoring of summer and winter data was scheduled from January 1999 to study long-term performance.

Brick masonry vaulted building - Sidaganahally, for solar passive cooling.

7) Bio-diversity Conservation Prioritisation Project

This project, led by IISc and KSCST, aimed to document biodiversity knowledge and conservation strategies across Karnataka. Eleven villages representing coastal, malnad, pilgrimage, industrial, and dry zones were selected for study. People's Biodiversity Registers (PBRs) were prepared to record ecological knowledge, biodiversity use, and village development aspirations. These registers, maintained at local panchayats, ensure people's knowledge is preserved as a community resource. India's first-ever PBR in the local language was released at Mala village, Dakshina Kannada, on 5 June 1997. In total, nine PBRs were completed in Karnataka, marking a milestone in participatory biodiversity documentation.

People's Biodiversity Registers (PBRs) prepared and released at each PBR sites.

8) Heavy metal pollution in soils of a watershed contaminated by sewage and industrial effluent from Bangalore Urban area

A study by UAS, GKVK and NBSS & LUP examined heavy metal pollution in soils and waters of the Vrishabhavathi watershed, Bangalore. Rapid urbanisation and industrialisation caused untreated effluents and wastes to enter irrigation systems, contaminating soil, groundwater, and crops. Field investigations involved mapping land use with satellite data, documenting polluted irrigation areas, and collecting ~100 soil and multiple water samples. Laboratory results showed significantly elevated metals in polluted soils (Fe 368 mg/kg, Zn 79 mg/kg) compared to unpolluted soils. Plant samples also revealed high levels of Pb, Ni, and Zn, indicating uptake into the food chain. Pot culture experiments on fodder and cereals are underway to study heavy metal accumulation and risks to agriculture.

9) Genetic improvement of the medicinal plant Catharanthus roseus (L.) G. Don for its alkaloid contents and yield

The project at CIMAP, Bangalore, focused on improving Catharanthus roseus, a medicinal plant valued for its alkaloids. Mutagenesis using ethyl methane sulphonate and N-ethyl-N-nitroso-urea produced 15 mutants with varied biomass, branching, pollen fertility, and alkaloid levels. Three mutants showed 25–30% higher alkaloid content in roots and leaves. Specific mutants such as NEU 17-1 (leaf alkaloids) and NEU 24-17 (root alkaloids) were identified. Crosses between high-alkaloid mutants (NEU 107 and NEU 217) generated promising recombinants. Ongoing work focuses on stabilizing these traits for commercial cultivation.

10) Productivity of sugarcane lines obtained through tissue culture under problem soil conditions of Karnataka

At Gulbarga University, tissue-culture-derived sugarcane somaclones were evaluated for productivity under saline and sodic soils. Trials assessed photosynthetic

efficiency, ion uptake, sucrose metabolism, and morphological traits. Ratoon performance studies at Aland Sugar Factory and Ugar Sugar Works showed superior growth, yield, and sugar recovery in GS lines compared to original clones. Salt tolerance screening at Gangavati confirmed better early growth under stress. Performance was particularly good in ratoons during February–March compared to standard varieties CoC 671 and Co 8014. The technology proved useful for rapid screening and enhancing sugarcane productivity in problem soils.

11) New Section: Genetics of drought resistance and breeding for drought resistance in upland rice (Oryza sativa L.)

UAS Dharwad initiated a breeding programme to develop drought-resistant upland rice suited for Karnataka's 2.2 lakh ha rainfed areas. Eighteen genotypes, including resistant land races and improved varieties, were selected in 1997. Hybridisation produced 60 successful crosses under a line × tester design. Trials in 1998 tested parents and hybrids under stress (15 days irrigation withheld) and non-stress environments. Data on flowering time and yield were collected, with detailed analysis ongoing. F_2 populations were grown in Kharif 1998 for evaluation, aiming to incorporate physiological and biochemical drought resistance into high-yielding genotypes.

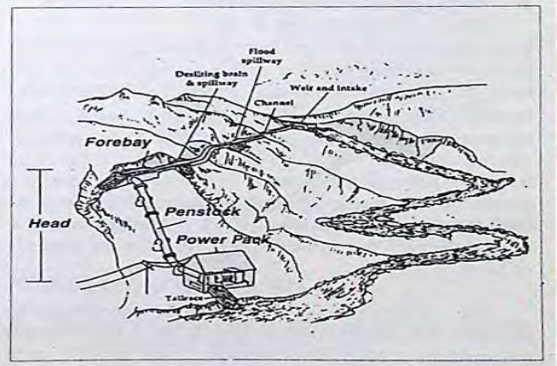
12) Development & Dissemination of Lime Based Building Blocks

IISc developed steam-cured lime-stabilized mud blocks to promote durable, eco-friendly building materials. Soil types tested included black cotton, tank bed, and red loamy soils, blended with lime and pozzolanas like fly ash and red mud. Steam curing at 80°C for 16 hours achieved strength comparable to 28-day ambient curing. Optimal results came from 12–16% clay with 15% pozzolana, while lime >10% improved long-term strength. A small steam-curing plant with 1000-block capacity was designed using a hybrid boiler system at 65% thermal efficiency. A production unit manufactured 12,000 blocks with 0.9 MPa wet strength in 7 days, demonstrating scalable, cost-effective technology.

KSCST Projects (1998-1999)

1) Energy – Microhydel Demonstration at Elneer Project

DST identified Elneer in Dakshina Kannada as a priority microhydel site, with 57.85 m net head and 60 lps discharge for 20 kW output. About 35 unelectrified houses stand to benefit. Initial community concerns over irrigation water were resolved through dialogue, leading to voluntary labour and funding support. Civil works like weir, penstock, powerhouse, and tail channel were completed by 1998. Electro-mechanical systems include a crossflow turbine, brushless alternator, load controller, and automatic shutdown. Commissioning in April 2000 was expected to bring electricity to villagers, with tariffs based on subscribed load rather than metering.



A schematic diagram of Microhydel installation

2) Action Research Centre on Biomass Utilisation (ARC on Biomass)

ARC at IISc advanced biomass gasification research through student projects, strategic studies, and village electrification pilots. Work included high-pressure gasifier design, producer gas conditioning filters, pulsed combustor testing, and gas engine studies. Field testing showed better gas quality from a 500 kW system compared to a 100 kW unit, with calorific value ~4.9 MJ/Nm³. Village models in Hosahalli and Hanumanthanagara explored user societies, financial systems, and sustainable O&M practices. Strategic research on dual-fuel engines and activated carbon production from agro-residues also progressed. ARC contributed to both fundamental R&D and practical rural electrification solutions.

3) Heavy Metal Pollution in Soils of a Watershed Contaminated by Sewage and Industrial Effluent from Bangalore Urban Area

A study in the Vrishabhavathi watershed examined soil, water, and crop contamination from untreated sewage and industrial effluent. Metals like Fe, Mn, Zn, Pb, Ni, and Cr were found at unsafe levels in water, soils, and edible plant parts. Polluted soils showed two- to three-fold higher concentrations than unpolluted lands, with metals accumulating in both surface and subsoil horizons. Sequential extraction confirmed mobility, with Ni and Cr being most mobile. Pot experiments showed reduced yields in crops like carrot and fodder grass under metal spiking. Findings warn of groundwater contamination and serious food-chain risks, stressing regulation of wastewater irrigation.

4) Genetic Improvement of the Medicinal Plant Catharanthus roseus (L.) G. Don for its Alkaloid Contents and Yield

CIMAP, Bangalore, worked on improving alkaloid yield in *Catharanthus roseus*, an important medicinal plant. Using chemical mutagenesis on the Nirmal variety,

mutants with higher biomass and altered morphology were generated. Some mutants recorded ~50% higher alkaloid content in roots or leaves. Plant spacing trials confirmed effects on overall yield. Genetic studies through backcrosses and segregating generations were initiated. Recombinants combining high leaf and root alkaloids are under development for commercial use.

5) Genetics of Drought Resistance and Breeding for Drought Resistance in Upland Rice (Oryza sativa L.)

UAS Dharwad initiated a breeding programme to develop drought-resistant rice for Karnataka's 2.2 lakh ha upland rainfed areas. Seventeen genotypes, including tolerant landraces and improved varieties, were crossed in a line × tester design. Sixty hybrids were evaluated under stress (15-day drought at flowering) and non-stress conditions. Traits like tillers, grains per panicle, harvest index, and root characteristics were studied. Amruth, Rasi, Dodiga, and Bilkalavi were identified as strong donors, while hybrids like Amruth × Jaya and Rasi × Jaya showed superior yield and stability. Results highlight additive genetic effects, supporting selection-based breeding for drought resistance.

6) Identification and Development of Moisture Stress Tolerant Lines through Pollen Selection in Sorghum

UAS Dharwad developed in vitro pollen germination methods to screen sorghum for moisture stress tolerance. Polyethylene glycol (PEG) was used to simulate stress, with tolerant genotypes like RSLG-262 maintaining higher germination at 36% PEG. Field trials assessed drought tolerance at the whole-plant level, measuring traits like chlorophyll content, water retention, and yield. Isozyme analysis and seed germination studies were carried out to compare tolerant and susceptible lines. Correlations between gametophytic and sporophytic tolerance are being evaluated. Selective fertilization experiments under stigma stress were conducted, with progeny evaluation planned for Rabi 1999 to develop stable drought-tolerant sorghum.

7) Development And Dissemination of Lime Based Building Blocks

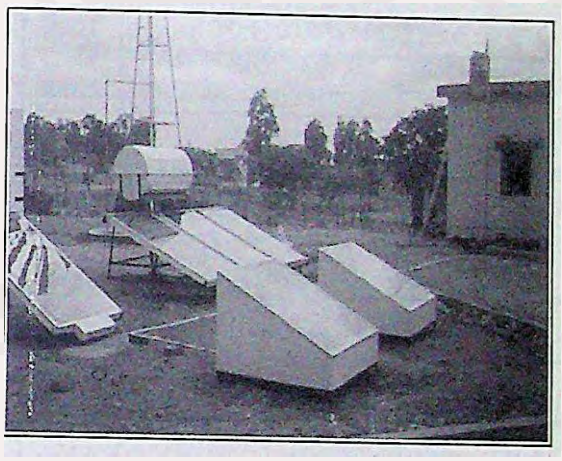
The project at IISc aimed to develop and promote steam-cured lime-based mud block technology for sustainable building construction. Laboratory studies showed a 2–6 fold strength increase with steam curing at 80°C for 16 hours compared to 28 days of ambient curing. Strength gains were steep in the first 20 hours, and the addition of 10–20% pozzolanas like fly ash or red mud further improved performance. An ideal mix was found with 12–16% clay and 10% lime plus 15% pozzolana. A production unit with mixers and block machines produced 12,000 blocks, achieving compressive strength of 4–9 MPa. These blocks were successfully used in constructing a three-storey load-bearing masonry building at IISc, proving their practical viability.

Halumannu deposit at Managuli, Basavanabagewadi taluk of Bijapur district.

KSCST Projects (1999-2000)

1) Energy Park

The Energy Park initiative by KSCST aimed to raise public and student awareness of renewable energy through site-specific demonstrations. By March 2000 ten parks were sanctioned to institutions across Karnataka, of which five had been completed. Participating colleges included BVB College Hubli, JNNCE Shimoga and KREC Surathkal among others. Installed devices comprised solar water heaters, PV streetlights, solar pumps, biomass gasifiers and solar cookers. Funding for individual parks ranged from Rs. 88,000 to Rs. 8,76,000 and notable completions included Melukote and SJCE Mysore. The programme demonstrated renewable technologies in educational settings and supported local adaptation and learning.



2) Investigation On Modified Black Cotton Soils from Karnataka

At BVB College, Hubli the team investigated modified black cotton soils to assess their suitability for construction. The work surveyed deposits in five districts and collected 16 representative samples for physico-chemical and engineering tests. Modified soils—aged mixes of black cotton soil with wood ash and organics—were characterized for reduced plasticity, lower swell–shrink and improved strength. Stabilized Mud Blocks (SMBs) produced with 6–7% stabilizer showed compressive strengths of about 5–8 MPa, outperforming blocks made from natural soils. The project involved local college faculty for survey, testing and training to ensure sustainability and scale-up. Benefits included lower construction cost, use of waste materials, reduced fired-brick demand and potential for rural housing adoption.

3) Identification and Development of Moisture Stress Tolerant Lines in Sorghum Through Pollen Selection

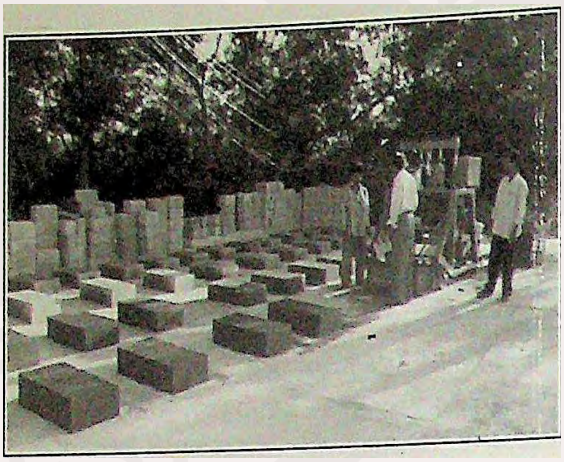
The sorghum pollen-selection project developed in-vitro screening techniques to identify gametophytes tolerant to moisture stress. Specialized media were standardized because conventional PEG-based media were ineffective for pollen germination under stress. Pollen grains were exposed to controlled moisture stress and characterized biochemically using enzyme markers such as peroxidases and catalase. Promising pollen-selected lines were integrated into breeding through selective fertilization and subsequent field trials of cultivars and landraces. The approach demonstrated a gametophyte-level route to develop moisture-stress tolerant sorghum with improved yield stability. Outcomes included enhanced drought resilience in selected lines and insights into gametophyte–sporophyte associations useful for breeding.

4) Genetics of Drought Resistance and Breeding for Drought Resistance in Upland Rice

The upland rice programme combined physiological, biochemical and genetic analyses to breed drought-resistant genotypes. Eighteen genotypes, including drought-resistant landraces and high-yielding varieties, were evaluated under field drought conditions. Traits such as water retention and enzyme activities (peroxidases, catalase, superoxide dismutase) were measured to identify tolerance mechanisms. Genetic studies sought to link these physiological and biochemical traits into breeding lines with high yield potential. Field trials in Malnad zones demonstrated improved yield stability for some drought-tolerant genotypes under moisture stress. The work aimed to provide economically viable, environmentally sustainable upland rice varieties for rainfed agriculture.

5) Indo-Norwegian Environment Programme (INEP)

The INEP, coordinated by B.S. Ramaprasad, supported integrated environmental projects in Karnataka with funding from the Norwegian Embassy to promote sustainable resource management, pollution reduction, capacity building and pilot demonstrations. Activities included urban environment improvement, restoration of Madivala and Hebbal lakes, Chamundi Hills ecological work, pico-hydel demonstrations, fly-ash utilisation, bioreactors for coffee effluents and ex-situ conservation of endemic plants. The programme emphasised technology demonstration, community involvement and institutional capacity building to tackle pollution and biodiversity challenges. Financial assistance of about NOK 36 million enabled measurable outcomes such as lake restoration, pico-hydel electrification and fly-ash valorisation. INEP's integrated approach produced quantifiable environmental and social benefits and enhanced local technical skills. Landmarks from 1999–2000 included project launches and the commissioning of the Elaneer micro-hydel plant in December 2000, illustrating the programme's multi-year impact.



KSCST Projects (2000-2001)

1) Energy Park Project

The Energy Park Project, sanctioned by MNES, was designed to create awareness about renewable energy through demonstrations of devices for students and the public. Ten energy parks were sanctioned across Karnataka between 1994–99 with sanctioned amounts ranging from Rs. 88,000 to Rs. 8,76,000. Institutions such as BVB College Hubli, Jawaharlal Nehru National College Shimoga, and the Academy of Sanskrit Research Melukote received funding support. Devices installed included solar PV streetlights, solar pumps, lanterns, cookers, and solar water heaters. For example, KLES's College of Engineering in Belgaum used its first-phase grant to install renewable devices and spent Rs. 77,464, with the second instalment pending release. The project remains in progress, continuing to spread renewable energy awareness through site-based demonstrations.

2) 20 kW Micro Hydel Power Plant at Elaneer

The Elaneer micro hydel project was implemented by KSCST to harness perennial streams in the Western Ghats for decentralized power generation. Using the Mavinasasi stream, a 20 kW, 25 kVA plant with a 58 m design head and cross-flow turbine was built to provide electricity to 37 households and temples. Commissioned on 14 December 2000, the project was executed with guidance from IISc and support from TIDE Technocrats, Bangalore. The total cost was Rs. 20.48 lakhs, with contributions from DST, KSCST, and villagers through labour and material donations. A local committee was formed to manage electricity charges and oversee daily operations. The project successfully demonstrated sustainable community-managed electrification in rural Karnataka.

3) Technical Back-Up Support Unit (TBU) for NPIC

KSCST has served as a TBU under the National Programme on Improved Chulhas since 1988–89, aiming to conserve fuelwood and improve rural women's living conditions. During 2000–2001, R&D included developing a single-pot fireclay stove with a cast iron plate and a tapered venturi, and testing ferro-cement Sarala stoves with efficiencies of 23–29%. Field demonstrations were conducted at multiple sites, showcasing fuel-efficient biomass devices. Training programmes were organized for entrepreneurs and agricultural officers on stove construction and maintenance. In addition, stove components were tested and certified for ISI approval, supporting manufacturers.

With MNES funding and IISc's technical support, KSCST advanced improved cooking technology across rural areas.

4) Testing and Certification of ASTRA/SARALA Stove Components and Portable Metallic Stoves for ISI Mark

The Technical Backup Support Unit (TBU) at KSCST is responsible for testing portable stoves submitted by manufacturers to evaluate their thermal and combustion efficiency as per ISI requirements. During the reported period, four portable metallic stoves were tested and approved for the ISI mark after meeting the prescribed standards. Certificates of approval were issued to firms such as Sundrine Industries, Bangalore, and Vijayalakshmi Industries, Andhra Pradesh, for their Sarala and ASTRA stove models. The programme has been implemented with financial support from the Ministry of Non-conventional Energy Sources (MNES). KSCST also received technical support for testing and certification activities from the Government of India and expert guidance from Prof. S.S. Lokras of IISc. This initiative ensured that improved stove designs met quality benchmarks while promoting fuel-efficient technologies in rural households.

5) Genetics of Drought Resistance and Breeding for Drought Resistance in Upland Rice (Oryza Sativa L.)

This project at UAS Dharwad addressed severe yield losses in Karnataka's 2.2 lakh hectares of rainfed upland rice due to moisture stress. The goal was to understand physiological and biochemical traits of drought tolerance and integrate them into breeding programs. Eighteen genotypes, including known tolerant lines, were selected for study under two contrasting conditions: continuous irrigation (E1) and induced moisture stress (E2). F1 hybrids and parental lines were planted in both environments to evaluate performance under stress. Soil moisture depletion was monitored using gypsum blocks, and 25-day-old seedlings were transplanted to the main field for evaluation. The research focused on identifying desirable traits for breeding drought-resistant, high-yielding upland rice genotypes.

6) Ecological Dynamics of Small Farm Operations in Karnataka and Their Potential for Organic Farming

This project studied the ecological and economic sustainability of small farms, which face challenges under costly conventional agriculture. Most small farmers in Karnataka operate on 1–4 hectares and earn only 1–2% of household income from farming. The study aimed to integrate ecological dynamics into farming systems and explore organic alternatives. Involving 150 farmers across five agro-ecosystems, it evaluated soil conservation practices and their effect on soil health. Soil samples from 30 farms revealed higher organic carbon levels in organic farms (1.0–2.5%) compared to small (0.25–1.25%) and large farms (0.25–0.35%). The results highlighted organic farming's potential for improving soil fertility, profitability, and sustainability in small farm systems.

7) Identification and Development of Moisture Stress Tolerant Lines in Sorghum Through Pollen Selection

The sorghum project at UAS Dharwad focused on developing drought-tolerant lines by using pollen selection as a screening tool. Pollen grains were subjected to in-vitro stress conditions using specially developed germination media. The study examined biochemical responses such as enzyme activity (peroxidases and catalase) to identify markers of stress tolerance. Genotypes were tested for pollen germination under moisture stress, and data was used to estimate gametophyte–sporophyte associations. Selective fertilization was applied to transfer tolerance traits to subsequent generations. The approach offered a novel, faster method for breeding sorghum lines capable of withstanding drought conditions.

8) Monitoring and Understanding the Multiple Functions of Agricultural Biodiversity in Selected Two Sites of Western Ghats in Karnataka

This project examined the importance of agricultural biodiversity in providing ecosystem functions and ensuring food security in Karnataka's Western Ghats. It studied contributions of biodiversity to soil nutrient cycling, pollination, pest control, and sustainability. Research was carried out in Udupi district and Holanagadde in Uttara Kannada, documenting indigenous crops and varieties. A final action plan for conserving crop genetic diversity was prepared, based on farmer practices and ecological findings. The project also highlighted a paddy landrace that adapted from drought-prone conditions to irrigated fields, showing strong potential. The study emphasized conserving traditional knowledge and biodiversity to sustain agro-ecosystems.

9) Environmental Impact of Cyanide-Leached Residues at K.G.F., Karnataka

This project investigated the risks of cyanide-leached residues generated by heap leaching at Bharat Gold Mines Limited (BGML), Kolar Gold Fields. About 32 million tonnes of residue containing free cyanide and toxic metal complexes were identified as potential threats to soil and groundwater. Chemical and physical characterization of the residues was carried out, along with leaching tests to analyse contamination potential. Extensive subsurface soil and groundwater investigations were conducted to assess spread of pollutants. Safe utilization technologies were explored, including using residues as sand replacements in mortar or stabilized building blocks. The study aimed to mitigate environmental hazards while finding productive uses for the vast waste generated.

10) An Attempt Towards Community Based Conservation Programme in Savanadurga Reserved Forest, Karnataka

This project promotes community-based, participatory conservation in the biodiversity-rich Savanadurga Reserved Forest, focusing on medicinal and other valuable plants. It aims to map species abundance and spatial distribution and to quantify density and productivity of locally used non-timber forest products (NTFPs). The programme studies harvesting impacts to identify sustainable harvest levels and to establish community-run resource monitoring. Baseline socio-economic surveys and contacts with local people have been initiated to record incomes and aspirations. Village forestry and participatory approaches are being documented to understand how community involvement affects conservation outcomes. The project seeks to motivate sustainable use while tailoring conservation plans to local needs.

11) Utilization of Nutrient Rich Organic Sludge in Afforestation of Wastelands in Karnataka

This study examines using nutrient-rich municipal and agro-industrial sludges to reclaim degraded red and black soils through afforestation. Objectives include characterizing wastelands, assessing sludge suitability, quantifying soil property changes, and monitoring heavy metal accumulation under different sludge applications. Field and pot experiments are being run with four sludge types (distillery, domestic, paper mill, sugar industry) and contour trenches at selected afforestation sites. Tree species tested include Melia dubia, Pongamia, and Azadirachta indica planted at a four-foot spacing. Pot culture trials simulate field conditions to evaluate growth and soil responses under controlled settings. The project aims to convert bulky waste into a resource for land reclamation while tracking environmental safety.

12) Environmental Impact of Cyanide-Leached Residues at K.G.F., Karnataka

This investigation addresses environmental and health risks from ~32 million tonnes of cyanide-leached residues produced by heap leaching at Bharat Gold Mines Limited (KGF). The work includes chemical and physical characterization of residues, leaching tests of contaminants, and extensive subsurface soil and groundwater sampling to map contamination extent. A key objective is to develop safe bulk-utilization options—such as replacing sand in mortar/concrete or making stabilized construction blocks—to mitigate disposal hazards. Methodology reviewed the heap leaching process that generated the residues and traced potential routes for cyanide and metal-cyanide complex release depending on pH. Results underscore significant contamination risk to groundwater and ecosystems if residues

are left untreated. The project therefore combines hazard assessment with remediation and beneficial-use strategies.

13) Research and Development in Small Scale Industries in Karnataka

This survey-based study evaluates R&D and technological innovation in Karnataka's tiny and non-tiny small scale industries (SSIs) to understand their contribution to competitiveness and economic performance. Between November 1999 and April 2001, 1,198 non-tiny and 648 tiny units were surveyed using a structured questionnaire, and data entry is ongoing for detailed analysis. Findings indicate that most units achieved quality improvement, reduced rejection rates, and increased output—key outcomes of their R&D efforts. R&D intensity was higher in the tiny sector (0.99) than in the non-tiny sector (0.79), with activities concentrated in Bangalore Urban and sectors like food, machinery, metal products, rubber, plastics, and chemicals. The study aims to correlate R&D investments with productivity and to map geographic and sectoral patterns of innovation. The ultimate goal is to inform policy measures that strengthen SSI technological capability and competitiveness.

14) Natural Resources Data Management System (NRDMS)

NRDMS, coordinated by KSCST since 1992–93 with DST and state funding, is building district-level geospatial databases through a network of centres to support planning and resource management. Thirteen district centres generate thematic maps and databases—examples include Belgaum (polling booth maps, water quality, rainfall), Dharwad (health, drinking water, disease monitoring), and Hassan (panchayath constituency and school/office mapping). Centres produce resource atlases, village-level maps, groundwater potential maps, and application-specific products such as decision support systems for rural water supply. The programme emphasizes GIS use for administrative, environmental, and planning tasks and validates tools like ARC/INFO and ARC/VIEW for local needs. NRDMS outputs include digitized maps, databases on infrastructure and natural resources, and pilot projects demonstrating local decision-support. The initiative strengthens local planning capacity by making spatial information accessible for governance and development.

15) Educational Facilities Upgradation using GIS

This project supports district administrations in planning and upgrading educational facilities through GIS-based analysis. The methodology for upgrading Lower Primary Schools (LPSs) to Higher Primary Schools (HPSs) includes mapping village boundaries, road networks, and existing HPSs, creating 2.5 km buffer zones, and selecting villages outside these buffers with existing LPSs. For locating new LPSs, a 1 km buffer is applied around existing schools, and villages outside these areas with over 200 people and at least 20 children aged 0–6 are identified. Villages falling outside the 2.5 km buffer of HPSs and new LPSs are then chosen as sites for new HPSs. This ensures systematic identification of underserved areas and equitable access to primary education. The approach combines population data with spatial analysis to guide effective educational infrastructure planning.

District Centre Activities: District NRDMS centres in Karnataka apply GIS and database management for planning and administration. In Belgaum, databases on water quality and rainfall were developed, along with election maps for Gram and Taluk Panchayats. Uttara Kannada maintains irrigation tank and rainfall data, using it for rehabilitation maps under the SEABIRD project. Kolar has focused on university and college databases, while Dharwad uses GIS to monitor disease spread. Hassan prepared constituency maps and school location data, while Mangalore developed a decision support system to assess educational infrastructure. Together, these centres showcase diverse applications of GIS for local governance, infrastructure planning, and resource monitoring.

16) Indo-Norwegian Environment Programme (INEP)

The Indo-Norwegian Environment Programme was launched in Karnataka in 1997 with the aim of sustainable natural resource management and pollution control. Major projects include urban environment improvement in Bangalore, restoration of Madivala and Hebbal lakes, and an ecological programme for Mysore. Other initiatives include decentralized pico-hydel projects in hilly areas, fly ash utilization at Raichur Thermal Power Station, and ex-situ conservation of Western Ghats plants. Further projects address iron ore waste reuse, clean coffee effluents treatment, and biomedical waste management in Gulbarga. Financial assistance from the Norwegian Embassy has been central, supporting multiple institutions and NGOs. The programme represents a comprehensive approach to addressing environmental and energy challenges in Karnataka.

17) Natural Resources Data Management System (NRDMS) - Tumkur District Centre

The Tumkur NRDMS Centre, set up in 1998, manages spatial and non-spatial data with support from the Karnataka State Remote Sensing Application Centre. It has procured thematic maps at a 1:50,000 scale and collects village-level infrastructure data for planning purposes. As of March 2001, the overall programme cost reached Rs. 295.30 million, with Rs. 182.46 million contributed by the Norwegian Embassy. Key projects include ecological improvement for Mysore, urban environment management, lake development, fly ash utilization, pico-hydel projects, and biomedical waste management. These projects are implemented through partnerships with government agencies, NGOs, and academic institutions. The programme has built strong capacity in GIS-based planning and sustainable development across Karnataka.

18) Student Projects Programme (SPP)

The Student Projects Programme was initiated in 1977–78 to engage students in solving developmental challenges through science and technology. The objectives are to encourage creativity, improve problem-solving methodologies, and enrich student education. By 2000–2001, KSCST had supported 1,266 projects, including 216 in that year across 30 engineering colleges, with Rs. 9.8 lakhs in funding. The programme has since expanded to agriculture, fisheries, medicine, dentistry, and polytechnics. Annual seminars and exhibitions showcase student innovations,

with the 2001 event inaugurated by Chief Minister S.M. Krishna at KVG College of Engineering. The programme remains a cornerstone of student-driven research and innovation in Karnataka.

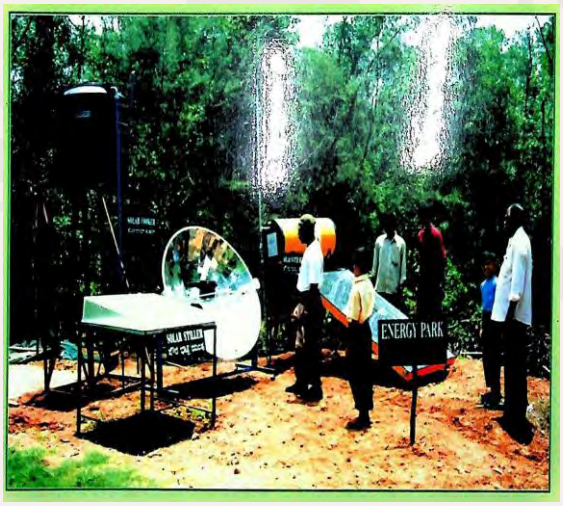
19) District-Level Data Management

District centres under NRDMS also handle data collection and thematic mapping for local applications. Shimoga has updated drinking water data and digitized slope maps for prioritizing water facilities in Bhadravati taluk. Tumkur collects village-level infrastructure data and applies GIS in wasteland development of Begurhalla watershed. These initiatives complement other district-level projects by integrating field data with GIS technology. Applications include planning of basic services like water supply, education, and health monitoring. Such efforts strengthen decentralized governance through science-based decision-making. The centres play a critical role in extending spatial technologies to local administration.

KSCST Projects (2001-2002)

1) Energy Park Project report

The Energy Park Project, sanctioned by MNES, aimed to raise public and student awareness of renewable energy through demonstration parks across Karnataka. Eleven parks were sanctioned between 1994–2002, with specific grants allocated to institutions such as BVB College (Hubli) and Mangalore University. Devices planned for installation included solar PV street and indoor lights and a 500 LPD solar water heater for the Mangalore University Park. KSCST received 50% of the Mangalore University grant and was responsible for installing the demonstration devices. A prior phase released Rs. 79,900 to KLES's College of Engineering, Belgaum, for PV streetlights, pumps and lanterns, of which Rs. 77,464 had been spent. The parks served as local demonstration and education centres to promote renewable technologies.



2) National Programme on Improved Chulhas (NPIC)

The NPIC, funded by MNES, promotes fuel-efficient smokeless cookstoves to conserve fuelwood and reduce indoor pollution, with KSCST functioning as a Technical Back-up Unit in Karnataka. The programme targeted dissemination of 18,000 improved chulhas in 2001–2002 and supported R&D, field trials, training and certification activities. KSCST's TBU developed and tested improved stove designs (fireclay, ferro-cement and pottery variants) and ran field demonstrations at universities and training centres. Training was provided to entrepreneurs and extension staff on construction and maintenance of two-pot ferro-cement Sarala stoves. The TBU also conducted testing for ISI approval and issued certificates to manufacturers whose portable metallic stoves met standards. Overall, NPIC combined technology development, capacity building, certification and dissemination to improve rural cooking efficiency.

Thermal Efficiency Tests of Chulhas: KSCST's TBU laboratory conducted thermal efficiency tests on various two-pan chulha designs submitted by manufacturers to evaluate performance for dissemination. Tested units included ferro-cement, pottery-lined and prefabricated concrete chulhas with chimneys, showing thermal efficiencies ranging roughly from 20% to 29%. The highest measured efficiency (29%) was for a two-pan ferrocement fixed chulha with chimney, while several pottery and tile-based two-pan chulhas recorded 25–27% efficiencies. Some prefabricated concrete models recorded slightly lower efficiencies around 20–24%. These measured efficiencies guided certification for ISI marking and informed choices for field promotion. The testing program therefore provided objective performance data to support improved stove adoption.

3) Impact of agricultural operations on soil and water quality in Bangalore

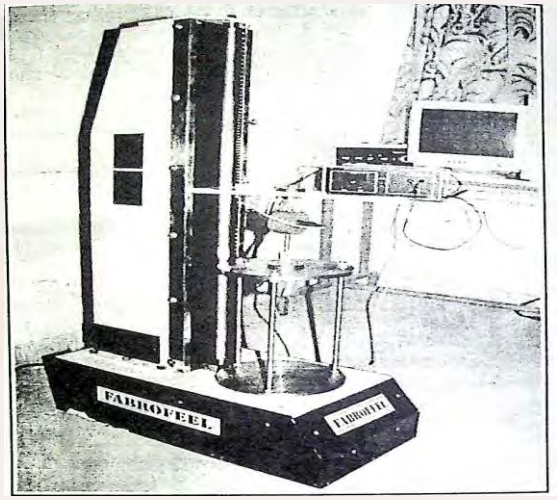
The Vrushabhavati valley study examined the impact of peri-urban agricultural reuse of treated sewage on soil and water quality, with sampling near BWSSB's treatment plant. Surface water analyses revealed elevated total dissolved solids, BOD, chloride and potassium levels, indicating contamination concerns. Groundwater (borewell) samples also showed high TDS, sulfate and potassium exceeding drinking-water tolerance levels. Sub-surface soils were generally neutral but showed accumulation of chloride, sulfate and nitrate linked to river water quality. The study recommended remedial measures to mitigate soil contamination and protect groundwater quality. Findings highlighted the need for careful management of treated sewage reuse in peri-urban agriculture.

4) Design and Development of Rice Husk Combustor for Foundries

Researchers at IISc designed and fabricated a cylindrical rice husk combustor to produce CO_2 and sodium silicate for foundry applications as a low-cost alternative. The pilot unit (700 mm diameter × 1,650 mm length) used a blower to direct air for uniform charring of rice husk and enable controlled gasification/combustion. Initial experiments showed some non-uniform charring which was mitigated by placing a heavy metal disk on the bed, and chemical analyses of char and gases were encouraging. The technology offered potential reductions in foundry fuel costs by using abundant agricultural residues. Further optimization was planned to improve uniformity and scale the design for practical use. The work demonstrated a viable pathway to valorize rice husk for industrial thermal and chemical needs.

5) Design and Development of an Equipment to Measure Handle of Apparel Fabrics

The FABROFEEL instrument, developed at Bapuji Institute of Technology, quantifies the tactile "handle" of apparel fabrics by pulling a circular specimen through a nozzle and recording force–displacement data. The apparatus uses a load cell attached to an extraction rod to measure the peak and continuous force required during extraction, producing a characteristic force-displacement curve. Mean peak-load values are used to compute a handle force metric that correlates with established KES-F and other laboratory tests. The device's simple operating principle enables textile labs and garment factories to assess fabric feel objectively. Validation showed correspondence with other standard instruments, supporting FABROFEEL's utility. The equipment enables quality control and product development by linking tactile properties to measurable mechanical response.



6) Indo-Norwegian Environment Programme (INEP)

INEP (1997–2002), supported by Norwegian aid, funded integrated projects in Karnataka to promote sustainable resource management, pollution control and capacity building. Major initiatives included urban environment improvement, restoration of Madivala and Hebbal lakes, Chamundi Hills ecological work, pico-hydel demonstrations, fly ash utilisation, and ex-situ conservation in Pilikula. The programme financed technology demonstration cells (iron-ore tailings products), bioreactors for coffee effluents, biomedical waste management and urban forestry, among others. Several projects were completed (including urban environment programmes and empowerment of sanitation workers), while others were ongoing with multi-agency implementation. INEP combined technical interventions, institutional strengthening and community participation to address environmental issues holistically. Financially, the programme mobilised substantial Norwegian and local funds to implement a portfolio of environment projects.

7) State Science and Technology Awards

The Sir M. Visvesvaraya and Sir C.V. Raman State Awards recognize distinguished contributions in science and engineering and were presented during the reporting period. Recipients of the Sir M. Visvesvaraya Award included Prof. Hombe Gowda Sharat Chandra (2001) and Prof. Amulya N. Reddy and Prof. B. V. Sreekantan (2002). Sir C.V. Raman Awardees included Dr. A. K. N. Sinha and Dr. B. L. S. Murthy (2001) and Dr. N. Balakrishnan and Dr. B. S. Harish (2002). These awards highlight notable scientific and engineering achievements in Karnataka. The ceremonies underscored KSCST's role in recognizing and promoting excellence. Awardees serve as role models to inspire research and innovation in the state.

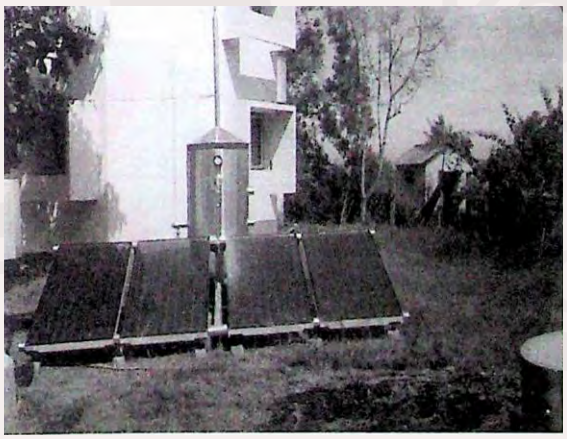
8) Landmarks of KSCST

KSCST was established in 1975 with IISc support and has since launched many state-level science and technology initiatives to address development challenges. Notable milestones include the Student Projects Programme (1977), community biogas at Pura (1982), large-scale dissemination of the Astra Ole stove (1984), and the Drought Monitoring Cell (1988). Energy milestones include the 100-kW wood gasifier commissioning (1989) and several micro-hydel installations through the 1990s and 2000s. Institutional developments included INEP secretariat establishment (1998), the SSIP (2002), a major rainwater harvesting program (2003) and a Patent Information Centre (2005). These landmarks reflect KSCST's sustained role in technology demonstration, capacity building and policy support across energy, environment, agriculture and education.

KSCST Projects (2002-2003)

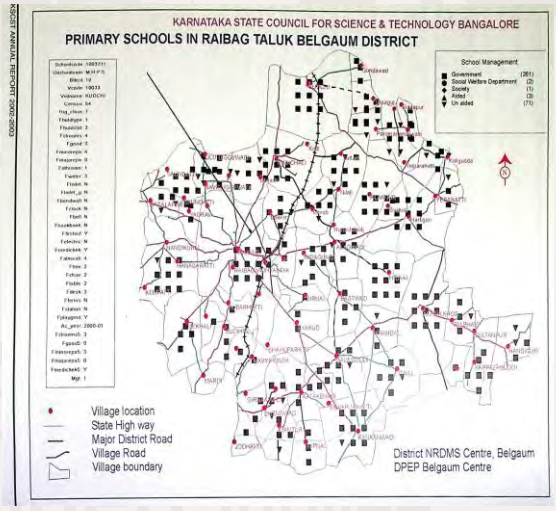
1) Energy Park (2002–03)

The Energy Park project was initiated by the Ministry of Non-Conventional Energy Sources (MNES), Government of India, with the objective of creating awareness on renewable energy among the general public, especially students. The project focused on the demonstration of renewable energy devices through the establishment of Energy Parks. KSCST was designated as the state nodal agency for its implementation in Karnataka. With financial support from MNES, Energy Parks were set up in select institutions across the state. These parks served as live demonstration centres for renewable energy technologies. They provided students and the public with practical exposure to energy conservation methods. In total, KSCST established 11 Energy Parks during this period.



2) Natural Resources Data Management System (NRDMS)

The NRDMS project was launched in 1992–93 with the support of the Department of Science and Technology, Government of India, to develop GIS-based spatial and non-spatial databases for district-level planning. It was implemented in two phases covering 16 districts, with centres located in Zilla Panchayat offices to ensure interaction with line departments and planners. The programme included activities such as technical advisory meetings, database compilation, and staff training at IIT Bombay on GRAM++ software. District centres collected and updated data on resources, demography, socioeconomy, agro-economy, and infrastructure. Special focus was given to generating maps for Common Minimum Needs like drinking water, health, and education. Shivamogga and Dakshina Kannada centres were particularly active in watershed management mapping. The Government of Karnataka also provided budgetary support for 13 NRDMS Centres in 2003–04.



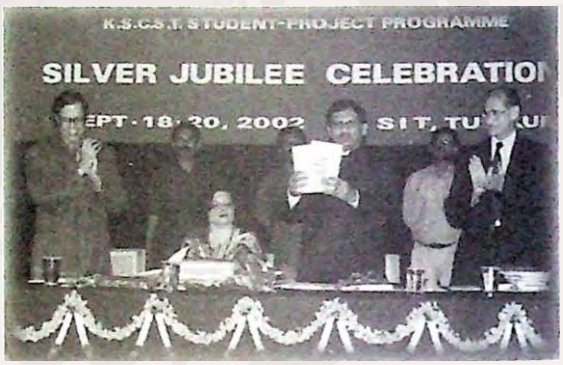
3) National Green Corps (NGC) – 2002–04

The National Green Corps (NGC) programme was launched by the Ministry of Environment and Forests, Government of India, with the aim of creating Eco-clubs in schools to instil environmental values among students. In Karnataka, the Department of Ecology, Environment and Forests entrusted KSCST with implementing the programme during

2002–03 and 2003–04. The target was to establish 2,700 Eco-clubs, and during the year 1,347 were successfully formed across the state. On average, 84 Eco-clubs were set up per district following the prescribed norms. Teachers were trained to guide students in organizing activities under the clubs. The main thrust areas included gardening, rainwater harvesting, sanitation, plantation, waste management, and energy conservation. These Eco-clubs created awareness at the grassroots level and actively engaged students in sustainable practices.

4) Student Projects Programme (SPP – 25th Silver Jubilee Series)

The Student Projects Programme (SPP) of KSCST was designed to support innovative student projects that addressed local community and industry problems relevant to the state. The 25th Series marked the Silver Jubilee of SPP and was jointly organized with Siddaganga Institute of Technology, Tumkur, in September 2002. During this series, KSCST supported 160 projects across 30 engineering colleges, of which 85 were selected for presentation at the seminar-cum-exhibition. The event included the release of an SPP brochure and a CD containing project details for guiding future research. Awards were given to outstanding projects and institutions, with B.V.B. College of Engineering, Hubli, being selected as the Best College of the Year. Eminent scientists delivered six lectures on emerging topics like biotechnology, nanotechnology, and smart materials. The event successfully highlighted student innovations and their practical relevance.



5) Scientists Students Interaction Programme (SSIP)

The Scientists Students Interaction Programme (SSIP) was initiated by KSCST to promote scientific awareness among school students by facilitating direct interaction with scientists. The programme was organized in collaboration with the Department of Public Instruction and Department of Education, targeting schools under the Mahithi Sindhu scheme. During 2002–03, seven SSIP events were conducted in cities including Mysore, Hubli, Davangere, Tumkur, Manipal, Hassan, and Bangalore. Nearly 50 scientists from IISc, universities, and local institutions participated, sharing their knowledge in areas like astronomy, medicine, physics,

biology, and ecology. A total of 295 schools and 1,215 students benefited from these programs, engaging in lively discussions and question sessions. The program was well-received and helped improve the scientific outlook of participating students. KSCST incurred an expenditure of ₹0.19 lakhs to organize these events.

6) State Scientists Award Programme

The State Scientists Award Programme was instituted by the Government of Karnataka to recognize eminent scientists through the Sir M. Visvesvaraya and Sir C. V. Raman awards. KSCST was entrusted with managing this programme. In June 2002, the council received 103 nominations for the Sir C.V. Raman awards, out of which 11 scientists were selected for the year 2000 and 10 for the year 2001. The awards were presented during the National Science Day celebration held on 28th February 2003 at J.N. Tata Auditorium, IISc, Bangalore. The function was attended by about 1,200 dignitaries and guests, with the awards presented by the Hon'ble Minister for Forest, Ecology & Environment on behalf of the Chief Minister of Karnataka. The event was presided over by the Hon'ble Minister of State for Science and Technology. A total expenditure of ₹7.72 lakhs was incurred for conducting this prestigious programme.

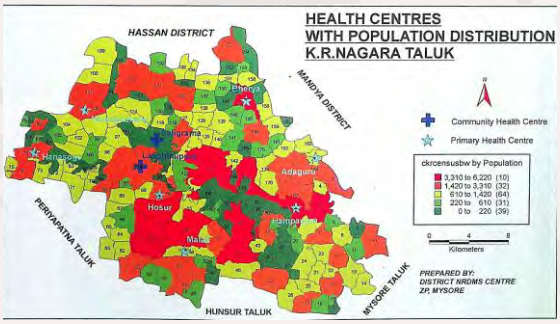
7) District Committees for Science and Technology (DCST)

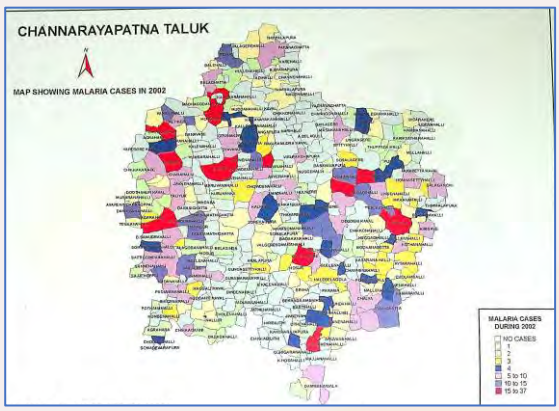
The District Committees for Science and Technology (DCST) were established by KSCST to decentralize science and technology activities at the district level. The Dakshina Kannada DCST was particularly active during 2002–03, organizing several programmes to promote science education and awareness. Key activities included a district-level science exhibition at St. Philomina High School, a quiz competition for high school students at NITK Auditorium, and a computer fair at Sri Bharathi College. The committee also conducted the Children's Science Congress with teacher training on "Food and Nutrition" and organized a district-level Science Congress at Canara College, Mangalore. Special events like World Environment Day, Ozone Day, and National Science Day were celebrated with competitions and sky observation sessions. A District Science Teachers Association was also formed to strengthen future activities, and the total expenditure incurred was ₹0.52 lakhs.

KSCST Projects (2003-2004)

1) Natural Resources Data Management System (NRDMS) – Karnataka

The NRDMS project was launched in 1992–93 with DST support to establish GIS-based databases in Karnataka's districts for planning and resource management. Implemented in two phases, it covered 16 districts, with centres set up in Zilla Panchayats for better coordination with officials. The State NRDMS Centre at KSCST guided district centres, conducted training, and compiled databases. Data was collected on natural resources, socio-economy, agro-economy, demography, and infrastructure. Thematic maps were generated for drinking water, health, education, and watershed management, especially in Shivamogga and Dakshina Kannada. These efforts built local capacity and promoted scientific planning at the district level.





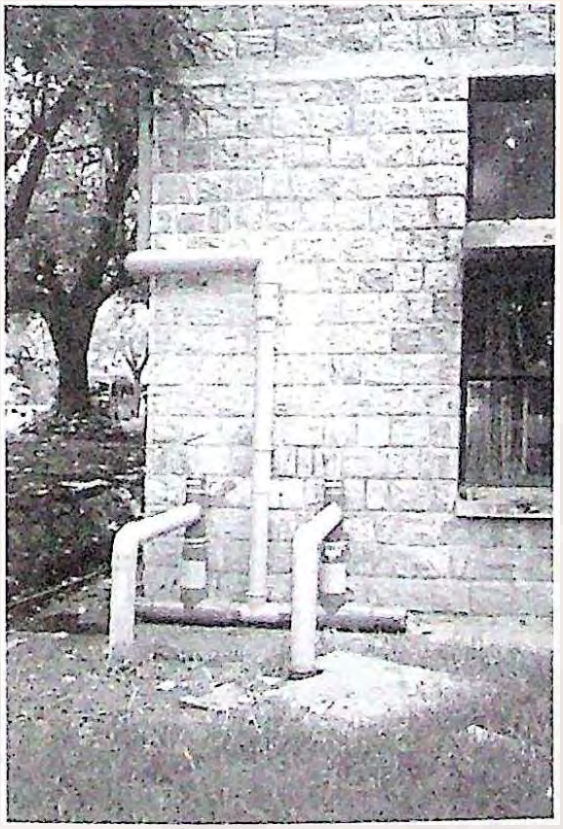
2) Rainwater Harvesting for Tumkur City

This project was initiated by KSCST with DST support and funding of ₹9 lakhs, supplemented by ₹1.3 lakhs from local contributions. It aimed to promote urban water conservation in Tumkur through awareness and demonstration structures. The project was formally inaugurated on 9 September 2003. Activities focused on sustainable use of rainwater resources in the city. The initiative encouraged community participation in adopting simple, low-cost harvesting systems. An expenditure of ₹0.86 lakhs was reported during the year.

S/N	Project components	% planned	% progress	Planned	Achieved
1	Survey & Plan for 10 sites	100%	100%	10	10
2	Survey & Plan for exhibition plot	100%	100%	1	1
3	Rainfall data for Tumkur 100 years	100%	100%	1	1
4	Awareness campaigns	100%	67%	3	2
5	Exhibition plots	100%	50%	1	0.5
6	Workshops & Training Programmes	100%	50%	4	2
7	Demo Plots	100%	90%	10	9
8	Project Management	100%	75%	24	18
9	Pubilicity Meterial & Documentation	100%	25%	4	1

3) Rainwater Harvesting for Bengaluru City

Implemented with a Norwegian grant of ₹41 lakhs under the Indo-Norwegian Environment Programme, this project addressed water sustainability in Bengaluru. An additional ₹6 lakhs came from local contributions. Awareness campaigns and demonstration units were set up to educate citizens and institutions on rainwater harvesting. The project emphasized reducing water scarcity through community-level adoption. KSCST reported an expenditure of ₹2.77 lakhs during the year. It became a model initiative for sustainable urban water management.



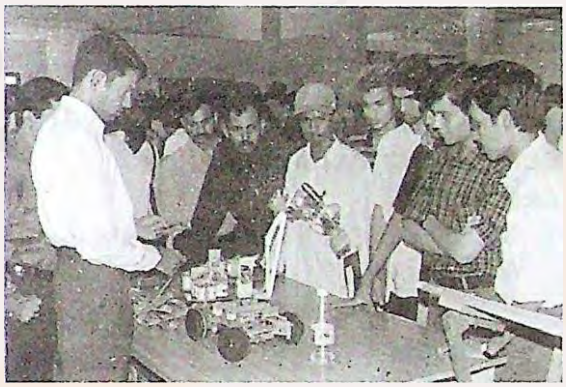
4) National Green Corps (NGC) – Karnataka

The NGC programme was launched by MoEF to establish Eco-clubs in schools and instill environmental values among students. In Karnataka, KSCST was entrusted with implementing the programme during 2002–04.

A target of 2,700 Eco-clubs was set, and 1,347 were successfully formed with 84 per district. Teachers were trained to guide activities such as gardening, plantation, sanitation, waste management, and energy conservation. Students actively participated in awareness and sustainability practices. The programme incurred an expenditure of ₹1.28 lakhs during the year.

5) Student Projects Programme (SPP)

The SPP supports engineering student projects addressing local community and industry needs. In 2003, it received 650 proposals, funding 170 projects from 37 colleges. A total of 69 projects were showcased at the Seminar and Exhibition held in Bellary. Eminent scientists delivered lectures on IT, systems engineering, product development, and water issues. Awards were given to outstanding projects, with Davangere's Bapuji Institute named "Best College of the Year." The programme incurred an expenditure of ₹13.40 lakhs.



6) Scientists Students Interaction Programme (SSIP)

SSIP was launched by KSCST to improve students' scientific awareness by enabling direct interactions with scientists.

Conducted with DSERT and Education Department support, it targeted Mahithi Sindhu schools. In 2003–04, nine programmes were held across district headquarters. Scientists from IISc and RRI interacted with rural students, answering questions on diverse subjects. Enthusiastic participation made the events highly successful. The programme cost ₹0.51 lakhs, with another ₹1.30 lakhs sanctioned for publishing a student–scientist Q&A book.

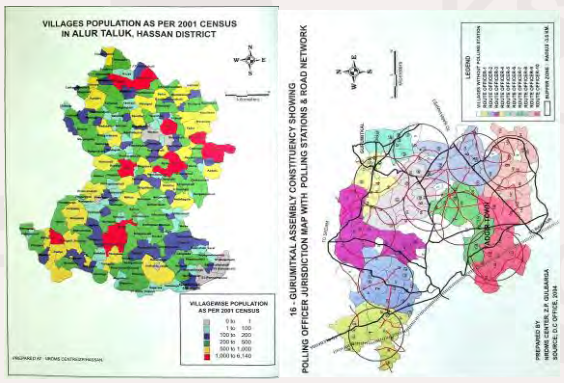
7) District Committees for Science and Technology (DCST) – Dakshina Kannada

KSCST's DCST structure decentralized science activities, with Dakshina Kannada DCST being highly active. In 2003–04, it organized exhibitions, quiz contests, elocution, and World Environment Day and Ozone Day programmes. Teacher training, sky shows, and the 48th Public Hearing on Environment and Development were also conducted. Local colleges' labs were used to give high school students hands-on science exposure. National Science Day was celebrated with demonstrations and science kits. A Science Centre at Pilikula was developed with models, telescopes, and a Taramandala for training.

KSCST Projects (2004-2005)

1) Natural Resources Data Management System (NRDMS)

Launched in 1992–93 by DST, GoI, the NRDMS programme established 16 GIS-based centres in Karnataka districts to aid Zilla Panchayat planning. Databases and thematic maps at 1:50,000 scale were created covering health, water, education, watershed, and elections. By 2004–05, 13 centres were handed over to ZPs, with KSCST continuing technical support. Applications included mapping of groundwater, rainfall, Census 2001 data, Samanya Mahiti, GP-wise data, and baseline maps for urban/NGO use. District-specific initiatives included election maps (Belgaum, Dharwad, Hassan), Village Information System (Mysore), and Watershed/health facility mapping (Tumkur).



2) Identification of Strategies for Mapping of Science & Technology Needs in a State

This project aimed to build a district/taluk-level database on problems requiring S&T interventions, addressing gaps in local-level data. Interactive GIS platforms and relational databases were developed to support decision-making in agriculture, health, housing, and natural resources. Data was collected from departments like Mines & Geology, WRD, and Health. Problem areas such as water scarcity, groundwater depletion, and quality were mapped. Health issues like TB, leprosy, sanitation, and unique problems (forest disease in Chikmagalur, solid waste in urban areas) were documented. The outcome was a framework linking local problems with S&T solutions.

3) Rainwater Harvesting in Bengaluru

Implemented under Indo-Norwegian Environment Programme, this pilot focused on augmenting water availability by recharging groundwater through RWH models in schools, industries, hospitals, and residential layouts. With Rs. 41 lakh sanctioned, low-cost and replicable interventions were demonstrated. By March 2005, 85% of funds were utilized. Major achievements included 10% spending on data collection, 73% on training, 119% on demo plots, and 68% on

RWH Training Programme

RWH at Kengeri Beedi workers Housing Scheme

project management. The project created awareness through workshops, training, and publicity materials while demonstrating the effectiveness of RWH as a sustainable water source in Bangalore.

4) Rainwater Harvesting in Tumkur

Initiated to address Tumkur's water scarcity, the project demonstrated RWH solutions through replicable models in urban contexts. Activities included consultancy, detailed site-specific surveys, awareness campaigns, and training. Ten demo plots were set up in public institutions and one exhibition plot at the RTO office. IEC materials in English and Kannada were distributed. Monitoring continued till Dec 2005, with a concluding workshop in Nov 2005. The project successfully demonstrated that RWH can supplement scarce water resources in fast-growing, non-riverine towns like Tumkur.

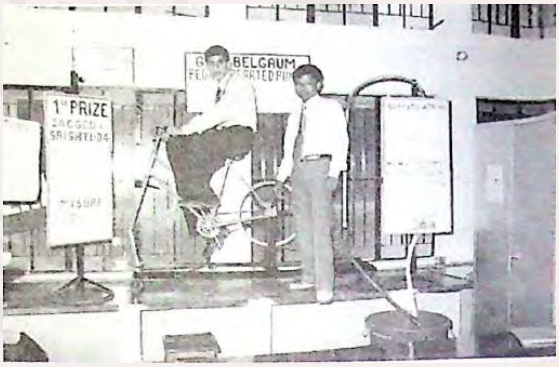
RWH Demo plot inauguration at SIT Tumkur

5) Fluoride Removal from Drinking Water by IISc Method

High fluoride in drinking water (above 1.5 ppm) causes fluorosis. This project field-tested the IISc-developed magnesium oxide-based technique in Kolar and Gadag districts. Four de-fluoridation units were installed, and water quality was monitored fortnightly. Treated water met IS 10500 standards, with villagers reporting health relief, especially from joint pains. Treatment cost was 16–28.33 paisa per litre, with each unit costing ~Rs. 2500. Demand for more units rose, but expansion faced budgetary constraints. The project showed a cost-effective solution for fluoride mitigation in rural Karnataka.

6) Student Projects Programme (SPP)

Started in 1977–78, SPP promotes problem-solving and R&D skills in engineering students. In 2003–04, the 27th series saw 465 proposals from 36 colleges; 213 were funded, and 126 showcased at Gogte Institute, Belgaum. Projects were reviewed by experts, with commendation certificates awarded. Four technical lectures on advanced materials, GPS, molecular computing, and CFD were delivered. Nitte Institute was recognized as Best College of the Year. The programme continues to bridge classroom learning with real-world problem-solving while nurturing young innovators.



7) Scientists Students Interaction Programme (SSIP)

SSIP encourages dialogue between scientists and students, sparking curiosity and scientific learning. In 2004–05, five events were held across Karnataka. Highlights include Prof. C.N.R. Rao interacting with 1000 students in Bangalore, astronomy workshops in Pilikula, and thematic lectures at IISc for selected students. Events were also held in Coorg, Dakshina Kannada, and Bangalore rural schools. Around 1500 students participated, learning about topics like ozone depletion, photoelectric effect, and the universe. The programme created an inspiring platform for students to engage with eminent scientists.

8) State Scientist Awards Programme

Instituted by GoK in 1996, the awards recognize outstanding contributions of scientists and engineers. Categories include Sir M. Visvesvaraya Senior Scientist Award, Sir C.V. Raman Young Scientist Award, Prof. Satish Dhawan Young Engineers Award, and Dr. Kalpana Chawla Young Women Scientist Award. In 2004, awards for 2002–03 were presented at IISc by CM Sri N. Dharam Singh. Senior awardees included Prof. Amulya K.N. Reddy, Prof. B.V. Sreekantan, Prof. N. Mukunda, and others. Over 800 people attended. The awards promote scientific excellence across diverse fields.

9) Formulation of Science & Technology Policy for Karnataka

In 2002, GoK formed a 10-member Expert Committee chaired by Prof. U.R. Rao, with Prof. M.K. Surappa (then KSCST Secretary) as member, to frame an S&T policy. The committee met in Feb–Mar 2005 at KSCST, identifying five priority sectors: S&T education, agriculture & food, health & nutrition, energy & industry, and environment/resource management. It also highlighted the financial and administrative implications for implementation. The policy aimed to integrate science and technology as a driver of Karnataka's socio-economic development.

KSCST Projects (2005-2006)

1) Identification of Strategies for Mapping of S&T Needs in Karnataka

KSCST created a GIS-based database to identify block- and district-level problems requiring S&T interventions. Data was generated for water, health, demography, environment, and transport sectors. Water issues included fluoride, hardness, and wastewater scenarios, while health data covered infrastructure, doctors, fertility, and HIV. Demographic data documented destitutes with disabilities, and environmental data mapped air quality in major cities. A road network map was also prepared. This project laid a foundation for localized S&T planning and monitoring.

Municipal solid waste dump fills are at various places

2) Investigation of Solid Waste Disposal Sites in Karnataka

A survey across 129 taluks in 17 districts identified 350+ dump sites with 400 soil and 250 water samples analyzed. Results showed excess nitrates, lead, sodium, chlorides in soil and unsafe levels of iron, nitrate, lead, and hardness in water. Leachate contamination was traced as a major cause. The study also highlighted poor conditions of Paurakarmikas, with over 50% facing hygiene issues. Challenges included low public cooperation and poor biomedical waste handling. Findings emphasized urgent need for improved solid waste management.

3) Formulation of Karnataka State Science & Technology Policy

A 10-member expert team led by Prof. U.R. Rao formulated Karnataka's first S&T Policy. Focus areas included education, agriculture, health, energy, industry, and environment. The committee met seven times to finalize recommendations. The final report was submitted to Hon'ble Minister Shri Basavaraja Horatti on 17th August 2005. The policy aimed at fostering technological development aligned with rapid advancements. It set a roadmap for future state-level S&T initiatives.

4) Workshop on Technology Management: Prospects and Profits

Organized with DSIR and SJCE Mysore, this one-day workshop was held on 12th December 2005. Experts including Dr. Vinay Kumar (DSIR), Dr. Ashok Kumar (Industrialist), and others delivered lectures. 119 participants attended, gaining insights into technology management, IPR, and commercialization. The workshop emphasized the role of technology in finance, manufacturing, and marketing. It highlighted the importance of research and innovation for competitiveness.

Participants benefited from expert interaction and practical exposure.

5) Workshop on Consultancy and Services Sector

Conducted jointly by Consultancy Development Centre (New Delhi), KSCST, and District Science Centre, Mangalore. The workshop addressed the role of consultants in India's infrastructure growth and export-oriented policy environment. It aimed to prepare consultancy organizations, clients, and policymakers for global competition. The event identified sectoral needs and opportunities for consultants. It was inaugurated by the Deputy Commissioner of Dakshina Kannada. About 120 delegates from various institutions participated.

6) National Meet of State S&T Ministers, Councils, and Departments with SAC-PM

Chaired by Prof. C.N.R. Rao with inaugural session by Dr. R.A. Mashelkar and Prof. V.S. Ramamurthy. Presentations were made by state S&T heads including Karnataka, Kerala, Assam, and Punjab. Discussions highlighted achievements of State S&T Councils and their role in solving local issues. Karnataka's funding model for S&T inputs to line departments was commended for replication. Challenges like inadequate funding, weak linkages, and lack of manpower were discussed. The meet emphasized networking, forecasting, and giving S&T prominence in governance.

KSCST Projects (2006-2007)

1) Identification of Strategies for Mapping of S&T Needs in Karnataka

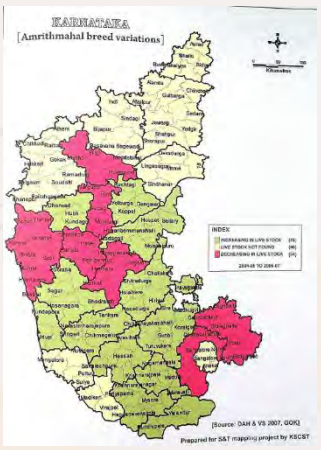
KSCST created a GIS-based database to identify block- and district-level problems requiring S&T interventions. Data was generated for water, health, demography, environment, and transport sectors. Water issues included fluoride, hardness, and wastewater scenarios, while health data covered infrastructure, doctors, fertility, and HIV. Demographic data documented destitutes with disabilities, and environmental data mapped air quality in major cities. A road network map was also prepared. This project laid a foundation for localized S&T planning and monitoring.

2) Resource Maps for Gram Panchayats – Suvarna Gramodaya Programme

KSCST prepared resource maps for 200 villages selected under the Suvarna Gramodaya scheme. High-resolution satellite data, SOI toposheets, settlement, and land records were used. Villages were geo-referenced on Google Earth with control points marked. Images were downloaded, mosaiced, and stitched into layouts. Final maps depicted resources, infrastructure, and development potential. These maps are intended for area-based development programs. The initiative supports providing urban facilities to rural areas.

3) Investigation and Characterization of Solid Waste Disposal Sites in Karnataka

KSCST and KSPCB conducted state-wide investigations in 175 taluks. Over 350 dump sites were identified, with 400 soil and water samples collected. Analyses were done by the Department of Mines & Geology. Excess contaminants like iron, nitrates, lead, sodium, and hardness were detected. Socio-economic and agricultural data of nearby communities were recorded. The study revealed serious environmental and health issues. It emphasized the need for improved waste management practices.



4) Identification of Strategies for Mapping S&T Needs in the State

This project created a GIS-based framework for identifying S&T needs. Problems in agriculture, horticulture, sericulture, and health were documented. The Rapid Appraisal Method was used for prioritization. A spatial database with unique codes and thematic maps was developed. An in-built query component

Interaction Programme at Bapuji Institute of Technology (BIET), Davanagere

enabled targeted interventions. District officers provided ground data through structured formats. The project built a roadmap for localized S&T interventions.

5) Village Infrastructure Maps of Gottigere Gram Panchayat – Total Sanitation Program

The project aimed at digital mapping for rural sanitation management. High-resolution satellite imagery and field surveys were used. Base maps highlighted major developments like roads and water bodies. Infrastructure such as drains, streetlights, and manure pits were mapped. Data was integrated with cadastral maps to show survey numbers. GIS-based maps aided better planning and decision-making. The initiative enhanced Gram Panchayat management capacity.

6) TePP Interaction Programme for Innovators

Sponsored by DSIR, KSCST organized three TePP interaction programmes. They were held in Bengaluru, Davanagere, and Belgaum in September 2006. Over 300 innovators participated across three cities. Exhibitions showcased local inventions like the magic stove and banana fibre cloth. Innovators interacted with DSIR officials to understand schemes. Faculty, students, farmers, and industrialists actively participated. The programmes created awareness and guided innovators for support.

KSCST Projects (2007-2008)

1) Karnataka State Spatial Data Infrastructure (KSSDI)

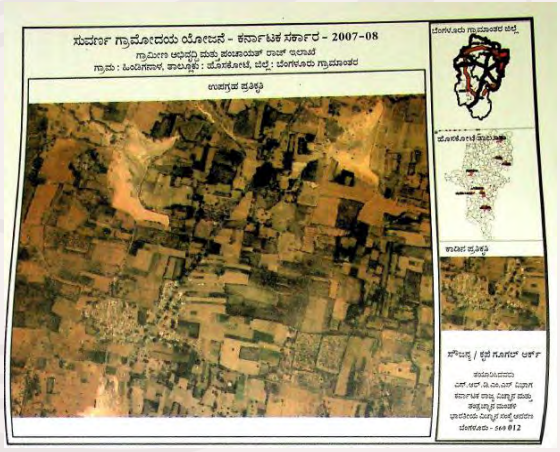
KSCST, with DST-GOI and GoK, initiated KSSDI to develop a web-based geo-portal for spatial data access. Objectives include creating a data clearinghouse and building a user-friendly system for acquiring, storing, and distributing geospatial data. An MoU was signed on 6th October 2007, and multiple committees were formed for management. Technical discussions with GIS firms were conducted, and presentations on geo-portal design were made. Preparation of the Request for Proposal (RFP) is in progress. The project follows a multi-stage process of design, prototyping, and deployment. It will enable efficient use of spatial data for governance and planning.

2) Utilisation of Kudremukh Iron Ore Tailings for Fine Aggregate in Concrete and Mortars

This project explores iron ore tailings as a substitute for scarce river sand in construction. Tailings from Kudremukh mines were collected and characterized for physical and chemical properties. Grain size analysis has been completed, and equipment procurement is in progress. A demonstration building will be constructed using tailings-based mortar and concrete. An exposure programme will engage building professionals to promote adoption. The initiative addresses environmental damage from sand mining and reuses over 200 million tons of tailings stored at Lakya Dam. It promotes sustainable, eco-friendly, and cost-effective construction practices.

3) Resource Maps for Gram Panchayaths – Suvarna Gramodaya Programme

The project supported 200 Panchayats by preparing resource maps using high-resolution satellite imagery, SOI maps, and cadastral records. Villages were selected across 10 districts, including Bengaluru Rural, Mysuru, Dakshina Kannada, Udupi, and Belagavi. Two A0-size copies of maps were handed over to each Zilla Panchayath. The maps enabled planning, monitoring, and inventory of government properties and schemes. Three training workshops were conducted in Kolar, Bengaluru Rural, and Dakshina Kannada for implementers. The initiative provided actionable tools for local development planning. It strengthened Panchayats' capacity under Suvarna Gramodaya Programme.



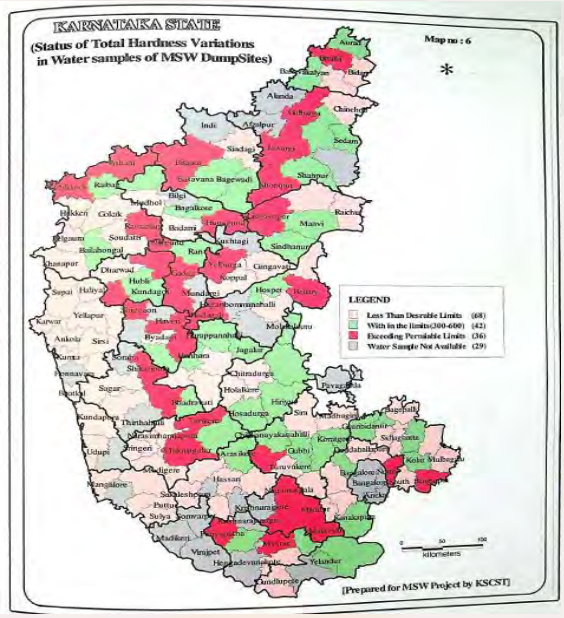
4) Identification of Strategies for Mapping of S&T Needs in Karnataka

This project aimed to inventory local-level S&T problems and create thematic GIS-based maps. Data from agriculture, irrigation, health, and other sectors was compiled using Rapid Appraisal methods. Problems were assigned unique codes and linked to administrative units on GIS.

Thematic maps were generated to visualize sector-wise needs across the state. A user-friendly database with query functions was developed for planning interventions. The study highlighted priority S&T areas for state development. The project provided a roadmap for monitoring and implementing targeted S&T programs.

5) Investigation and Characterization of Solid Waste Disposal Sites in Karnataka

KSCST and KSPCB surveyed all 175 taluks, assessing dump sites with 400 soil and water samples. Thematic maps were prepared, and 14 water and 9 soil parameters were analyzed. Results revealed contamination from municipal solid waste, including nitrates, lead, and iron. Documentation included household, agricultural, and construction waste types. Findings stressed the urgency of decentralized waste management to handle decomposable fractions locally. Western Ghats and coastal regions showed high nitrate levels, while drier northern areas showed reduced organic matter. The project provided scientific inputs for managing solid waste sustainably.



6) Assessment of Quality of Electricity Distribution Governance in Karnataka

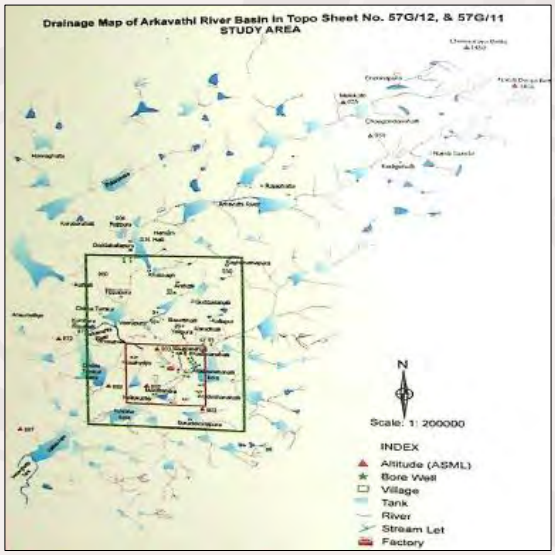
The study assessed distribution governance, service, transparency, and consumer participation in Karnataka. Surveys were conducted in 10 locations, covering households, businesses, and service stations. Around 80 samples per station were collected, providing qualitative and quantitative insights. Workshops engaged 40 students/faculty on metering, billing, and power-saving technologies. The study highlighted growing public awareness of tariff and transmission issues. It emphasized the need for greater consumer participation in governance. The project contributed to strengthening electricity sector reforms through public engagement.

7) Inventory of Existing Technologies for Biomass Gasification

KSCST and IISc's CGPL undertook this DSIR-sponsored project to inventory biomass gasification technologies. The team visited gasifier manufacturers, R&D labs, and user industries across India. Technical data was collected on rural-focused biomass gasification models. A database was developed to compile and standardize this information. The database was made accessible through the DSIR website for free use. It provided information on technology status, applications, and performance. The initiative supports rural energy access and wider dissemination of gasification technologies.

8) Study on Effluent and Hazardous Waste Management in Doddaballapur

The project addressed groundwater pollution from industrial effluents in Doddaballapur. A systemic analysis mapped flows between industries, homes, agriculture, and groundwater. Effluent generation was 4,365 KL/day, with textiles contributing 3,236 KL/day. Major polluters included Go Go Exports (34%), Denim Works-I (21%), and Himatsinka Sede (18%). Water quality analysis showed acceptable pH but high TDS levels. The study proposed the Industrial Ecology Concept for sustainable planning. It serves as a model for managing pollution in similar industrial areas.



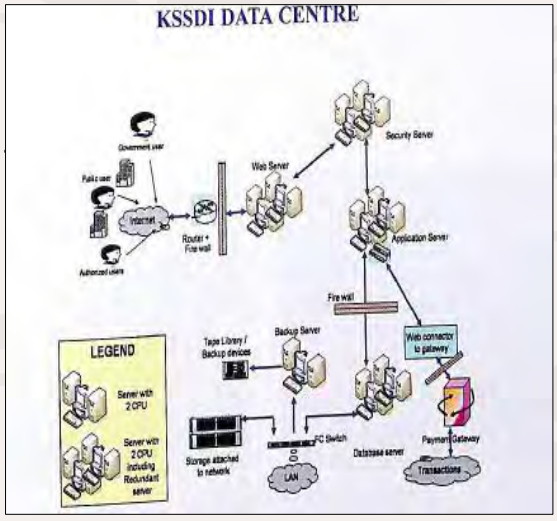
9) Design and Development of Temperature-Indicating Chalks/Crayons

KSCST developed cost-effective, energy-free temperature indicating crayons for industrial use. Over 60 formulations were created, covering a temperature range of 400°C to 1200°C. Each crayon melts within ±1% accuracy of its rated temperature. The product is user-friendly, 125 mm in length and 11 mm in diameter. The technology was commercialized with VPL Chemicals Pvt. Ltd., Bengaluru. Supported by TePP, DSIR, the project enabled widespread industrial application. The crayons provide a reliable and affordable tool for welding, forging, and heat treatment.

KSCST Projects (2008-2009)

1) Karnataka State Spatial Data Infrastructure (KSSDI

KSSDI, initiated in April 2007 by DST-GOI and GoK, developed a centralized web-based Geo Portal for spatial data access and sharing. Built using ERDAS Apollo software, it is OGC compliant and supports WMS, WFS, and WRS services. Data was standardized at Taluk, District, and State levels for seamless use. A Data Clearinghouse was created as a single-window gateway for agencies. The system supports planners, Zilla Panchayats, and line departments in local-level planning. It provides scientific decision-making support through easy access to geospatial datasets. The portal enhances e-governance by enabling transparent and efficient data use



2) Demonstration of Micro-hydel Power Plants in Hilly Areas of Karnataka

Sanctioned by DST, GoI at a cost of ₹14.29 lakh, the project demonstrated a micro-hydel plant at Vanachalu village, Coorg. A MoU was signed in October 2008 between KSCST and ERDA, Vadodara. Civil structures and engineering drawings were prepared, with site and beneficiaries identified. A willingness letter and NOC were obtained from the Gram Panchayat. Technical data was shared with ERDA to supply turbine and equipment. Quotations for civil and electrical works and HDPE pipes were invited. Designed for 90m head and 15 LPS discharge, the project aimed to power rural households sustainably.


Technical team site visit: Vanachalu, Coorg District

3) Networking for Water, Sanitation and Hygiene (WASH) – Eco Water Literacy Campaign 2008

KSCST launched a DST-GoI sanctioned campaign to promote water conservation, sanitation, hygiene, rainwater harvesting, and groundwater recharge. Awareness programs were conducted in 16 districts through road shows, rallies, essay/painting competitions, and exhibitions. Booklets, posters, and leaflets, including *Amruthavarshini*, were published in English and Kannada. Training targeted IREP engineers, IISc Ladies Club members, NGOs, teachers, and students. Working models demonstrated rooftop rainwater harvesting and recharge techniques. District-level workshops engaged local resource persons and voluntary organizations. The campaign built strong awareness in both rural and urban Karnataka.

View of training programme on rainwater harvesting organised at KSCST

4) Design and Fabrication of Paper Bag Manufacturing Machine

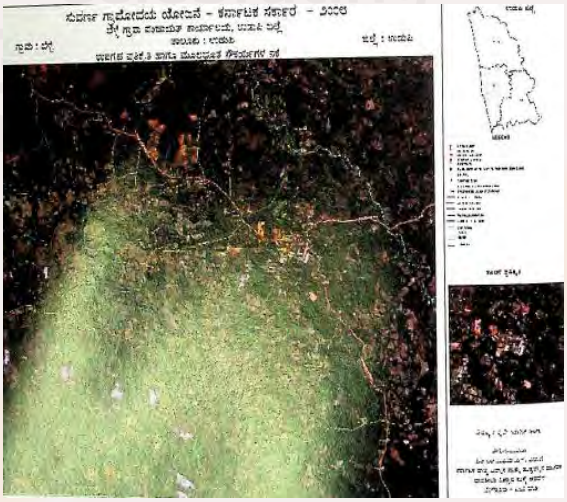
KSCST and IISc designed a low-cost machine to mass-produce paper bags from waste newspapers. Two bag types, flat bottom and box bottom, were developed, with one fully fabricated and the second under progress. The prototype produces 8 bags per minute, encouraging rural employment. A major challenge was the gumming system, which was redesigned using a cam-driven mechanism for efficiency. The machine promotes waste paper utilization and reduces plastic dependence. Domestic gum is planned to lower costs further. The project has environmental, economic, and social benefits.

5) Recovery of Metals and Disposal of Hazardous Components in E-Waste

This DST-supported project developed scientific methods for safe e-waste management, targeting metals and hazardous components. Copper was successfully leached from wires using Acidithiobacillus ferrooxidans, with complete dissolution in 11 days. Experiments extracted lithium from batteries, achieving 20.5% recovery with 0.1N H_2SO_4. Various lithium-ion cells from mobiles and computers were analyzed. A special tool was designed for safe dismantling of cells. The project addressed crude and unsafe e-waste handling by developing eco-friendly solutions. It demonstrated viable processes for recovering copper, gold, silver, and lithium safely.

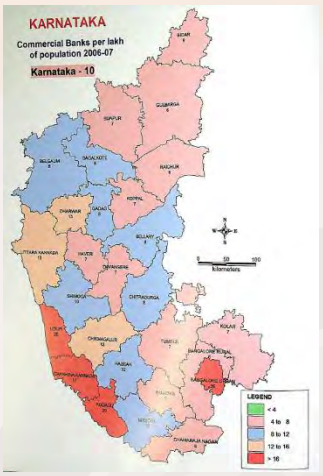
6) Resource Mapping for E-Governance in Panchayaths – Udupi District

The project created digital resource and infrastructure databases for villages using satellite imagery, GPS, and field surveys. Data on land, water, forests, minerals, demographics, and amenities was collected. Resource and habitation maps were integrated with cadastral records. Digital databases for Taluk/Zilla Panchayats were prepared for decentralized planning. Training was provided to Zilla Panchayat GPS officials for future updates. The system supports Gram Panchayaths in planning development activities effectively. It enhances transparency and quality in governance through geospatial technology.



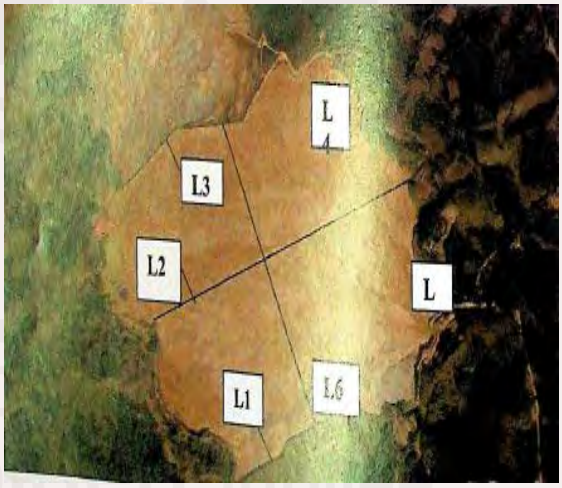
7) Planning Atlas of Karnatak

In collaboration with the State Planning Board and Directorate of Economics and Statistics, KSCST prepared a geo-spatial Planning Atlas. It compares Karnataka's development indicators with 19 states and ranks districts and divisions. The atlas includes charts and maps of development indicators. It provides critical data on economy, infrastructure, and social development. The report serves as a baseline for assessing sectoral progress. It is a first-of-its-kind publication from the Directorate of Economics and Statistics. The atlas aids planners, researchers, and administrators in future development measures.



8) Utilisation of Iron Ore Tailings for Fine Aggregate in Concrete & Mortars

KSCST and IISc studied Kudremukh iron ore tailings as substitutes for sand in construction. Six tailing samples were characterized for grain size, gravity, and composition. Mortar mixes with tailings showed maximum flow at 25% sand replacement. Relationships between flow and water-binder ratio were established. Tailings-based concrete demonstrated workability and strength within acceptable ranges. Long-term monitoring and a demonstration building are part of the project. The study shows tailings can replace scarce sand sustainably, with environmental and economic benefits.



KSCST Projects (2009-2010)

1) Karnataka State Spatial Data Infrastructure (KSSDI)

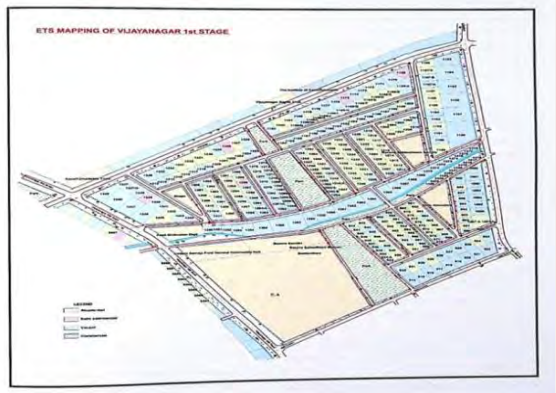
KSSDI was initiated in 2007 to establish a centralized GeoPortal for geospatial data acquisition, storage, and dissemination. The objectives were to develop a web-based portal for planners, decision-makers, and citizens, and to create a clearinghouse for spatial data from multiple agencies. The Karnataka GeoPortal was developed using ERDAS Apollo and supports OGC-compliant services (WMS, WFS, WRS). A modern Data Centre was established with IBM, CISCO, and Oracle systems. The Beta version was tested in October 2009 and officially launched in December 2009 during the 9th NSDI event. The platform now serves as a state-level gateway for spatial data sharing and planning.

Karnataka Geoportal – Login Page

Karnataka GeoPortal's – Map Viewer

2) Geospatial Databases for Urban Planning – Mysore Urban Development Authority (MUDA)

This project supported Mysore Urban Development Authority (MUDA) in developing a Web-GIS for property management and urban planning. Objectives included mapping MUDA areas, linking site plans, photographs, and property details with geospatial layers, and enabling digital monitoring. Surveying and mapping of Vijay Nagar 1st Stage was carried out using ETS, GPS, and satellite imagery. A pilot Web-GIS integrated property details, digital maps, and images, with a website created for user access. A detailed project report with technical and financial feasibility was submitted for large-scale implementation. This system aims to improve transparency and efficiency in urban property management.



3) Utilisation of Iron Ore Tailings for Fine Aggregate in Concrete and Mortars

The project investigated iron ore tailings as a replacement for sand in mortars and concretes, addressing natural sand scarcity. About 20 tons of tailings were collected from Kudremukh Iron Ore Company for detailed testing. Physical and chemical characterisation established specific gravity

(2.77–3.35) and flow properties, with optimum performance at 25% replacement. Mortar studies demonstrated 100% replacement feasibility in plastering and rendering applications. Concrete studies addressed workability, shrinkage, durability, and long-term strength. A demonstration building was constructed using tailing-based materials, and training programmes were conducted to disseminate the technology to professionals.

4) Geo-Spatial database on China

This study assessed science and technology (S&T) developments in China with a focus on education, research institutions, publications, and international collaborations. Data was compiled from public sources on universities, training institutions, and research output in fields like electronics, aeronautics, materials science, and energy. A GIS database was prepared with socio-economic indicators, S&T infrastructure, and human resource statistics. The project analysed China's thrust areas, global partnerships, and overall S&T capacity. A comprehensive report was submitted, combining spatial data with detailed analytical insights. The outcome provides a model for using geospatial tools in science policy assessment.

5) Planning Atlas of Karnataka

KSCST, the State Planning Board, and Directorate of Economics & Statistics prepared the first Planning Atlas of Karnataka. The Atlas aimed to integrate spatial and statistical data to depict developmental indicators across districts, divisions, and the state as a whole. It contains three sections: inter-state comparisons across 19 states, rank charts of Karnataka divisions, and district-wise charts/maps of key indicators. The document comprises 275 pages, with over 125 pages devoted to spatial maps and visualizations. It provides insights into economic, infrastructure, and social development, supporting policy formulation and planning. The Atlas serves as a valuable resource for academics, administrators, and policymakers.

6) Demonstration of Micro-Hydel Power Plants in Hilly Areas of Karnataka

This DST-funded project demonstrated micro-hydel generation using "Pump as Turbine" technology at Vanachalu village, Coorg. The site had a perennial stream with 80 m head, 15 LPS discharge, and 10 months of water availability. A 4 kW plant was installed with infrastructure including a weir, fore-bay tank, HDPE pipelines, penstock, powerhouse, and underground cabling. Eight houses were electrified, each with three CFL lights and one TV point. Civil and electrical works were completed in 2009, and trials showed successful generation. By May 2010, 16,260 kWh had been generated, with 4,015 kWh used by villagers and surplus diverted to a dump load.

7) Help Desk and Support Network – Rainwater Harvesting, Ground Water Recharge and Water Management Programme for Bangalore City

To address Bangalore's water crisis, KSCST and BWSSB set up an RWH Help Desk in October 2009, following the government's mandate on rainwater harvesting. The programme trained plumbers, contractors,

and entrepreneurs, building technical capacity for large-scale adoption. By March 2010, 18 training sessions had been conducted, training about 560 professionals, with a total of 800 trained overall. Fourteen awareness camps across city constituencies reached around 6,300 participants. Demonstrations were held in 106 BWSSB buildings, supported by awareness materials in print and electronic media. The initiative created a strong support network to promote sustainable RWH and groundwater recharge in Bangalore.

8) Networking for "WASH" – Eco Water Literacy Campaign 2009

DST supported KSCST's statewide campaign to promote awareness on Water, Sanitation, and Hygiene (WASH). Activities included workshops on rainwater harvesting, solid waste management, and urban lakes, as well as teacher and home sustainability training. Regional workshops in Gulbarga, Afzalpur, and Gurubhavan trained Gram Panchayat members, teachers, and NGOs. Folk art programmes (Kalajathas) carried the water conservation message to rural communities. A Kannada booklet Amruthavarshini was published as a simple RWH guide. The campaign reached diverse groups, combining scientific knowledge with cultural outreach for effective eco-literacy.

9) Recovery of Metals and Disposal of Certain Hazardous Components in E-Waste

This project developed eco-friendly methods for recovering valuable metals and disposing of hazardous components in e-waste. Work began with characterization of PCBs, cables, and lithium batteries, supported by equipment like flame photometers and pulsed power supplies. Copper recovery trials included leaching and bioleaching, achieving full dissolution in 11 days with Acidithiobacillus ferrooxidans. Lithium-ion battery studies involved safe dismantling, analysis, and leaching, with up to 20.5% lithium recovery using sulphuric acid. Processes for recovering copper, gold, and silver are under development. The project lays the foundation for sustainable e-waste management in India.

10) Status Report on Municipal Solid Waste Management, Bio-Medical Waste and Plastic Waste Management and Inventory of Recycling Units

IISc and KSCST conducted a comprehensive study on waste management in Karnataka, covering municipal, biomedical, and plastic waste. The project documented existing practices, quantified waste generation, and prepared an inventory of recycling units. A detailed report was submitted to KSCST and used by the state's Urban Development Department to guide policy. Findings highlighted infrastructure gaps and provided a framework for meeting waste management rules. The study emphasized the urgency of addressing urban waste challenges. Its recommendations now serve as a reference for strengthening waste management systems in Karnataka.

11) Geospatial Application for Urban Water Supply and Sewerage

KSCST and BWSSB collaborated to build a geospatial application for efficient water supply and sewerage management in

Bengaluru. A pilot was implemented in the Yelahanka subdivision, creating a digital database of water distribution and sewerage networks. The system linked consumer data, billing, and water supply monitoring into a web-based platform. This enabled better utility management, reduced inefficiencies, and improved service delivery. The project demonstrated the role of GIS in urban infrastructure planning. Its success provides a model for scaling to other city divisions.

12) Design and Development of Paper Bag Making Machine

IISc's Aerospace Engineering Department developed paper bag machines as alternatives to plastic, addressing pollution concerns. Two prototypes were built: a template folding type and a three-stage folding type for flat-bottom bags. Both machines produce up to eight bags per minute using a cam-driven folding mechanism. Designs incorporated hand wheels, drive shafts, and integration of all processes. Demonstration confirmed technical feasibility and functional reliability. The project shows potential for large-scale, eco-friendly bag production, reducing reliance on plastics.

13) State Level Astronomy Programme for Karnataka

To mark the International Year of Astronomy (2009), KSCST organized workshops and lectures across Karnataka. Events were held at Gulbarga University and University of Mysore, covering Indian astronomy, telescopes, eclipses, and sky observations. Chandra Lectures in Shimoga, Gulbarga, and Mysore featured eminent speakers, drawing 138–225 students per session. In total, over 700 students participated, gaining practical exposure through telescopes and sky-watch activities. Certificates were distributed to motivate participants. The programme created widespread awareness and inspired students toward astronomy and space science careers.

14) Trainers Training Programme on Sustainable Rainwater Harvesting and Ground Water Recharge in Developing Countries – HRD and Technology Transfer

Supported by DST and NAM S&T Centre, this KSCST-led programme trained international professionals on sustainable water management. Delegates from 16 NAM countries, along with Indian participants, attended 10 technical sessions on RWH, recharge methods, and watershed management. Field visits in Bengaluru, Tumkur, and Hassan gave exposure to successful models. Hands-on training was conducted at the KSCST Rainwater Harvesting Helpdesk. Participants now train around 1,000 technicians annually in their home countries. The initiative strengthened global collaboration, ensuring technology transfer and sustainable practices in water conservation.

KSCST Projects (2010-2011)

1) Karnataka State Spatial Data Infrastructure (KSSDI)

Sanctioned in 2007, the KSSDI project aimed to establish a centralized GeoPortal and Data Clearing House for acquiring, processing, storing, and distributing geospatial data. Covering all 29 districts of Karnataka, it integrated spatial and attribute datasets for planning in natural resources, demography, socio-economy, and infrastructure. The portal was developed using OGC standards for interoperability and deployed with advanced server and storage solutions. Training programs were conducted to build user capacity. The Karnataka GeoPortal was officially launched in December 2009 by the Hon'ble Union Minister of State for Science & Technology. It has since improved accessibility and promoted geospatial planning among government agencies.

2) Demonstration of Micro-hydel Power Plants in Hilly Areas of Karnataka

KSCST, in collaboration with ERDA, Vadodara, implemented a micro-hydel project in Vanachalu village, Kodagu district. The objective was to demonstrate "Pump as Turbine" technology for electricity generation in remote, hilly areas. A 4 kW micro-hydel plant was commissioned in August 2009, providing reliable electricity to eight households. Each household received power for three CFL lights and one TV point, addressing basic energy needs. Civil and electrical infrastructure such as weir, forebay, and cabling was developed.

3) Development of Animal Disease Profile and Related Profiles for Use in Disease Forecasting, Prevention, Control and Eradication of Livestock and Poultry Diseases in State

This project focused on creating a technical framework for forecasting, preventing, controlling, and eradicating livestock and poultry diseases in Karnataka. The objectives included assessing departmental needs, identifying GIS applications, and preparing a Request for Proposals (RFP) for implementing an animal disease management portal. Consultations with officials guided the analysis of hardware, software, data, and manpower requirements. The project successfully produced the RFP and bid documents to invite qualified geospatial professionals. Findings emphasized the importance of GIS-based disease mapping for effective livestock health governance.

4) Utilisation of Iron Ore Tailings for Fine Aggregate in Concrete and Mortars

The project evaluated the feasibility of using iron ore tailings (IOT) as a substitute for natural sand in concrete and mortars. Physical and chemical tests confirmed IOT as fine, inert, and clay-free material suitable for construction. Experiments showed that up to 50–60% of sand could be replaced without compromising strength. Concrete performance in terms of strength, shrinkage, and stress-strain was examined, and long-term durability is being monitored. Demonstration buildings were constructed using IOT-based masonry mortars and reinforced concrete slabs.

5) Monitoring, Evaluation, Learning and Documentation of Watershed Works under IWMP Programme

Implemented with the Watershed Development Department, this project focused on monitoring and evaluating Integrated Watershed Management Programme (IWMP) works. Covering 69 projects across seven districts of Belgaum division (2.87 lakh hectares), it aimed to assess socio-economic, environmental, and biophysical impacts using scientific and geospatial tools. Activities included baseline surveys, thematic studies, and MIS data integration. MoUs were signed with WDD and TERI for execution and socio-economic assessments. State and district offices were established, and staff recruited for implementation.

6) Development of Web-based Interactive Portal for RDPR

The project developed a GIS-enabled portal for the Rural Development and Panchayat Raj (RDPR) Department to monitor biogas plants in Karnataka. The system displays district and taluk-level maps with details of installed plants and beneficiaries. Users can search for specific villages and view beneficiary information, including names and addresses. The portal integrates geospatial data with a map viewer, ensuring dynamic updates from district-level offices. Hosted on the Karnataka GeoPortal, it supports decision-making for renewable energy programmes. The initiative improved transparency, monitoring efficiency, and accessibility of RDPR data.

7) Gram Panchayath Resource Mapping (Drinking Water Facilities) – Planning for Economic & Social Development in Chitradurga District

This project created GIS-based maps of drinking water facilities and infrastructure across Chitradurga district to support Panchayath-level planning. It focused on borewells (working and defunct), assets under NREGA, and other amenities such as health, education, and communication facilities. Data was integrated with socio-economic information into a spatial database. Each facility was geotagged with photographs for accuracy. The database enables Panchayath Raj Institutions to monitor and manage developmental activities effectively. It strengthens decision-making for drinking water management, infrastructure planning, and sustainable local development.

8) Design and Development of Paper Bag Manufacturing Machine

The project at IISc developed three low-cost machines for manufacturing eco-friendly paper bags using old newspapers and locally made gum. The first machine, a single drive model, produced simple pouches at a rate of 8 bags per minute. The second, a double drive machine, created flat-bottom bags with improved efficiency and reduced vibrations. The third machine was designed for box-type paper bags, capable of handling complex folding and gumming to produce 2–3 bags per minute. Each machine was tested successfully, demonstrating technical viability. This initiative offers a sustainable alternative to plastic bags.

9) Recovery of Metals and Disposal of Certain Hazardous Components in E-Waste

This project at IISc addressed the safe recovery of metals from e-waste while ensuring eco-friendly disposal of hazardous components. Bioleaching with Acidithiobacillus ferrooxidans achieved up to 97% copper dissolution from PCBs, while acid leaching using HCl, H_2SO_4, and HNO_3 enabled complete recovery of gold and nickel. Electrolytic deposition further ensured over 99.6% copper recovery. An innovative method peeled gold sheets using ferric chloride solutions within 18.5 hours. Characterization confirmed high-purity recovery with crystalline morphology. The results demonstrated effective recovery technologies for copper, gold, and other metals, supporting sustainable e-waste management.

10) Municipal Solid Waste Management in Karnataka

The project reviewed the status of solid waste management (SWM) in Karnataka's 219 urban local bodies, highlighting gaps in collection, transport, and processing. It noted that waste segregation at source was poorly implemented, with inefficient pushcart-based primary collection and inadequate processing facilities. Protests from locals and lack of public participation slowed the pace of implementation. Despite challenges, Karnataka received four national awards for best SWM practices in 2009, with Mysore, Bhatkal, Siraguppa, and Mangalore recognized. The report recommended decentralized, people-driven, and scientific approaches. This initiative provided critical insights for strengthening urban SWM systems.

11) Biomedical Waste Management in Karnataka

The study assessed biomedical waste (BMW) handling in Karnataka, especially in small-town hospitals that generate significant hazardous waste. While awareness of BMW rules exists, compliance is often weak, with poor segregation and frequent mixing of waste types. Many hospitals have infrastructure such as color-coded bins but implementation is compromised by lax practices and poor accountability. The use of service providers for BMW collection has improved operations but needs review for effectiveness. The report emphasized transparency in data collection, stronger accountability, and strict enforcement of rules.

12) Digital Geospatial Data Generation and Terrestrial Scanning for 3-D Reconstruction of Heritage Site at Hampi

Under the Indian Digital Heritage programme, KSCST initiated a six-month pilot project in 2011 to digitally document Hampi monuments using terrestrial scanning. The project aimed to create a geo-database, establish a geospatial framework, and develop 3D renderings of three selected monuments. With a sanctioned cost of Rs. 20 lakhs, the project focused on high-resolution scanning to aid conservation and heritage research. Administrative processes and data collection were initiated soon after the award. The project set the stage for advanced digital preservation of India's cultural heritage. It demonstrated the potential of 3D technologies in heritage management.

KSCST Projects (2011-2012)

1) Rainwater Harvesting Helpdesk

In response to the Government of Karnataka's 2009 RWH mandate, KSCST set up a Rainwater Harvesting Helpdesk in collaboration with BWSSB. The Helpdesk, inaugurated on 29 October 2009, operates at IISc and a 1.5-acre Theme Park in Jayanagar, which demonstrates various RWH and recharge methods. It has organized 46 training programs for 1,364 plumbers and contractors, and 34 awareness camps reaching about 5,000 people. It serves as a one-stop solution, offering demonstrations, phone and web consultations, and DPR preparation for 116 BWSSB buildings. The initiative has influenced policy and improved awareness through media coverage. The Theme Park remains the first of its kind in India.

2) Recovery of Metals and Disposal of Hazardous Components in E-Waste

Sponsored by DST, this project developed eco-friendly methods for recovering valuable metals and managing hazardous e-waste. It successfully completed R&D trials on copper, gold, and lithium battery disposal, achieving positive outcomes. To disseminate results, a national workshop was held at IISc in December 2011, attended by ~80 stakeholders from industry, academia, and government. Technical sessions covered recycling methodologies, hazardous waste rules, German recycling experiences, and the project's own findings. Experts presented methods for recovering precious metals and safely disposing of lithium batteries. The project raised significant awareness on sustainable e-waste management.

3) Treatment of Desiccated Coconut and Waste Water.

This project addressed pollution caused by effluents from desiccated coconut industries in Tiptur, Tumkur district. The wastewater, containing 0.5–3% coconut oil, is malodorous, rancid, and toxic to plants, leading to both profitability loss and environmental damage. The project aimed to design anaerobic digestion systems to lower fatty acid levels and explore oil recovery methods. It also sought to scientifically verify the efficiency of existing Effluent Treatment Plants. Key focus areas included waste treatment, oil recovery, and compliance with pollution standards. The study emphasized developing cost-effective, scientific solutions for industry sustainability.

4) Monitoring, Evaluation, Learning and Documentation of Watershed Works under IWMP Programme.

KSCST, with WDD Karnataka, undertook MEL&D of watershed works under IWMP across Belgaum division. The project covers 69 projects in seven districts, spanning 2.87 lakh hectares. Activities include baseline surveys, inception and monthly reports, quarterly documentation of good practices, and thematic studies on NGOs, capacity building, and community organizations. Case studies and photographs showcase achievements like rejuvenated water bodies and community participation. The project supports WDD's MIS with continuous reporting and feedback mechanisms. It enhances monitoring, learning, and decision-making for watershed development.

5) Mapping of Layout Plans of Bangalore Development Authority Using Geospatial Technologies.

KSCST initiated this project to digitize BDA's 1,500 layout map sheets and create a geospatial database for Bangalore city. Phase 1 focused on digitizing scanned sheets, while Phase 2 proposed using satellite imagery to reconstruct damaged maps. The project aimed to integrate layouts into a seamless, geo-referenced database for planning and monitoring. It also documented land use changes in consultation with BDA officials. Early outputs included sample digitized layouts and satellite-based overlays, demonstrating the approach's technical feasibility. This effort marked a major step in modernizing BDA's planning and land management processes.

6) Field Verification under Suvarna Bhoomi Yojane of Agriculture Department

KSCST provided external field verification support to the Agriculture Department for the Suvarna Bhoomi Yojane, aimed at helping small farmers shift to high-value horticultural crops. The project was implemented in Kolar, Chickkaballapura, and Bijapur districts. Objectives included field verification, mid-course corrections, and GPS-based monitoring to track scheme implementation. KSCST's role ensured transparency and scientific assessment of progress. Field evaluations were completed and the final report was being prepared. The project supported dry-land agriculture through scientific monitoring and crop diversification.

7) Assessing the Status of Kalyanis and Measures for Rejuvenation in Different Agro-climatic Zones of Karnataka State Using Geospatial Technologies

This project focused on surveying traditional water tanks (Kalyanis) in Tumkur, Hassan, and Bagalkot districts, representing three agro-climatic zones. Objectives included mapping their locations with GPS, creating a geospatial database, assessing water quality and storage capacity, and suggesting rejuvenation measures. Initial work included recruitment of staff, preliminary field visits, and creation of baseline data. Collection of spatial and non-spatial data had begun, supported by photographs. The project emphasized conservation of traditional water systems for sustainable water management. Work was in its early stages of execution.

8) Development of Organic Seedlings of Horticultural Crops by Rural Farmers and Dissemination of the Technology

This DST-sponsored project was implemented by NGO HOPE FIRST in collaboration with KSCST to promote organic farming. The focus was on training rural farmers, especially women, in producing organic seedlings using bio-fertilizers and bio-pesticides. The project aimed at standardizing organic seedling production methods and linking farmers with supporting agencies. With a sanctioned budget of ₹35.75 lakhs, infrastructure and a project office were established. Initial training programs for rural farmers were conducted, and project

staff recruited. This initiative promotes eco-friendly farming and sustainable horticulture.

9) Rainwater Harvesting Resource Center Utthan, Uttar Pradesh

KSCST partnered with Utthan to establish a Rainwater Harvesting (RWH) Resource Center at the Shambhunath Institute of Engineering & Technology, Allahabad. The center demonstrates over 25 techniques of RWH and groundwater recharge. Objectives included capacity building, training of trainers, developing course materials, and raising awareness. Work commenced with surveys, coordination meetings, and floating of tenders for execution in November 2011. Training materials, including handbooks, leaflets, and guidelines, were planned. The center is envisioned as a state-of-the-art facility to spread RWH practices in the region.

10) Bacteria Free Water for Drinking by Silver Treatment (BFWDST)

This project developed a cost-effective silver-based method for treating drinking water to remove bacterial contamination. Led by KSCST and IISc, it aimed to quantify bacterial removal, create a simple field methodology, and compare results with commercial water purifiers. The initiative addressed the urgent public health concern of contaminated drinking water in rural and urban areas. Laboratory experiments and field validation studies were conducted, with encouraging results. The project was in its advanced stages, with protocols for mass application being finalized. Photographs showed active testing in laboratory conditions.

KSCST Projects (2012-2013)

1) Rainwater Harvesting Help Desk and Support Network

This project was launched by KSCST in collaboration with BWSSB to support the Government of Karnataka's mandate on rainwater harvesting (RWH) in Bangalore. A helpdesk was set up at IISc and at the Rainwater Harvesting Theme Park in Jayanagar, a 1.5-acre facility demonstrating RWH techniques. The initiative conducted 46 training programs for 1,364 plumbers and contractors and organized 34 awareness camps across the city. Sixteen additional programs under the "60 days RWH Abhiyana" reached thousands of citizens. The helpdesk also prepared DPRs for 116 BWSSB buildings to implement RWH. Over 1,700 visitors availed consultation, making it a recognized one-stop resource for RWH adoption.

2) Assessing the status of Kalyanis and measures for rejuvenation in different Agro-climatic zones of Karnataka State using Geospatial Technologies

KSCST initiated this project to assess and rejuvenate traditional water tanks (Kalyanis) in Tumkur, Hassan, and Bagalkot districts across three agro-climatic zones. Using GPS mapping, around 650 Kalyanis were surveyed, with both geospatial and non-spatial data collected. Findings revealed that only 15% of Kalyanis were in good condition, while 55% were disused and 30% polluted with chemical and physical contaminants. The project created a digital database with photos and geo-tagged data for each tank. The survey identified siltation, poor maintenance, and pollution as key issues. Scientific remedial measures will be suggested based on hydrological and physical assessments for rejuvenation.

3) Crowd Sourcing of Geographic Information on Public Assets and Amenities by Authoritative Source

This project explored the use of crowdsourcing to collect spatial data on public assets at the Gram Panchayath level in Karnataka. Authorized local youth and officials used a mobile app to capture geographic information with GPS, ensuring accountability. Pilot studies were conducted in Doddabelavangala (Bangalore Rural) and Kadaganchi (Gulbarga). The crowdsourced data was successfully integrated with cadastral base maps and existing spatial layers. The approach proved more economical and time-efficient than traditional surveys. The methodology demonstrated potential for large-scale government use in planning, as it produces reliable, micro-level geospatial data quickly.

4) Rainwater Harvesting Resource Center, Utthan, Uttar Pradesh

KSCST established a Rainwater Harvesting (RWH) Resource Center at the Utthan Institution in Allahabad to promote sustainable water management. The center demonstrates over 25 techniques for RWH and groundwater recharge, with display boards in Hindi for accessibility. Training programs for trainers and locals were held in 2012, with 41 and 33 participants respectively, covering technical sessions and field visits. The center was inaugurated on August 14, 2012, and handed over to Utthan. It has since remained fully

functional as a demonstration and training hub. The project also launched the "Utthan Green Youth Club" to sustain awareness and action on water conservation.

5) Bacteria-Free Water for Drinking by Silver Treatment (BFWDST)

This collaborative project between KSCST and IISc focuses on developing a silver metal-based method for bacterial removal in drinking water. Objectives include quantifying bacterial removal, creating a simple methodology for field application, and comparing with domestic water purifiers. Laboratory tests are being conducted on rainwater, borewell water, tap water, and pond water samples. Initial results show a significant reduction in bacterial counts within 24 hours, with some samples reaching potable levels. Two bacteriological analysis methods—HPC and MTFT—are being used to validate results. The project is in its advanced stages, moving towards standardized protocols for wider application.

6) Treatment of Desiccated Coconut and Waste Water

This project, by KSCST and IISc, targets wastewater generated by desiccated coconut (DC) industries in Tiptur, Tumkur. The effluents are rich in organic matter and oils, causing odor, high COD, and environmental harm. Researchers identified three wastewater streams: coconut water from de-shelled nuts, washwater, and virgin coconut oil effluent. Surveys showed existing practices of open aerobic treatment with manual skimming of oil for resale. Findings revealed that separating streams at source is critical for effective treatment. Anaerobic digestion proved challenging due to low pH and high lipid content. The project emphasizes recovery of oil as a by-product alongside wastewater treatment solutions.

7) Astronomy Programmes in the State of Karnataka on the Occasion of Transit of Venus

KSCST organized statewide educational activities in June 2012 to commemorate the rare astronomical event of the Transit of Venus. The programs aimed to inspire students and teachers by deepening their interest in astronomy. Eleven workshops were held across districts like Gulbarga, Belgaum, Mangalore, Shimoga, and Tumkur, reaching 2,323 students and 136 teachers. Expert lectures were delivered by scientists including Prof. Haldodderi Sudhindra and Dr. Prajwal Shastri. Activities included interactive sessions, model-making, and essay competitions. The initiative successfully created awareness and promoted scientific curiosity among the youth and educators across Karnataka.

8) Monitoring, Evaluation, Learning and Documentation of Watershed Works Under IWMP Programme

KSCST partnered with the Watershed Development Department to monitor and evaluate watershed works under the IWMP scheme. Baseline surveys, process monitoring, and geospatial evaluations were conducted to assess socio-economic and environmental impacts. Awareness activities like Jalayanana Melas, Jathas, and street plays enhanced community participation. The program empowered Self Help Groups (SHGs) by training them in income-generating activities in districts like Haveri and Bagalkot. Soil and water conservation, forestry, and horticulture activities showed positive results. The

project improved farmer livelihoods, women's participation, and resource sustainability while providing documented reports for decision-making.

9) The Development of Organic Seedlings of Horticultural Crops by Rural Farmers and Dissemination of the Technology

This DST-supported project by HOPE FIRST and KSCST promoted organic farming practices through the production of organic seedlings. It trained rural farmers and women to use bio-pesticides, bio-fertilizers, and sustainable seedling practices. About 250 farmers from Doddaballapur, Malur, and Chamarajanagar were trained in organic methods. Free bio-pesticides were distributed to encourage adoption. Farmers were also educated on sustainable practices like using FYM enriched with bio-agents for seed treatment. Group discussions and training sessions helped improve seedling quality and productivity, while reducing reliance on harmful chemical inputs. The project demonstrated strong outreach and practical adoption of eco-friendly farming practices.

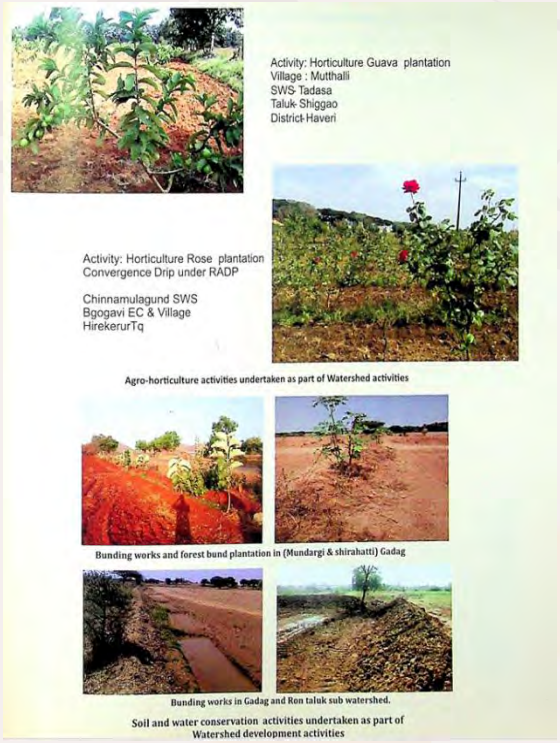
10) Trainers Training Programme on "Sustainable Rainwater Harvesting and Ground Water Recharge in Urban and Rural Areas"

KSCST organized a training programme in March 2012 at IISc to build capacity among engineers of KRIDL, PRED, and KRWSS. The program trained 65 engineers on sustainable RWH and groundwater recharge methods. Nine technical sessions covered rooftop and open-space harvesting, water quality monitoring, GIS applications, and case studies. Experts emphasized both technical designs and traditional water source revival. Field visits in Bangalore provided hands-on exposure to watershed and RWH systems. Supported by high-level officials, the training equipped participants with knowledge and skills to implement water conservation projects effectively across Karnataka.

KSCST Projects (2013-2014)

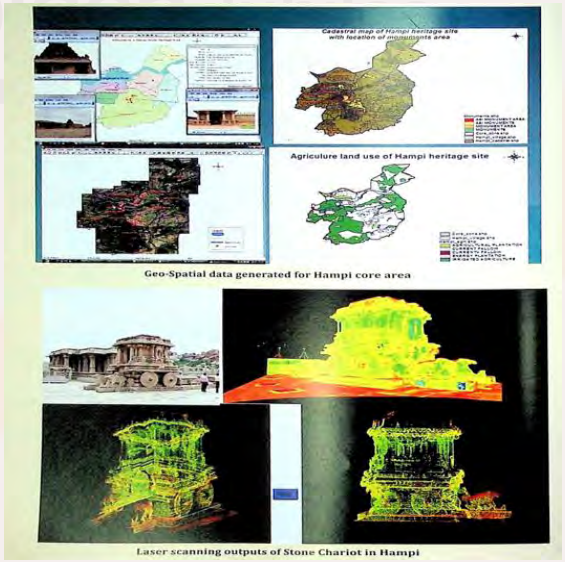
1) Monitoring, Evaluation, Learning and Documentation of Watershed Works Under IWMP Programme

KSCST undertook MELD activities for IWMP with funding from the Watershed Development Department, Government of Karnataka. The project included baseline surveys, process monitoring, impact evaluation, thematic studies, MIS-based monitoring, and dissemination of results. Regular reports—monthly, quarterly, half-yearly, and annual—were submitted along with case studies and success stories. Awareness-building activities like Jalajathas and street plays in Belgaum sensitized communities to watershed objectives. Soil and water conservation works, horticulture plantations, and livestock activities showed positive outcomes across multiple districts. Training also strengthened Self-Help Groups by enhancing clarity on purpose and skills for income generation.



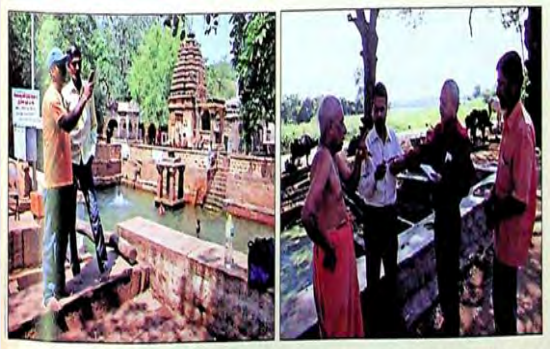
2) Digital Geospatial Data Generation and Terrestrial Scanning for 3D Reconstruction of Heritage Site at Hampi

This project, under the Indian Digital Heritage programme, followed a successful pilot on laser scanning of monuments. Its objectives are to develop a geospatial framework, build a digital database, and create 3D renderings of around 50 monuments at Hampi. Procurement of an imported 3D laser scanner is in the final stage with bids received. KSCST secured import duty exemption through DSIR registration with the Ministry of Science and Technology. Collaboration with Survey of India and other mapping agencies has begun for high-resolution datasets. This initiative will digitally preserve and document the core heritage site of Hampi.



3) Assessing the Status of Kalyanis and Measures for Rejuvenation in Different Agro-Climatic Zones of Karnataka State Using Geo-Spatial Technologies

KSCST initiated this project to assess traditional water bodies called Kalyanis in Tumkur, Hassan, and Bagalkot districts. Surveys using GPS documented about 650 Kalyanis during pre- and post-monsoon periods. A GIS database linking spatial, physical, hydrological, and qualitative data was created. Analysis revealed that only 15% of Kalyanis remain in usable condition while over 55% are defunct and 30% are polluted. The decline highlights urgent need for scientific rejuvenation and pollution control measures. The project provides district-wise data to support revival of these traditional rainwater storage systems.

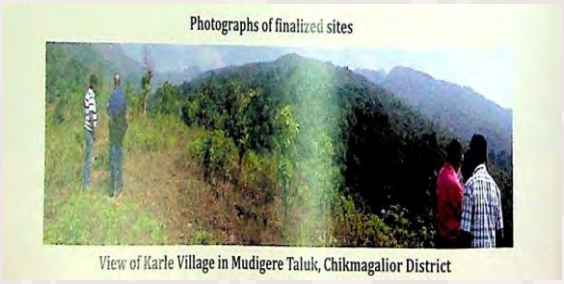


Physical survey- Capturing geographic coordinates using GPS of Kalyani in Mahakuteshwara temple, Badami taluk, Bagalkot district

Project team interacting with the locals at Kalyani in Koratgere, Tumkur district

4) Identification of Potential Sites for Installation of Micro-Hydel Power Plants for Decentralized Power Supply in Tribal Dominated Hilly Areas of Karnataka

This project aimed to identify potential sites for micro and pico-hydel plants in remote hilly districts to electrify tribal households. A preliminary meeting with experts finalized the methodology and site selection process. A total of 26 potential sites were identified across Uttara Kannada, Dakshina Kannada, Chikkamagaluru, Coorg, and Shimoga. Field visits confirmed technical feasibility and included beneficiary consent collection. Techno-economic feasibility reports were prepared, and five sites are being finalized for detailed project reports. The project shows potential for decentralized clean energy supply in off-grid communities.



Photographs of finalized sites

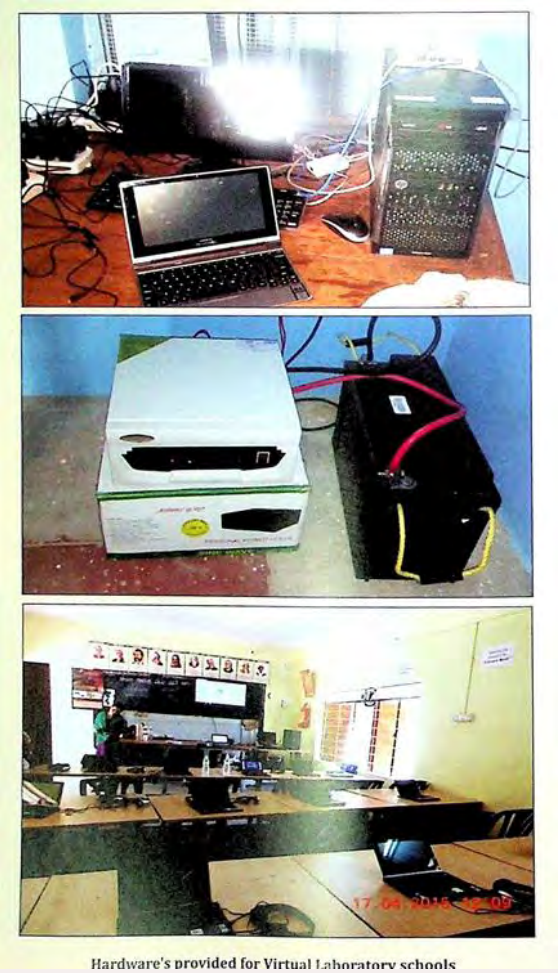
View of Karle Village in Mudigere Taluk, Chikmagalior District

Beneficiary house with paddy field in Karle Village in Chikmagalior District

5) Establishment of Virtual Laboratory (E-Learning Center) to Improve the Quality of Education in the Backward Talukas of Karnataka

KSCST implemented Virtual Laboratories under the Special Development Programme with funding of Rs. 120 lakhs from the Government of Karnataka. The project established digital learning facilities

in 10 high schools across backward talukas. These centres used internet, computers, and video conferencing for collaborative learning. Schools received syllabus-based content for science, mathematics, and social science in Kannada and English for classes 8 to 10. Institutions included schools in Belgaum, Tumkur, Ramanagar, Raichur, Koppal, Dharwad, and Gulbarga. The programme enhanced teaching effectiveness and improved access to quality education in underserved areas.



Hardware's provided for Virtual Laboratory schools

6) Digital Geospatial Data Generation and Terrestrial Scanning for 3D Reconstruction of Heritage Site at Hampi

A scaled-up version of the Hampi 3D documentation project was launched after a successful Rs. 20 lakh pilot. Supported by DST under the Indian Digital Heritage programme, the project focuses on 3D reconstruction of about 50 monuments. Objectives include developing a geospatial framework and a digital geo-database using high-resolution scanning. Procurement of an imported 3D scanner has reached the final stage with DSIR registration enabling tax exemption. High-resolution geospatial datasets of Hampi's core are being developed with Survey of India. The project safeguards cultural heritage while advancing research and visualization technologies.

7) Networking for "WASH" – Eco Water Literacy Campaign

KSCST implemented the DST-sanctioned "Networking for WASH – Eco Water Literacy Campaign 2010 (Karnataka)" to raise awareness on water, sanitation and hygiene with a project cost of ₹6,74,000 in March 2012. The campaign produced and distributed publicity materials such as the Amruthavarshini booklet, posters and leaflets and organised ten awareness camps in Belgaum in partnership with BGVS. Training programmes targeted women in backward villages and covered topics including water & sanitation, water-borne diseases, rainwater harvesting and scientific solid-waste disposal. Strong participation came from SHG federations, ASHA workers and Anganawadi workers, and a local monitoring network was established. A survey of Mavallipura lake was carried out with ESG Bangalore to assess municipal solid-waste impact. The initiative combined IEC materials, community training and local monitoring to improve WASH practices in the target areas.

8) Bacteria Free Water for Drinking by Silver Treatment (BFWDST)

The BFWDST project led by A.R. Shivakumar with IISc collaboration developed and field-tested a simple silver-sheet method to reduce bacterial contamination in drinking water, supported by DST with a budget of ₹5,06,800. The project standardized bacteriological analyses (HPC and MTFT) focusing on E. coli and total/fecal coliforms and compared silver treatment with three commercial purifiers. In total 220 MPN and 50 CFU tests were carried out and 172 samples (rain, open well, borewell, tap and pond) were analyzed at IISc. Results showed dramatic reductions in bacterial loads; for example a sample >1600 MPN/100 ml fell to 23 MPN after 8 hours and became potable within 24–48 hours with no detectable residual silver. Across 224 samples treated for eight hours, removal efficiencies ranged from <25% up to 90%, demonstrating variable but significant efficacy. The project concluded with reports, a presentation at MNIT Jaipur and endorsement by the Project Appraisal Committee as a successful, low-cost bacterial reduction approach.

Silver sheet inserted in water sample for testing

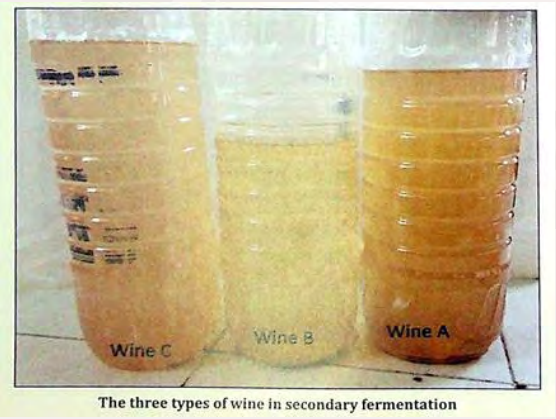
Water Sampling at every 2hrs of intervals with silver sheet for testing

9) Evaluation of Watermen Training Programme of RDPR in Karnataka

KSCST evaluated the RDPR/SIRD watermen training programme (annual budget ₹6,80,400) to assess the effectiveness of training for personnel responsible for rural water supply monitoring and maintenance. An MoU with SIRD guided the evaluation which sampled at least 10% of trained watermen, targeting three villages per taluk across 176 taluks and covering over 500 Gram Panchayats. Data collection was carried out by NRDMS staff using structured questionnaires focused on training objectives, syllabus relevance and social aspects of ensuring safe, adequate village water supply. Personal visits and interviews provided primary data which were analyzed using logical and statistical synthesis to evaluate outcomes. The final report documented coverage, findings and recommendations to improve training content and delivery. Results and recommendations were presented to SIRD/RDPR at a concluding meeting in February 2014.

10) Treatment of Desiccated Coconut and Waste Water

Researchers led by Dr. H. N. Chanakya and Dr. S. G. S. Swamy investigated wastewater from desiccated coconut (DC) industries, which produce high COD/BOD effluents with rancid oil and strong odour. The study categorized traditional and mechanized DC units and performed physico-chemical analyses, lipid separation, and batch anaerobic degradability tests. A lab-scale continuous anaerobic digester was run for eight months to evaluate biodegradation performance and process stability. Work also explored hygienic collection and valorisation of coconut water into fermented products (wine, toddy) and nutraceuticals, with fermentation samples in secondary stages. Lipid separation and by-product recovery were studied to convert pollutants into marketable products and reduce effluent load. The research provides treatment strategies combined with value-addition to improve environmental performance and sustainability of DC industries.



The three types of wine in secondary fermentation

11) Household Survey for Water Consumption in Hebbal, Bangalore (University of Western Sydney, Australia)

KSCST conducted a household water-use survey in Hebbal for the University of Western Sydney with a budget of Rs. 2,46,860 to compare consumption patterns between Bangalore and Sydney. Over 200 households were visited using a questionnaire developed with IISc collaborators and BWSSB meter readers assisted in data collection. The study contrasted Sydney's primarily surface-water supply (≈293 L/person/day) with Bangalore's mixed surface and groundwater supply, noting town supply averages around 190 L/person/day or ~110 L for households with additional sources. Technical meetings and joint analysis supported a comparative paper prepared for the Peri-Urban 2014 conference. Data and fund utilization certificates were submitted to the University of Western Sydney. The survey provided empirical evidence on decentralized supply, conservation opportunities and policy implications for Bangalore.

12) A Round Table Evolving Integrated Strategy for Augmenting Water Resources to Support Increasing Demand of a Rapidly Expanding Metropolis – Bangalore

KSCST organized a DST-supported round table (March 2013) to develop integrated strategies for augmenting Bangalore's water resources amid rapid urban growth and rising demand. Experts reviewed interventions including rainwater harvesting, lake rejuvenation, wastewater reuse and groundwater recharge to better manage the city's hydrological cycle. Discussions highlighted loss of recharge areas, reduced open spaces, sewage-stormwater mixing and large inequities in per-capita water access across the city. Recommendations included establishing an

apex institutional body, enforcing water regulation, restoring 400+ lakes, removing encroachments, and fixing distribution leakages. The round table also urged ICT-based groundwater databases, real-time monitoring, R&D centres, borewell regulation, capacity building and public water literacy. Outcomes aimed to guide policy toward equitable, efficient and sustainable urban water management including feasibility studies for continuous supply.

KSCST Projects (2014-2015)

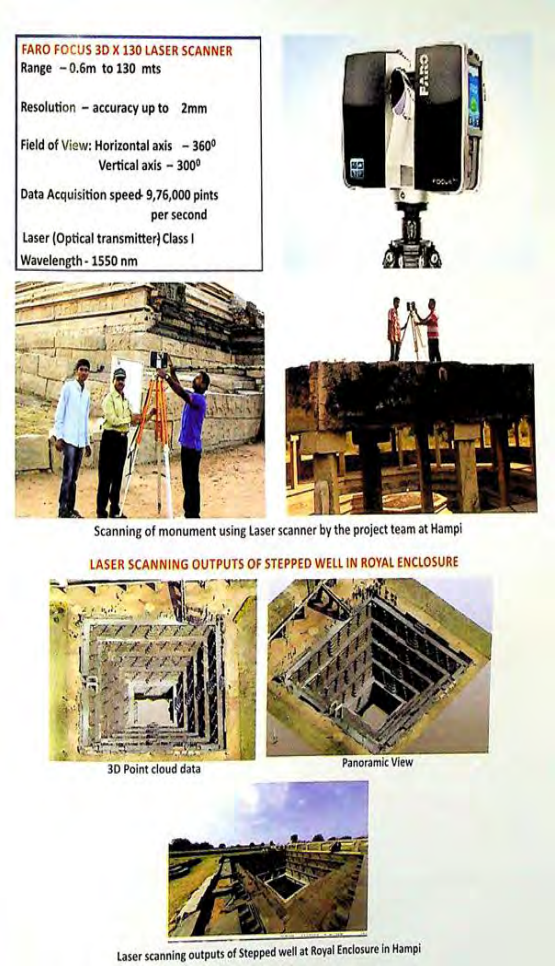
1) Identification of Potential Sites for Installation of Micro-Hydel Power Plants in Tribally Dominated Hilly Areas of Karnataka

This project, led by Dr. M. Prithviraj with co-investigators Mr. S. N. Sondur and Mr. S. N. Jayaram, and funded by DST at a cost of ₹19.86 lakh, aims to identify potential sites for micro/pico-hydel power plants in Karnataka's hilly tribal regions. The objectives are to identify suitable hamlets, prepare techno-economic feasibility reports, and generate DPRs for selected sites. A preliminary meeting with experts helped in formulating the approach, and 26 potential sites were identified in districts including Uttara Kannada, Dakshina Kannada, Chikkamagaluru, Coorg, and Shivamogga. Field visits were conducted with expert inputs and beneficiary consent obtained. Feasibility reports have been completed for all identified sites, and consultation is ongoing to finalize five for DPR preparation. The project is a significant step toward decentralized renewable energy for remote households.

SALIENT FEATURES OF BOOSANAKERE PROJECT

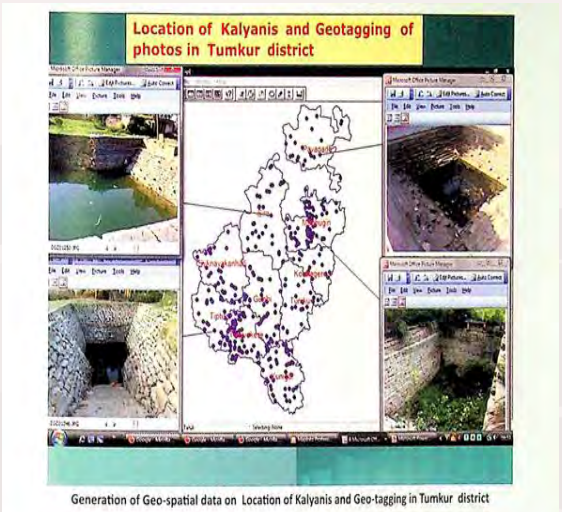
2) Digital Geospatial Data Generation and Terrestrial Scanning for 3D Reconstruction of Heritage Site at Hampi

This scaled-up project under the Indian Digital Heritage (IDH) programme, funded by DST at ₹83.03 lakh, is being executed by KSCST investigators Dr. M. Prithviraj and Mr. U.T. Vijay. It follows a successful pilot project that demonstrated the potential of laser scanning technology for documenting monuments. The project aims to create a geospatial framework for Hampi, build a comprehensive digital geo-database, and produce 3D renderings of about 50 monuments. A Request for Proposal was released for procuring an advanced 3D Laser Scanner, with bids received and procurement nearing completion. The council has also obtained DSIR certification for import duty and tax exemption to facilitate equipment purchase. This initiative will enable detailed digital documentation and conservation of Hampi's heritage structures.



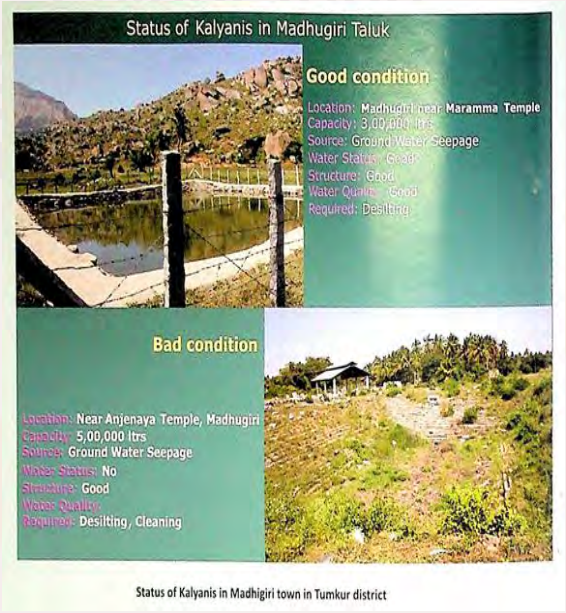
3) Assessing the Status of Kalyanis and Measures for Rejuvenation in Different Agro-Climatic Zones of Karnataka State Using Geo-Spatial Technologies

KSCST investigators Dr. S.G. Sreekanteswara Swamy and Mr. U.T. Vijay undertook this DST-funded project (₹15.66 lakh) to study the condition of traditional water tanks called Kalyanis in Karnataka. These structures, once crucial for water storage in low-rainfall areas, have deteriorated into polluted or abandoned sites. The objectives include surveying Kalyanis with GPS, creating a spatial and non-spatial database, and assessing hydrological and water quality parameters. Surveys were conducted in Tumkur, Hassan, and Bagalkot, covering about 650 Kalyanis during pre- and post-monsoon periods. Analysis shows that only 15% of Kalyanis are usable, highlighting severe neglect. The project emphasizes the urgent need for scientific rejuvenation of traditional water bodies using geospatial methods.



Generation of Geo-spatial data on Location of Kalyanis and Geo-tagging in Tumkur district

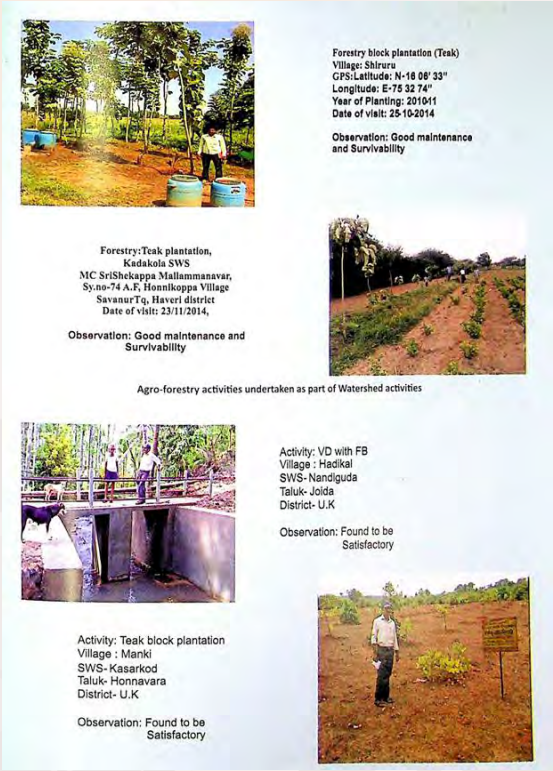
Tumkur District		Bagalkot District		Hassan District	
Taluk	No of Kalyanis	Taluk	No of Kalyanis	Taluk Name	No of Kalyanis
Madhugiri	79	Badami	12	Arsikere	42
Koratagere	14	Bagalkot	3	C.R.Patna	150
Sira	30	Bilagi	3	Belur	12
Tumkur	24	Hungund	9	Arkalgudu	11
Gubbi	47	Jamkandi	6	Hassan	13
Tiptur	20	Mudhol	2	Holenarsipura	6
C.N. Halli	32			Sakleshpura	3
Pavagada	23				
Kunigal	45				
Turuvekere	66				
Total	**380**		**35**		**237**



Status of Kalyanis in Madhigiri town in Tumkur district

4) Monitoring, Evaluation, Learning and Documentation of Watershed Works Under IWMP Programme

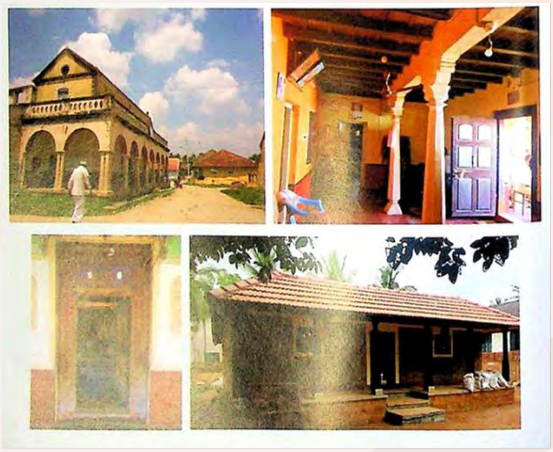
This large-scale project, worth ₹303 crore and funded by the Watershed Development Department (GoK), is being implemented by KSCST investigators Mr. H. Hemanth Kumar and Mr. U.T. Vijay. The focus is on monitoring, evaluation, learning, and documentation (MELD) of watershed works under IWMP using scientific and geospatial approaches. Baseline surveys, concurrent monitoring, and impact evaluations on socio-economic and environmental indicators are being conducted. Progress reports are submitted regularly, along with thematic studies and case documentation. Awareness activities like Jalajathas and street plays in Belgaum and other districts sensitized communities to IWMP objectives. The project has strengthened SHGs, promoted horticulture and livestock activities, and improved rural livelihoods through sustainable watershed practices.



5) Study on Status of Local Timber Resources and its Future Potential in Hassan District, outlines a research project focused on timber resources and consumption in the Hassan District.

This research project, led by Principal Investigator Mr. H.R. Phalanetra, examines the availability and use of local timber resources in Hassan District. It focuses on the growth and abundance of timber as well as wood consumption patterns across urban and rural households. Surveys were conducted to understand the use of timber in construction, including beams, pillars, doors, windows, staircases, and flooring. The study aims to generate data for sustainable resource management in the region. By analyzing both supply and demand aspects, it provides insights into the future potential of timber resources. The project highlights the need for

balanced utilization and long-term sustainability of timber in Hassan.



6) Establishment of Virtual Laboratory (E-Learning Center) to Improve the Quality of Education in the Backward Talukas of Karnataka

This project, led by Dr. M. Prithviraj and Dr. S.G.S. Swamy with coordination by Shri K.N. Venkatesh, was initiated by KSCST to enhance education in backward talukas of Karnataka through Virtual Laboratories (VLs) and E-Learning Centers. The objective is to improve the quality of teaching and learning using IT tools that allow students to conduct science experiments virtually and develop scientific attitudes. Virtual Laboratories provide internet-based, video-conference-enabled environments with digital content in Science, Mathematics, and Social Science. Implementation has reached multiple high schools across districts like Tumkur, Yadgir, Gulbarga, Ramanagara, Belgaum, Raichur, Dharwad, and Koppal. Students and teachers are actively using the resources, and review meetings have ensured effective deployment. The initiative has enhanced accessibility to quality education, supported remote learning, and fostered collaborative learning in underserved regions.

Hardware's provided for Virtual Laboratory schools

Students learning lessons through VL at Madhugiri

Students learning lessons through VL at Channapatna

NCSTC, DST GOI, New Delhi and KSCST officials Visited Govt High School, Channapatna
(Dr. B.P Singh Head & Advisor, NCSTC, Dr. D.K.Pandey, Scientist 'F' NCSTC and
Dr. M. Prithviraj, Executive Secretary, KSCST)

Students from VL High Schools at Sir M.V Rain Water Harvesting Theme Park, Bangalore

A new wave of learning sweeps rural classrooms

With the introduction of self-learning computer consoles, results in several rural govt schools have improved by at least 20 per cent

Article published for VL Government High School, Channapatna(T), Ramanagara(D)

ಸರ್ಕಾರಿ ಶಾಲೆಯಲ್ಲಿ ಸ್ಮಾರ್ಟ್ ಕ್ಲಾಸ್

Article published related to Virtual Classroom of Government High School, Kalghatgi(T), Dharwad(D)

7) Indo-Tunisia Workshop on Geospatial Technologies

The Indo-Tunisia Workshop on Geospatial Technologies, coordinated by Mr. H. Hemanth and organized by KSCST with DST support, focused on knowledge exchange in geospatial sciences. The workshop addressed themes such as National Map & Policy, Space and Earth Observation, and Land Management, while also recommending cooperation in areas like climate change, disaster management, and natural resource management. Technical discussions emphasized big geo-data management, spatial decision support systems, geospatial portals, and open-source technologies. Proposed areas of collaboration included cloud-based GIS, photogrammetry, cadastre, interoperability, and spatial data mining, with capacity-building as a key priority. A follow-up workshop in Tunisia was recommended for 2016, along with a joint call for proposals in identified areas. The workshop also explored opportunities for industry collaboration and leveraging Indian satellite data for applications in Tunisia.

8) Energy Efficient Buildings Workshop Series on Low Carbon Materials and Building Systems

The Energy Efficient Buildings Workshop Series was organized by the Department of Civil Engineering and Centre for Sustainable Technologies at IISc in collaboration with KSCST, coordinated by Prof. B.V. Venkatarama Reddy, Dr. Monto Mani, and Mr. H. Hemanth. The workshops aimed to build capacity in low-carbon building materials and technologies to promote sustainable and green construction practices. Content included lectures, demonstrations, and hands-on training on energy-efficient buildings, alternative roofing systems, climate-responsive architecture, and low-carbon materials such as stabilized soil blocks, rammed earth, and fly ash bricks. The workshops targeted architects, engineers, and construction professionals working on eco-friendly building solutions. Between June 2014 and February 2015, the seventh, eighth, and ninth workshops were successfully conducted, highlighting continuity of the program. Resource persons included faculty and invited experts, ensuring strong academic and practical knowledge transfer to participants.

KSCST Projects (2015-2016)

1) Rainwater Harvesting Help Desk

PI: A. R. Shivakumar Senior Fellow, KSCST Established with BWSSB after RWH became mandatory (Nov 2009), the Help Desk promotes rainwater harvesting across Bengaluru through awareness, training, demonstrations and policy engagement. KSCST set up helpdesks at IISc and a unique 1.5-acre Jayanagar Theme Park hosting 26 working models of RWH, groundwater recharge and conservation. The program focuses on training professionals (architects, engineers, contractors, plumbers, masons), preparing literature, and demonstrating cost-effective local methods. Outreach to the public, schools and colleges included 12 awareness events, 11 lectures and large public gatherings. To April 2016 the desks recorded ~28,000 visitors, answered 2,869 phone queries and ran 69 hands-on training programmes training 1,729 practitioners, positioning the desk as a one-stop RWH resource for Bengaluru.

2) "RWH ADVISER" — DO-IT-YOURSELF RWH TOOL

A KSCST–UNICEF partnership (MOU Feb 2015) supported development of a site-specific RWH design software with academic partners and expert inputs. Th e tool's front end collects user inputs via a questionnaire while the back end integrates long-term rainfall and related datasets to compute tailored, scientific recommendations. KSCST prepared the development framework; SERC (IISc) and NMIT produced beta implementations with technical guidance on groundwater recharge. The backend uses 50 years of district/block rainfall data and computational logic to generate graphics and design outputs. A beta web version and a mobile app exist and the application was launched during World Water Day 2016, with ongoing field testing and iterative refinement before final branding and wider deployment.

3) Field Testing of HUC-Based Solar PV–LED Lighting Kit

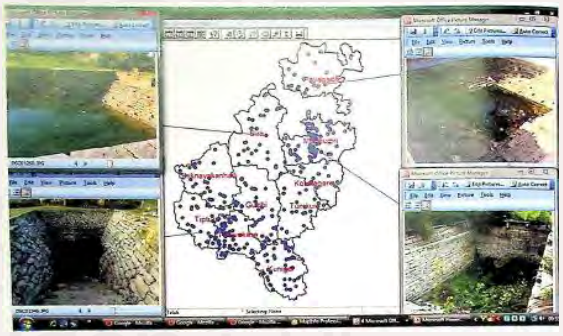
Principal Investigator: Executive Secretary, KSCST; Co-investigator: S. N. Jayaram. KSCST coordinated field deployments of Hybrid Ultra Capacitor (HUC) powered solar lighting kits developed by IISc/SSCU and manufactured by MESHA. A total of 150 kits were installed across India (including remote/residential institutions) and caretakers were appointed to monitor performance and collect field data. Early feedback indicates satisfactory operation and user acceptance across varied climatic zones. Based on positive results, SSCU/IISc agreed to supply additional kits and KSCST discussed scaling partnerships with MESHA for CSR and DST support. The objective is to validate HUC robustness for rural off-grid lighting and enable larger field trials.

4) Digital Geospatial Data & Terrestrial Scanning for Hampi (IDH)

Project PI: Dr. U. T. Vijay; implemented under DST's Indian Digital Heritage programme since April 2013. The project demonstrates 3D laser scanning plus geospatial workflows to document, model and reconstruct heritage monuments for restoration and virtual tourism. Progress includes scanning of 45 of the targeted 50 monuments with registered/cleaned point clouds, post-processing, 3D modelling, mesh generation and CAD outputs. High-resolution satellite imagery and fieldwork produced a 1:1000 digital map and spatial/non-spatial databases for the Hampi core; GPS surveys, photography and infrastructure inventories for 56 monuments are complete. Outputs support conservation planning, interpretation, training and long-term digital preservation of the heritage site.

5) Assessing Status of Kalyanis & Rejuvenation Measures

Dr. S. G. S. Swamy and Dr. U. T. Vijay; the study maps and assesses traditional kalyanis in Tumkur, Hassan and Bagalkot to inform restoration. Objectives included GPS mapping, spatial/non-spatial database creation, capacity/runoff/siltation assessment, water-quality analysis and science-based rejuvenation prescriptions. Field teams surveyed ~655 kalyanis pre- and post-monsoon and compiled a GIS database; district completion reports for Tumkur and Hassan were submitted. Findings show only ~15% in good use, >55% unused/poor and ~30% polluted—leading district CEOs to direct action planning. Recommendations combine geospatial analysis, hydro-geological assessment and targeted interventions for restoration and pollution control.



6) Networking For "WASH" — Eco Water Literacy Campaign (KARNATAKA)

PI: A. R. Shivakumar; coordinator: S. N. Jayaram; DST-funded awareness project to build water, sanitation and hygiene literacy across Karnataka. Activities included divisional workshops in Mysuru, Bengaluru, Belagavi and Kalaburagi, school and PU college outreach events, and a printed booklet for children on energy, water and environment conservation. The campaign organized multiple outreach programs

(including Mysore and Kalaburagi divisional workshops) and campus events at colleges and institutes to promote RWH and WASH practices. These engagements strengthened awareness among officials, students and communities and provided practical guidance for local adoption. Project outputs included workshops, outreach material and strengthened local networks for WASH promotion.

7) Monitoring, Evaluation, Learning & Documentation (MEL&D) OF IWMP — Belgaum

PI: H. Hemanth Kumar and U. T. Vijay; KSCST acted as an independent MEL&D agency for WDD's IWMP (2011–2016) covering 69 projects across 2,87,000 ha in Belgaum division. The council provided periodic evaluation reports, diagnostics and recommendations to enable mid-course corrections and improved implementation quality. Field monitoring showed significant biophysical interventions (forestry, horticulture, drainage treatments) and socio-economic activities yielding positive outcomes and farmer satisfaction. The MEL&D inputs facilitated evidence-based adjustments and strengthened accountability across stakeholders. Notable localized impacts include rejuvenation of downstream open wells in Mannur SWS, demonstrating tangible community benefits.

8) Water Purification Using Nanotechnology

PIs: S. G. S. Swamy, U. T. Vijay and S. N. Sondur; pilot validation of an IIT-Madras nano filter to remove arsenic from village water supplies. Objectives were to identify affected habitations, install pilot units, monitor water quality and user feedback, and plan scale-up based on performance. A 2,000 L/day unit was commissioned at Halammappur (Yadgir) on 03-Dec-2015 and handed to the Gram Panchayat; users reported arsenic-free water and health benefits. A 5,000 L/day HGML-funded unit was installed at Medhinapura (Raichur) on 24-Dec-2015 and handed over in Feb 2016. Monitoring, reporting and handover to local management were completed, with scaling contingent on continued performance.

9) Study on Status of Local Timber Resources — Hassan District

PI: Phalanetra H.R., Fellow, KSCST NRDMS Centre, Hassan; the study assesses local timber species, consumption patterns and future potential for regional construction and crafts. Methodology included field surveys of sawmills and processing units, consumption estimation for rural/urban housing and GIS/GPS mapping of resources. The study links species

distribution to ecological niches, soil and climate to advise sustainable management and support vernacular architecture. Data and consumption estimates inform regional planning, resource sustainability and livelihood strategies for timber-dependent crafts. Outputs aid local policy and resource-use recommendations.

10) Evolution of Tumakuru into a 'SMART DISTRICT' - The Path Towards Sustainable Urbanization - A Pilot Project

PI: Dr. S. G. Sreekanteswara Swamy; coordinators: Prema Iyer, Harish Bhat and H. Hemanth Kumar. The pilot proposes an inclusive “smart district” model integrating towns and surrounding villages, preserving natural resources, livelihoods and cultural identity while strengthening infrastructure and digital governance. Study areas are six villages across six taluks (Tumakuru, Tiptur, Gubbi, Koratagere, Pavagada, Chikkanayakanahalli) where the project prepares People’s Biodiversity Registers, conducts participatory rural appraisals and maps fragile ecosystems and cultural assets. Progress includes mapping, orientation meetings, a field trip and two review meetings addressing interim and final report formats. The aim is to use local biodiversity knowledge and participatory planning to ensure sustainable rural–urban development and to design replicable smart-village approaches.

11) Village Information System (VIS)

PI: H. Hemanth Kumar, Fellow, KSCST; part of a DST-GOI initiative to standardize cadastral-level village information for planning and governance. Pilot locations are Awaradi & Hiremandihalli (Bailhongal, Belagavi) and Bilikere (Mysore), selected across agro-climatic zones for contiguous village clusters. The project integrates cadastral maps, high-resolution satellite imagery and field surveys to generate thematic 1:10k maps covering land use, habitation, minerals, water, soil, infrastructure and socio-economic layers. Outputs include parcel and settlement maps, unique coding for parcels/settlements and a structured database to support micro-level planning. VIS aims to supply planners and PRIs with actionable spatial data for evidence-based decision making.

12) Training Program on Geospatial Technologies & Its Application

PI: H. Hemanth Kumar, Fellow, KSCST; NRDMS-funded national training (₹10 lakh) to build capacity in GIS, Remote Sensing and GPS. The 21-day program (21 Sept–9 Oct 2015) comprised three weekly modules—GIS fundamentals, RS basics and applied project work—with instruction

from Survey of India, ISRO, IISc, KSRSAC, KSNDMC and industry. Activities included hands-on software training, field trip to Nandi Hills and a visit to NRDMS Mandya, culminating in participant project work demonstrating practical applications. Trainees—academics, planners and officials—received exposure to district-level geospatial governance and real-world workflows. The course enhanced technical skills to implement applied geospatial solutions in government and research.

13) Workshop on "Water Related Technologies" — Raichur

Organized jointly by Raichur Zilla Panchayath and KSCST on 15 Mar 2016 for ~85 district officials to introduce scientific water-management tools. The workshop—opened by KSCST leadership and the ZP CEO—presented technical lectures on RWH, rejuvenation of traditional systems, nano water purification, geo-spatial planning and biofuels as rural energy options. KSCST showcased applied case studies and operational technologies to address local water scarcity and resource planning. The event aimed to catalyze adoption of evidence-based water interventions at district level and foster inter-departmental coordination. Officials were encouraged to apply the presented technologies in local development planning.

14) Multimedia Studio Cum Video Conferencing Facility at KSCST

Convener: Executive Secretary; Coordinator: K. N. Venkatesh. KSCST established an in-house multimedia studio and VC centre for streaming/recording lectures, interactive meetings, remote student project evaluations, VC with NRDMS districts and content delivery to Virtual Labs. The facility hosted a series of technical talks (2015–2016) on topics from virtual labs to cyber security and green living, expanding reach to schools and colleges statewide. It supports capacity building, archiving of educational resources and remote pedagogy for decentralized learning. The studio strengthens KSCST's outreach, evaluation and knowledge-sharing capabilities across the state.

15) Establishment Of Virtual Laboratory (E-Learning centre)

PI: Dr. S. G. S. Swamy; Coordinator: K. N. Venkatesh. KSCST implemented Virtual Labs in 10 high schools, installing 3D science experiments (Biology/Physics), procuring the Karadi Path English communication package and updating digital content from SVYM. Teachers received training and participated in an

interaction meeting to share experiences; centres were branded “Sir C. V. Raman Virtual Lab” with KSTePS approval. KSCST addressed hardware needs, replaced stolen equipment where necessary and initiated new centres and additional 3D experiments aligned to grades 9–10. Outcomes include enhanced student engagement, hands-on digital experiments and plans for sustainable content development and hardware support.

16) Eyes On Nature — Environmental Literacy Program

A four-month program (launched 5 June 2015) engaging 100 students from 10 schools to connect scientific observation of nature with art, literature and theatre. Activities included nature trails, hands-on experiments, water quality testing, sapling planting and creation of Nature Diaries, reports and posters. The program culminated in an exhibition and cultural presentations; a final report was released on 21 Nov 2015. Students demonstrated increased observation skills, creative outputs and environmental stewardship and integrated scientific learning across disciplines. The initiative fostered active learning and community awareness about sustainable living.

17) Vigyan Darshan — Science Tour

PI: Dr. S. G. S. Swamy; Coordinator: K. N. Venkatesh. The three-day Vigyan Darshan (21–23 Jan 2016) brought 100 rural high-school students and 20 faculty to premier science and R&D institutions in Bengaluru to popularize science. Visits included Lalbagh, Namma Metro, IISc rainwater theme park, ISRO Satellite Centre, Planetarium and museums, combined with interactive sessions on scientific thinking and career guidance. Each student received

a copy of “Kalam Mestru” and participants reported high satisfaction and inspiration. The tour aimed to broaden horizons and motivate students toward higher studies in science and technology.

18) Science Express — Climate Action Special

KSCST organized visits for 600 high-school students (Hospet, Wadi; 4–8 Apr 2016) to the Science Express Climate Action Special exhibition. The exhibition covered greenhouse effects, monsoon variability, sea-level rise, biotechnology, biodiversity and India’s R&D in climate science, stressing human impacts and sectoral vulnerabilities. The outreach linked classroom learning to national research and conservation initiatives and aimed to build climate literacy among rural youth. Student engagement fostered awareness on mitigation and adaptation themes and encouraged scientific curiosity about climate issues.

19) Energy Efficient Buildings Workshop Series — Low Carbon Materials

Coordinators: Prof. B. V. Venkatarama Reddy and H. Hemanth Kumar. The tenth workshop (21–23 Dec 2015) focused on low-carbon building materials and climate-responsive design for government engineers, blending lectures with hands-on production of stabilized soil blocks, fly ash bricks and rammed earth techniques. Practical sessions included block manufacturing, masonry dome construction and site visits, highlighting potential 50% reductions in building carbon emissions. The workshop’s practical orientation generated strong demand and equipped participants to adopt sustainable construction methods in public projects.

20) Study Of Noise Levels for the City of Mysuru

KSCST measured noise and traffic volume at 16 locations across silence, residential, commercial and industrial zones in Mysuru to quantify urban noise pollution. Measurements included vehicle/horn noise at multiple distances and a public perception survey with over 800 respondents; results showed many sites exceeding CPCB limits and identified traffic congestion hotspots. The study proposed site-specific and general noise-reduction measures and recommendations to city authorities for mitigation and enforcement. Findings provide a baseline for urban planning and public health policy to address noise pollution.

KSCST Projects (2016-2017)

1) Development Of Geospatial Web Applications on Karnataka Geo-Portal (KSSDI PHASE II)

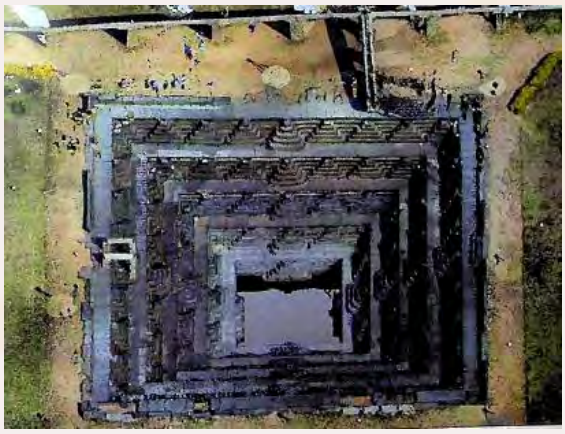
KSSDI Phase II extended the Karnataka Geoportal into a governance-focused platform by adding web-based geospatial applications and decision-support tools for Watershed and Health schemes. Features include WMS, CS-W metadata catalogue, WFS/WFS-T, WCS, WPS, transactional services, mobile mapping, multi-attribute queries and multilingual support. Portlets (watershed, health) were developed from user needs; proof-of-concepts (IRCTC, biogas MIS) were implemented. High-resolution Davanagere maps (1:2000) and Shivamogga water-source mobile uploads were added. Integration of MIS–GIS for Belgaum watershed projects completed. Awarded Geospatial Excellence (2014) for citizen-centric dissemination.

2) Monitoring, Evaluation, Learning & Documentation of Watershed Works Under IWMP

KSCST acted as an independent MEL&D agency (2011–2016) for IWMP in Belgaum division covering 69 projects over 287,000 ha across seven districts. The Council delivered regular evaluation reports and provided timely inputs for midcourse corrections. Field-level biophysical (forestry, horticulture, drainage) and socio-economic interventions showed positive outcomes. Farmers reported satisfaction with improvements in agriculture and allied activities. The work supported evidence-based adjustments to watershed implementation. Outputs informed department decision-making and project consolidation.

3) Digital Geospatial Data Generation & Terrestrial Scanning for Hampi (IDH)

Under DST's Indian Digital Heritage programme, KSCST demonstrated 3D laser scanning + geospatial methods for heritage documentation and virtual tourism. Terrestrial laser scanning of 77 World Heritage monuments, post-processing, 3D modelling, mesh generation and CAD outputs were completed. High-resolution 2D thematic maps (villages, cadastral, LU/LC, drainage) for Hampi core were produced using 0.6 m imagery and SOI toposheets. GPS surveys, photography and infrastructure inventories for 56 monuments were done. Outputs support restoration, interpretation and virtual reconstruction.



4) Village Information System (VIS)

VIS aimed to create cadastral-level village databases (demography, resources, LU/LC, socio-economic) as part of a DST-funded standardization effort. Pilot areas: Awaradi & Hirendihalli (Belagavi) and Bilikere (Mysore); mapping methodology integrated cadastral maps, HRSI and field surveys. Parcel and settlement mapping completed for 9 of 12 villages; settlement/asset mapping and soil/water analyses ongoing. Unique coding for settlements/parcels and revised guidelines were produced. Presentation to Mysuru ZP led to interest in district-level scaling. Equipment and procurement (HRSI, GPS, laptops) supported fieldwork.

5) Water Purification Using Nanotechnology

KSCST field-tested an IIT-Madras nano water filter to treat arsenic-affected drinking sources in Yadgir (DST-funded) and Raichur (HGML-funded). A 2,000 L/day unit at Halammapur was installed, handed to the Gram Panchayat, monitored and reported; beneficiaries reported health improvements after drinking arsenic-free water. A 5,000 L/day unit was commissioned at Medhinapur, Lingasugur, and handover/ reporting to funders completed. Monitoring, beneficiary feedback and project completion reports were submitted for scale-up consideration.

6) Field Testing of Hybrid Ultra Capacitor (HUC) Solar PV Lighting Kit

KSCST coordinated field evaluations of HUC energy-storage lighting products developed by IISc & MESHA Energy Solutions. Deployments included 150 HUC lanterns; field performance trials were conducted across climatic zones. A proposal for large-scale field testing (1,000 units; Rs. 80.20 lakh) was submitted to DST in 2016; technical committee recommended 5W/10W kits and requested a revised budget. Revised proposal submitted and awaiting sanction. Aim: validate HUC robustness for rural off-grid lighting.

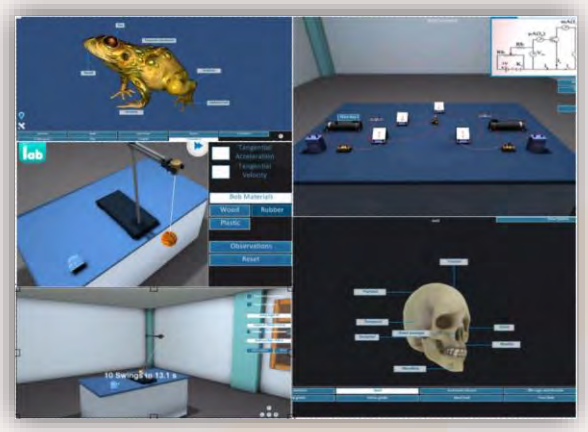
7) Virtual Laboratory (E-Learning centres) In Backward Talukas

KSCST, KSTePS and DST-GoK piloted virtual labs in 10 high schools to improve science education in backward talukas. Centres provide 3D virtual experiments (English & Kannada), Karadi Path English modules and digital content to promote collaborative learning. KSCST supplied laptops and equipment, formed a teacher subcommittee to create new 3D experiments, and monitored operations/support. The programme aims

to inculcate scientific attitude and expand reach through recorded/streamed lessons.

8) Virtual Classrooms (VCR) Under CSR – REC, GOI

KSCST implemented Virtual Classrooms in 10 government high schools using REC CSR funds (Rs. 174 lakhs) to strengthen science teaching via IT tools. After baseline studies and a PMC, a multi-step tender selected M/s Phoenix Technova for hardware/software provision. A subcommittee developed syllabus-based 3D science animations for grades 8–10. Project included procurement, vendor negotiations and teacher engagement to operationalize VCRs across identified schools.



9) Radio Serial: "Understanding and Managing Natural Disasters"

KSCST with Vigyan Prasar and AIR Bengaluru produced a 26-episode radio serial (launched 5 June 2016) in Kannada and Konkani to raise disaster science awareness. Episodes (30 minutes) aired Sundays across AIR stations with interactive listener quizzes; five correct respondents per episode won science kits. The serial combined expert inputs and public engagement to enhance community preparedness and scientific understanding of hazards and responses.

10) Steel Mould for National Biogas & Manure Management Programme

KSCST supported development of a reusable steel mould for 2 m^3 biogas plants to reduce construction cost and build time. The mould lowers plant cost from ~₹30–35k to ~₹20k, enabling single-day construction and reduced skilled-labour needs; with ₹12,500 subsidy farmers pay ≈₹7,500. Twenty plants built so far; future work targets transport cost reduction and modular pieces to produce multiple plant sizes from one mould.

11) Dissemination of Priyagni (AGNI MITRA) Stoves in Kalaburgi

KSCST approved field demonstration and testing of CGPL/IISc Agni Mitra stoves using wood-chip fuel for medium-scale/community cooking. TIDE procured and tested three units; installations made at university hostels and a school, with initial fuel supplied. Demonstrations showed commercial potential for community cooking; project exploring sustainable fuel sourcing and further field placements.

12) Rainwater Harvesting Help-Desk & Theme Park for Bangalore City

KSCST, with BWSSB, established an RWH Helpdesk and a 1.5-acre theme park in Jayanagar demonstrating recharge models and water conservation techniques. Objectives: awareness, training for stakeholders, documentation, technical support and demo plots across BWSSB buildings. Activities included 71 training programs, 37 awareness camps, MOUs for continued support, and 2,600 student visitors; helpdesk handles public queries and contractor referrals to promote city RWH adoption.

13) Karnataka-Israel Program for Industrial R&D (KIRD) – Industry Coordination

KSCST managed awareness and coordination for KIRD to enable Karnataka MSMEs to partner with Israeli firms for collaborative R&D. Two projects funded from first call: Blue Neem Medical Devices (₹90 lakh) for urinary incontinence device with Innoventions (Israel) and Rangsons Schuster (₹250 lakh) for aviation flexible hoses with Y. Schuster (Israel). KSCST facilitated joint agreements, proposal evaluations, monitoring committee reviews and progress reporting.

14) Identifying Unique Protein Properties in Non-Edible Oil Meals

Project with Jain University and KSCST to valorize protein-rich meals from non-edible oilseeds (neem, jatropha, pongamia) that currently have low value. Objectives: extract proteins, develop regenerated protein films, test antimicrobial/antioxidant/anticancer properties and explore packaging and biomedical applications. Progress: protein extraction and film development planned; films to be tested for multiple bioactivities and potential high-value uses (packaging, drug delivery, scaffolds).

15) Fatty Acid Methyl Ester (BIODIESEL) from Non-Edible Oil Seeds

Jain University projects comparing conventional transesterification, ultrasonic and microwave methods to produce biodiesel from non-edible seeds. Objectives: confirm product by FT-IR/GC, characterize per ASTM D6751, compare engine performance/emissions, and

evaluate yield, purity, cost and time across techniques. Rationale: microwave/ultrasonic methods may reduce reaction time and costs and improve commercial viability.

16) Diesel Engine 1000-Hr Test with Straight Vegetable Oils (SVO)

Endurance and performance study (target 1000 hours) of diesel engines using blends of straight vegetable oils with petrol to lower viscosity and assess engine wear/emissions. Tests include fuel property analysis, engine selection of blend, long-term running, and pre/post component evaluation. The work revisits SVO as alternative fuel, testing feasibility of low-petrol blends and necessary mitigation measures for real-world use.

17) 'EYES ON NATURE' Environmental Literacy Programme

A 4-month outreach programme (June–Sept 2016) for 200 high-school students across 11 schools to connect science with art and nature. Activities: field observations, nature diaries, water quality testing, carbon footprint and oxygen output exercises, natural dye extraction, and culminating cultural presentations. Outcomes included scientific reports, creative outputs, and enhanced observation skills and environmental stewardship among students.

18) CHETANA – Empowering Girls with Technology

An 8-day residential winter school (23–30 Dec 2018) at IISc to mentor top government-school girl students across Karnataka in technology and leadership. KSCST and IISc hosted 24 high-achieving students from multiple districts to provide exposure, mentorship, and capacity building aimed at empowering talented girls for further STEM pursuits.

19) Space Science & Technology Camp 2016

KSCST and Cindrebay Nurture Club organized a six-day Space Camp (18–23 April 2016) at IISc for 80 students to explore satellites, rockets, Mangalyaan, gravity, astrobiology and space science. Hands-on sessions and lectures enhanced student awareness of space research and its applications, inspiring interest in STEM and India's space achievements.

20) Teachers Enrichment Programme

A year-long professional development programme (16 day-long contact sessions across one year) run by KSCST, Anubhava Science Foundation and Dept. of Education to upgrade subject knowledge and pedagogy of 45 government/aided science teachers. Goals: develop curricular resources, enhance pedagogic skills, empower teachers to create engaging science learning environments and improve classroom practice.

21) Teachers Empowerment Workshop on Mathematics

Two-day workshops (July–Aug 2016) conducted at 12 locations benefitted ~700 high-school mathematics teachers. Sessions covered trigonometry, real numbers, analytical geometry, basics of probability, factorial concepts, and practical math applications. The program emphasized activities and simple methods to improve mathematical teaching across districts.

22) Interactive Workshop on Geo-Science Education for Teachers

Jointly organized with the Ministry of Earth Sciences, workshops in Mangalore, Belagavi and Kalaburagi trained ~200 high-school teachers in geoscience topics at Pilikula, Belgaum Science Centre and KSCST regional centre. Focus was on curriculum integration and practical teaching approaches to enhance earth science education in schools.

23) Teachers Training in Tribal Regions (Science & Maths)

Two three-day workshop phases (July 2016) at SVYM for PCM and biology teachers from Mysuru, Chamarajanagara and Kodagu districts. Activities included hands-on physics/chemistry experiments, use of simple materials for teaching aids, sessions on human anatomy, medicinal plants, and requests for dedicated lab manuals and more chemistry time. Program strengthened teaching capacity in tribal schools.

24) State Level On-The-Spot Painting Competition on Disaster Risk Management

State-level painting competition (18 Oct 2016) for 230 students (age 10–14) at IISc to promote DRM awareness with themes like “Disaster vs Collective Strength.” Top entries advanced to the national level (Vigyan Bhavan, 3 Nov 2016). Adjudication by Karnataka Chitrakala Parishath led to winners and consolations; event engaged children creatively in disaster preparedness messaging.

25) State Level Workshop on Traditional Water Harvesting Systems

A two-day expert workshop to review restoration and rejuvenation of Pushkaranis, Kalyanis and stepwells across Karnataka. Objectives: share research, formulate restoration roadmaps, provide recommendations for PRIs/ULBs/NGOs, and promote large-scale revival of traditional structures to enhance groundwater recharge and sustainable community water management.

26) Energy Efficient Buildings Workshop Series (Low Carbon Materials)

The 11th workshop (13–18 Feb 2017) led by IISc and KSCST focused on low-carbon materials (stabilized soil blocks, rammed earth, fly ash bricks) and hands-on training in building techniques. Practical sessions included block production, masonry domes and field visits; participants learned construction methods that can reduce building carbon emissions by ~50% and meet growing demand for sustainable construction.

27) Training On Solid Waste Management (SWM) for Newly Recruited Environmental Engineers

A 21-day training (23 Jan – 12 Feb 2017) by KSCST and DMA for 36 newly recruited Environmental Engineers covering technical and administrative aspects of SWM. The course involved experts from SWM institutions and aimed to build capacity for urban waste planning and implementation across ULBs.

28) National Brainstorming Workshop for Radio Serial "Sustainable Development"

A two-day national workshop (3–4 Nov 2016) with Vigyan Prasar and KSCST reviewed the "Natural Disasters" serial and planned formats/content for a new radio serial on "Sustainable Development." Participants included AIR producers, language agencies, scriptwriters and scientists to design engaging, informative programming for mass outreach.

29) Multimedia Studio Cum Video Conferencing Facility at Kscst

KSCST established an in-house multimedia studio and VC centre to stream/record expert lectures, support interactive meets, evaluate student projects remotely, and deliver technical content to VL schools. The facility hosted technical talks (2016–2017) by scientists, IP experts and teachers and

supports state-wide educational outreach and remote evaluation.

30) Regional Centre, Kalaburgi (Gulbarga)

KSCST's first regional centre (est. Jan 2014) addresses North Karnataka S&T needs: advisory committee formation, computer training for students, hosting "Science Express – Climate Action Special," renewable energy workshops, pre-university math training, free basic computer training for govt staff, and teacher workshops. The centre expanded regional outreach and capacity building.

31) Deployment Of Oracle 12c as Central Facility for State SDIs

KSCST procured and deployed Oracle 12c as a central spatial database facility for NSDI/NRDMS to standardize geospatial data handling. Following e-tendering, M/s Sonata implemented the system (Sep–Oct 2016) with training for national mapping agency officers. The central facility enables interoperable SDI projects across national/state agencies at lower operational cost.

32) Fourth Tier-2 Screening Committee on State S&T Programme / PEG

KSCST hosted the PEG meeting for DST's SSTP (24–25 Jan 2017) chaired by a DST advisor; 25 new proposals were screened and 15 ongoing projects were reviewed. The event facilitated expert evaluation for DST funding decisions and progress monitoring of state S&T projects.

33) ICPS Review Committee Meeting (DST ICPS DIVISION)

KSCST organized the ICPS review meeting (29 Nov 2016) chaired by Prof. Rajendra Prasad to assess progress in ICPS-funded projects including IDH-Hampi, Geo-ICT on HSRS and Koleru Lake rejuvenation. Experts reviewed technical progress and provided oversight to align project outcomes with ICPS objectives.

KSCST Projects (2017-2018)

1) Student Project Programme

The Student Project Programme (SPP) aims to provide financial and technical support to final year engineering students for innovative projects that address state-specific issues. In its 40th series, KSCST received 2,349 project proposals from 145 colleges and supported 542 projects. The thrust areas included solid waste to briquettes/pellets, solar power for lake de-frothing and desalination, applications for agriculture waste, rejuvenation of water sources, battery life enhancement, robotics for disaster management, water purification, and fire extinguishing systems. Best Seminar Projects included bio-lubricants for engines, bioactive compound studies from Mucuna Pruriens, iron nanoparticles for arsenic removal, and a voice-based email system for visually challenged people. Best Exhibition Projects featured a low-cost tricycle for handicaps, chitosan preparation from prawn shells, and noise-absorbing composites from agro waste. The program continues to encourage students toward socially relevant and impactful innovations.

2) Natural Resources Data Management System (NRDMS) – Karnataka Project

The NRDMS project, established in 1993 and led by Mr. H. Hemanth Kumar, provides geospatial data and services for health, education, transport, environment, disaster management, and governance. District NRDMS staff served as nodal officers for Assembly Elections 2018 by preparing geotagged polling station maps and supporting IT-related election activities. Key outputs included Karnataka ZP Atlas and TP Atlas, two Kannada reports on GIS in Panchayati Raj, and a report on UML-based GIS application customization. The project supported programs like NREGA, Panchatantra, MPIC, TSP, Jal Nirmal, and KVK, covering asset mapping, watershed management, malaria control, and tourism planning. Collaboration with CPRI enabled pollution mapping of transmission systems to guide insulator design. Training, workshops, and publications in Springer further strengthened Karnataka's role in applied GIS for governance.

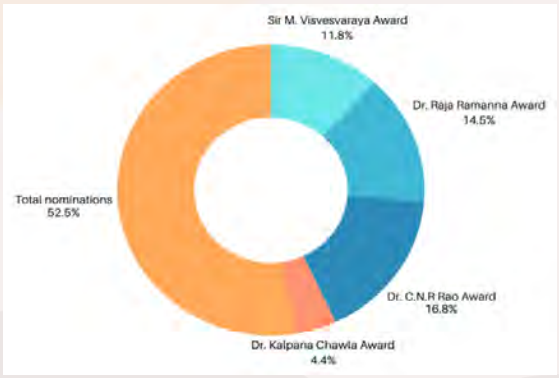
3) Development of Geospatial Web Applications on Karnataka Geoportal (KSSDI Phase II Project)

The KSSDI Phase II project, led by Mr. H. Hemanth Kumar with support from DST and GoK, focused on building web-based geospatial decision support systems. A key output was the Watershed Information and Management System (WIMS) for KWDD, a flagship ₹2400 crore, 9-year program aiding watershed planning, monitoring, and evaluation. The Karnataka Geo-Portal serves as a one-stop platform offering

WMS, WFS/WCS services, mobile applications, multilingual support, and training. It integrates cadastral maps with MIS data to support analysis and governance applications, hosted at KSCST and widely used by officials. Major activities included workshops, updating panchayat-level data, implementing National Data Repository standards, and participation in cadastral standards committees. Future plans include an Integrated Property Taxation Platform for Smart Cities to support urban governance and citizen services.

4) State Awards for Scientists and Engineers

The Government of Karnataka instituted the State Awards for Scientists and Engineers in 2010 to honor outstanding talent in science and technology. The awards are named after eminent figures like Sir C.V. Raman, Sir M. Visvesvaraya, Dr. Raja Ramanna, Prof. Satish Dhawan, Dr. C.N.R. Rao, and Dr. Kalpana Chawla. KSCST manages the program, with the selection committee chaired by Prof. C.N.R. Rao. For 2015–2016, the Council received 367 nominations and presented the awards on 25 April 2018 at IISc, Bengaluru. In 2017, 178 nominations were received and 13 awards were recommended by the committee on 16 January 2017 at IISc. The awards aim to recognize, encourage, and celebrate scientific contributions across diverse fields in Karnataka.



5) Rainwater Harvesting Cell

The Rainwater Harvesting Cell, established in 2008 under KSCST and led by A.R. Shivakumar, promotes sustainable rainwater harvesting and groundwater recharge. It has influenced state policies mandating RWH and guided over 360 institutions, including major hospitals, universities, and government bodies. Supported by UNESCO, the Cell developed a “Do-It-Yourself RWH Tool” and the RWH Assistant Android app for designing customized systems across Indian towns and cities. Between April 2017 and March 2018, the Cell offered consultancy, conducted training for engineers and masons, and engaged students through competitions and exhibitions. Awareness programs reached thousands through workshops, lectures, and exhibitions, while outreach included strong media coverage

and social media presence. The Cell has significantly advanced water sustainability practices through technology, training, and awareness.

6) Biofuel Cell

The Biofuel Cell at KSCST, coordinated by Mr. S. N. Sondur, manages 32 Biofuel Research, Information and Demonstration Centres (BRIDCs) across Karnataka, funded by KSBDB. In 2017–18, it organized quarterly review meetings, training programs, and R&D projects on biodiesel and by-product utilization. Outreach included World Environment Day activities with 6,000 seed balls, World Biofuel Day events across 27 districts, and orientation sessions for students and teachers. Training included biodiesel production, bioenergy workshops, seminars, and national conferences. R&D efforts explored crude glycerol as cattle feed, glycerol purification, biodiesel from various oils, and oil extraction from coffee waste. These initiatives strengthened the biofuel ecosystem by combining awareness, research, and community involvement.

7) Energy Cell

The Energy Cell, coordinated by Mr. S. N. Jayaram at KSCST, was created to promote renewable energy, conservation, and capacity building. Its objectives include technical support, demonstration of new technologies, training, and promotion of decentralized solar power. In 2017–18, the Cell prepared tenders for rooftop solar at IISc, conducted third-party evaluations of solar plants, and carried out feasibility studies for institutions. It also organized renewable energy workshops at engineering colleges to enhance awareness and skills. A major project funded by DST tested Hybrid Ultra Capacitor (HUC) powered solar PV kits and street lights in grid-deprived rural areas. By March 2018, 225 HUC kits were installed in Karnataka, with expansion planned for other states.

Third party evaluation of Solar PV power plants

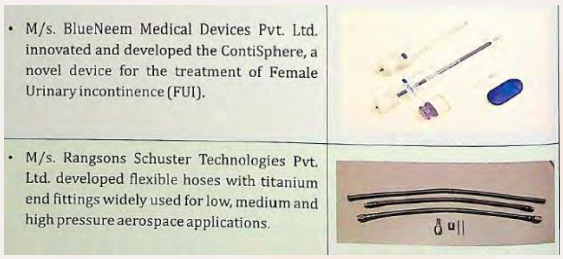
8) Patent Information Centre (PIC), KSCST

The Patent Information Centre (PIC), established in 2005 at KSCST with DST support, aims to raise IPR awareness and guide innovators in patenting. It provides training to academia, industry, and startups, supports setting up IP cells, and enhances patent output for incubation centers. In 2017–18, it conducted 12 workshops across Karnataka, covering patents, copyright, valuation, drafting, and prior-art search. Over 1,000 participants including students, researchers, and faculty benefited from these programs. The Centre

assisted with 3 provisional applications, 1 complete patent, and 1 design registration while guiding 50 innovators on IPR queries. PIC continues to serve as a vital resource for fostering innovation and strengthening Karnataka's intellectual property ecosystem.

9) Karnataka–Israel Industrial Research & Development Program (KIRD)

The Karnataka–Israel Industrial R&D Program (KIRD) was launched in March 2013 under an MoU between the Israeli Innovation Authority and Karnataka's Department of Science and Technology, represented by KStePS and KSCST. The program was designed to provide financial support to small and medium industries in Karnataka for collaborative R&D with Israeli companies. Its goal is to develop and commercialize innovative products through joint industrial research. The program is guided by a Joint Committee responsible for the selection and approval of projects. In the first call, M/s. Blue Neem Medical Devices Pvt. Ltd. received approval for the Project Contisphere with funding of ₹90,00,000, while M/s. Rangsons Schuster Technologies Pvt. Ltd., Mysuru, was approved for ₹2,50,00,000 for developing aviation flexible hoses with titanium fittings. Of the sanctioned amounts, ₹76,50,000 and ₹2,12,50,000 were released to the companies respectively, with 15% withheld to ensure timely project completion.



10) Field Testing of Hybrid Ultra Capacitors (HUC) Powered Solar Lighting Kits and Solar Street Lights for Grid Deprived Rural Areas, Lighting in Varying Climatic Zones of India.

This project, led by Dr. S.G.S. Swamy and Mr. S.N. Jayaram with guidance from an expert committee, tested Hybrid Ultra Capacitor (HUC) solar lighting in un-electrified villages across nine states. A total of 960 × 5W and 40 × 10W kits were installed to evaluate performance under diverse climatic conditions. The kits featured fast charging, rugged design, affordability, and scalability for street lighting. In Karnataka, 225 installations in villages such as Santhebachalli, Nagarahole, and Kolamgere improved safety, education, and reduced kerosene use. The initiative demonstrated HUC technology's potential to provide sustainable, cost-effective, and reliable lighting solutions in rural areas.

11) Assessment of Hydrological and Physical Status of Traditional Water Harvesting systems in Karnataka State Using Geo-Spatial Technologies and Measures for Restoration and Rejuvenation

Under the leadership of Dr. U.T. Vijay, this project assessed the hydrological and

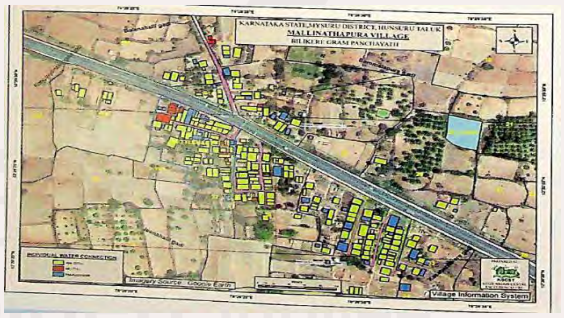
physical status of traditional water bodies such as Kalyanis, Pushkaranis, Gokatte, and Kunte using geo-spatial technologies. Field surveys were completed in 10 districts, and taluka- and district-wise reports in English and Kannada were submitted to local Zilla Panchayaths. GIS-based databases were created, integrating spatial and non-spatial data with photographs. Awareness workshops were conducted for Panchayath Raj officials to emphasize the importance of rejuvenation. The study provides scientific inputs for restoration measures to revive traditional water harvesting systems and strengthen groundwater recharge.

12) Utilization of Crude Glycerol Obtained in Biodiesel Production as an Alternate to Glycogenic feed Supplement for Dairy Cows

Led by Dr. Bandla Srinivas (NDRI) with KSCST collaboration, this project explored using crude glycerol from biodiesel production as a glycogenic feed supplement for dairy cows. Funded with ₹55.58 lakhs, the study aimed to purify glycerol from non-edible oil seeds and waste cooking oil, analyze its safety, and evaluate nutritional benefits. Research included in-vitro fermentation of glycerol-fortified rations, gas production studies, and analysis of plant metabolite residues. Initial findings showed potential for safe inclusion in cattle diets to enhance energy balance and milk production. The project links bioenergy and dairy farming by creating value from a biodiesel by-product.

13) Village Information System

Spearheaded by H. Hemanth Kumar, VIS aimed to develop standardized village-level spatial datasets for better planning and governance. Using satellite imagery, topo maps, and GPS/DGPS, 12 villages were mapped, and three Gram Panchayaths (Awaradhi, Hirenandihalli, Bilikere) underwent detailed cadastral, soil, and water quality surveys. A unique coding system was introduced for settlements and land parcels, and socio-economic data were integrated with spatial data. Stakeholder consultations with Gram and Zilla Panchayaths received positive responses, with proposals for scale-up. The initiative proved feasible for district- and state-level replication, supporting sustainable grassroots development through integrated data systems.



KSCST Projects (2018-2019)

1) Natural Resources Data Management System – Karnataka Project

The NRDMS Centres, established in 1993, provide geospatial data and services for diverse sectors including health, education, transportation, elections, disaster management, and administration. They regularly update datasets to meet increasing application demands while supporting state and district-level planning. Key achievements include preparing polling station maps for Assembly Elections 2018, publishing a Springer paper on geospatial decision-making, and presenting work to international delegates. Other outputs include a School Atlas based on 2011 Census and DSE data, training programs, and studies on environment, health, disasters, and rural development. The Centres collaborated with CPRI on transmission pollution mapping and prepared Spatial Resource Profiles for Aspirational Districts. A major proposal worth ₹6.71 crore was submitted to NSDI for a web-based GIS platform covering property tax, 3D city models, and asset management.

2) Development of Geospatial Web Applications on Karnataka Geo-Portal for G-Governance (KSSDI Phase II)

The KSSDI Phase II project (2013–2016), led by Mr. H. Hemanth Kumar with DST and GoK support, enhanced the Karnataka State Geo-Portal for governance applications. It developed web-based decision support systems for Watershed and Health Departments to integrate real-time geospatial data with management systems. The Karnataka Watershed Development Department's schemes like PMKSY were strengthened by integrating MIS with the Geo-Portal for planning, monitoring, and evaluation. Features added include WMS, WFS, WPS, metadata catalogues, decision support tools, mobile mapping, multilingual support, and crowd-sourced updates. The project contributed to NSDI-BIS standards, proposed applications for urban and rural bodies, and organized expert committee meetings. It was also tasked with creating NSDI awareness materials such as brochures, newsletters, and pamphlets.

3) Village Information System (VIS)

The Village Information System (VIS), initiated after a 2014 DST-GOI meeting, aims to integrate spatial and socio-economic data for decision-making at the village level. Pilot studies were conducted in Karnataka covering districts like Belagavi, Mysuru, Kodagu, and Udupi, representing diverse agro-climatic zones. Activities included preparing digital cadastral base maps, mapping 13 villages under 5 Gram Panchayaths, and developing thematic data on land, water, and assets. Reports and VIS Atlases were submitted to Zilla

Panchayaths and databases were published via a VIS portal. The themes included land use, soils, hydro-geomorphology, utilities, income, housing, and demographics. Findings revealed high utility coverage, rising RCC housing, women's property ownership, seawater intrusion, and migration trends with agriculture no longer the primary income source.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4) Activities of Academia–Industry Interaction Cell (AIIC)

Team Members Involved: Principal Investigator: Mr. H. Hemanth Kumar, Executive Secretary; Coordinator: Mr. K.N. Venkatesh, Senior Project Engineer.

Awareness-Cum-Training Program on Plasma Science & Technology and Energy from Nuclear Fusion: KSCST, in collaboration with the Institute for Plasma Research, Gandhinagar, organized a two-day awareness-cum-training program on 12–13 July 2018. The program targeted high school teachers and PU faculty from five southern states, with 69 participants attending. Sessions included an introduction to plasma, nuclear fusion, plasma applications, and hands-on experiments.

Chetana Programme: "Chetana – Empowering Girls with Technology" is a winter school program designed for high-performing girls from government schools across Karnataka. Held from 23–30 December 2018 at IISc, Bengaluru, it hosted 24 students from four districts and included lectures, discussions, and lab visits. The program also arranged museum and planetarium visits and featured an interactive session with Prof. C.N.R. Rao.

Design, Development and Prototype Making of Mathematical Toys: In collaboration with Dr. H.N. Science Centre, Gauribidanur, KSCST initiated a project to design and fabricate 22 mathematical toys using bamboo. The concepts were developed by Prof. K.P.J. Reddy and Shri V.S.S. Sastry, with fabrication by Uravu Indigenous Science and Technology Study Centre, Kerala. Prototypes like puzzles, equation cards, and Pythagorean triplet models help simplify both basic and advanced mathematical concepts.

H-Cube Summer Camp: KSCST, in partnership with IISc and Seed 2 Sampling Pvt. Ltd., organized the H-Cube Summer Camp from 25 March to 5 April 2019. Twenty students from Kendriya Vidyalaya, IISc, in classes 6 to 8, participated in the program. Its aim was to create an enriched,

joyful, and experimental learning environment where students become knowledge creators rather than passive learners.


Mathematics Workshop: KSCST organized two-day training workshops for mathematics teachers in collaboration with various organizations between October 2018 and February 2019. These workshops covered nine locations and benefited about 550 high school teachers. Additionally, a special program in Sagara taluk trained 60 high school and PU faculty in mathematics teaching.


National Mathematics Day: KSCST celebrated National Mathematics Day at IISc, Bengaluru, on 27 December 2018, marking the birth anniversary of Srinivasa Ramanujan with lectures and addresses by eminent professors. Follow-up activities included a teachers' workshop on 29 January 2019, a three-day linear algebra workshop in February 2019, and school-level celebrations. Across multiple locations, students and teachers engaged in hands-on training, origami, coding, and making 3D mathematical models.

National Science Day 2019: KSCST celebrated National Science Day 2019 to mark the discovery of the Raman Effect and Nobel laureate C.V. Raman's contribution to physics. The theme was "Science for the People & People for Science," highlighting inclusive scientific engagement. Activities included an on-the-spot painting

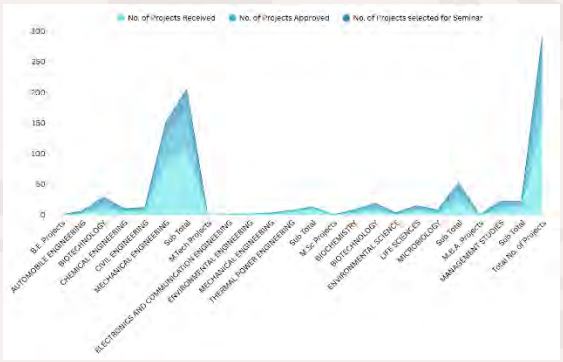
competition with 700 student participants and an essay competition in 37 schools. The main celebration at J.N. Tata Auditorium, IISc, involved 820 students, lectures on the solar system and ceramics, and prize distribution for competitions. A quiz program was organized in 10 Bengaluru locations for high school and degree students to promote curiosity. Additional celebrations at Teresina College, Mysuru, and Atria Institute of Technology, Bengaluru, engaged about 2,000 students from engineering and science colleges.

Science Workshop for High School and PU Students of Davanagere: KSCST and IISc organized a science workshop at Davanagere for 250 high school and 170 PU students in December 2018. The program

introduced participants to scientific concepts and encouraged interactive learning.


'Science to play key role in progress of world in future'

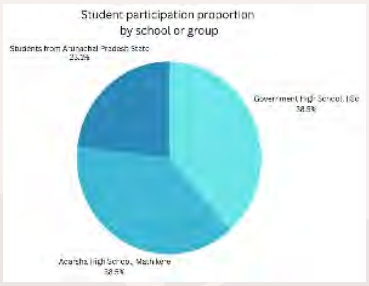
Student Project Programme (SPP): The SPP, started in 1977, supports final-year students with technical and financial help, encouraging innovation and building confidence, with over 90,000 projects supported in 41 years. In the 41st series, 2,973 proposals were received, 598 supported, with thrust areas spanning health, energy, agriculture, and waste management, along with biofuel-focused projects.



Teacher Enrichment Programme: This programme enhances science and mathematics teaching for higher primary school teachers through year-long contact sessions. In 2018–19, it was extended to 50 teachers in Magadi taluk, Ramanagara District, building on earlier success in Bengaluru North.

Two-Day Workshop for High School Teachers on Physics: KSCST organized two workshops in Bengaluru and Tumakuru in 2018 for government and BBMP high school teachers. Participants were given rotating disc experimental kits to enhance classroom physics teaching.

The Science Show – Interaction with Students from IISc Research Scholars: KSCST, with IISc research scholars, conducts "Science Magic Shows" demonstrating physics and chemistry experiments aligned with the school syllabus. Three such programs have been held to engage high school students.



Implementation of Virtual Laboratories (E-Learning Centres) in Backward Taluks of Karnataka: Virtual labs were set up in 21 high schools of backward taluks under GoK's SDP and REC's CSR initiative to improve science education with IT-enabled experiments. Progress included updated NCERT content, 3D experiments, cloud streaming, teacher workshops, and regular monitoring across schools in 10 districts.

5) Rainwater Harvesting Cell

The Rainwater Harvesting (RWH) Cell at KSCST, led by Mr. A.R. Shivakumar, promotes eco-friendly and cost-effective water conservation measures. Since 2005, it has guided more than 300 institutions across Karnataka and other states with sustainable solutions for rainwater harvesting and groundwater recharge. The Cell provides policy support that has influenced legislation for mandatory RWH in government buildings, parks, roads, and public spaces, while also collaborating with BWSSB in Bengaluru for implementation. Supported by UNESCO, the Cell developed

"RWH-Advisor," a free web and Android application to help users design site-specific RWH systems. It provided technical consultancy to institutions such as BHEL, Mindtree, VHD College, and others for RWH system adoption. Training and outreach activities included hands-on workshops for 83 participants and quiz/debate programs for 350 students and teachers to spread awareness.

6) Help Desk and Support Network for Rainwater Harvesting, Groundwater Recharge, and Water Management – Bengaluru

Since December 2011, RWH has been mandatory in Bengaluru, and KSCST, with BWSSB, established the RWH Helpdesk to provide guidance and support. The initiative, led by Mr. A.R. Shivakumar, focuses on creating awareness, training stakeholders, and demonstrating cost-effective RWH systems. Helpdesks were established at IISc and the Sir M. Visvesvaraya RWH Theme Park, which houses 26 working models. Between 2011 and 2019, the program conducted over 54 training programs, 37 awareness camps, and provided technical guidance to thousands of visitors and students. In 2018–19, 2,744 visitors and 2,924 students from 53 schools and 8 colleges participated in awareness activities. The Helpdesks continue to promote sustainable water management practices through demonstrations and stakeholder engagement.

7) Biofuel Cell

The Biofuel Cell, coordinated by Mr. S.N. Sondur, manages 32 Biofuel Research, Information, and Demonstration Centres (BRIDCs) across Karnataka. In 2018–19, the Cell organized quarterly district coordinators' meetings and workshops to review action plans, budgets, and progress. Training programs were conducted for staff and project assistants covering biodiesel production, oil and seed characterization, grafting techniques, and quality analysis. A biofuel nursery was established to propagate Pongamia, neem, mahua, and Jatropha for plantation purposes. The Cell also participated in IISc's Open Day, distributing biofuel plant seedlings to over 500 visitors. Research initiatives included extracting oil from spent coffee powder for potential biodiesel, with further quality and quantity analysis ongoing.

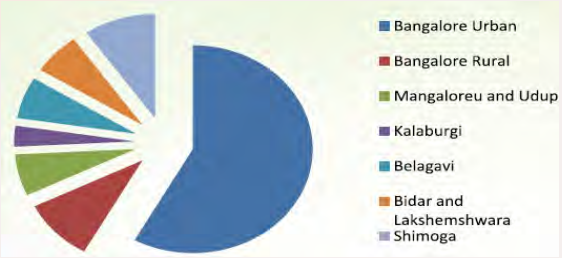
8) Energy Cell

The Energy Cell at KSCST, coordinated by Mr. S.N. Jayaram, was created to promote renewable energy use, conservation, and innovative projects. Its objectives include technical support, capacity building, and demonstration of decentralized power

generation systems. Major activities included managing rooftop Solar PV plants and LED replacements at IISc under REC's CSR program. The Cell also prepared a ₹26 crore proposal for rooftop solar plants and e-learning centers, of which ₹13 crore was sanctioned to cover 30 schools. Technical assessments were conducted in schools, and third-party inspections of solar installations were completed in Santemaranahalli and Bengaluru Urban Zilla Panchayat. Through these activities, the Energy Cell has advanced the adoption of renewable energy and sustainable practices across Karnataka.

9) Patent Information Cell

The Patent Information Cell (PIC) at KSCST promotes intellectual property rights (IPR) awareness and capacity building across Karnataka. It has conducted seminars, workshops, and camps covering patents, copyrights, trademarks, and other IP domains in universities and colleges. The Cell has facilitated the establishment of about 25 IP Cells in higher education institutions across the state. It has supported innovators by facilitating the filing of three trademarks, two patents via PFC-TIFAC, and 12 directly with the Patents Office. Collaborations with CIPAM, UN-WIPO TISC, BBC, and VTPC have enhanced innovation support, while internships are offered to students for IPR-related research. Over 4,365 beneficiaries, including school students, faculty, and entrepreneurs, have gained from its programs and outreach activities.



10) State Awards for Scientists and Engineers

The State Awards for Scientists and Engineers, managed by KSCST, recognize outstanding contributions to science and technology in Karnataka. Instituted by the Government of Karnataka, the awards honor eminent figures like Sir M. Visvesvaraya, Sir C.V. Raman, Dr. Raja Ramanna, Prof. Satish Dhawan, and Dr. Kalpana Chawla. A high-level committee chaired by Prof. C.N.R. Rao selects awardees, with KSCST responsible for implementation. For 2017, 178 nominations were received, and 13 awards were presented in August 2018 at IISc, Bengaluru, in the presence of the Chief Minister and eminent dignitaries. For 2018, 206 nominations were received, and 14 awards were recommended under five categories. The selection committee meeting is convened to finalize awards after detailed processing of nominations.

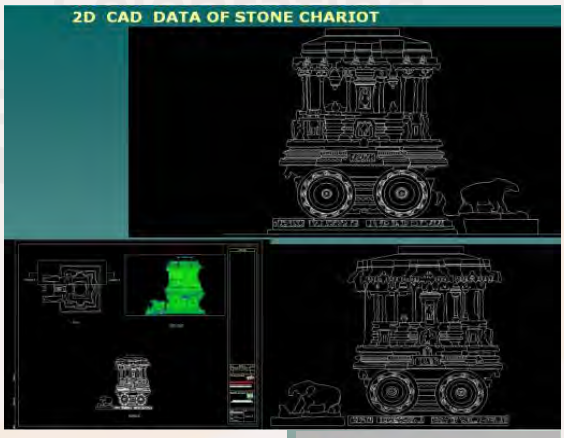
11) Assessment of Hydrological and Physical Status of Traditional Water Harvesting systems in Karnataka State Using Geo-Spatial Technologies and Measures for Restoration and Rejuvenation

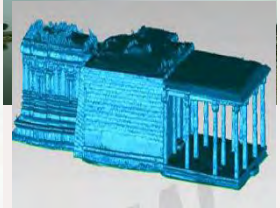
Led by Dr. U.T. Vijay with project associates, the study conducted comprehensive field surveys across Karnataka, collecting primary data on 30 parameters and GPS coordinates for about 14,500 water-harvesting structures. Technical reports for 20 districts (7,200 structures) were completed and submitted to respective Zilla Panchayats and RDPR, GOK, while GIS database creation and remaining district reports are in progress. The outputs are being used by the Rural Development & Panchayath Raj Department to plan rejuvenation under Jalamrutha and MGNREGA schemes. Awareness workshops for Panchayath Raj officials were held and the project's progress received an "Excellent" recommendation from DST's PAMC, prompting circulation of reports to other state S&T councils.Site-level rejuvenation examples (e.g., Rangasthalam Kalyani) and district-wise diagnostics support targeted restoration and groundwater recharge interventions




12) Digital Mini-Spectacle for Showcasing the Glory of Hampi

A multi-institutional collaboration (KSCST, IIT Delhi, NID Bengaluru, IIT Bombay, CBRI) with ASI-Hampi aimed to create high-resolution 3D scans, precise 3D models, physical replicas, and AR/VR interfaces for selected Hampi monuments. The team chose the Vittala temple complex as a proof-of-concept to produce digital and physical models for Kamalapura museum and planned wider city-level spectacle work. KSCST completed high-resolution 3D laser scanning of nine Vittala-complex monuments in October 2018 and carried out registration, post-processing, and mesh generation during November–December 2018.The 3D point-clouds and mesh outputs were submitted to IIT Delhi (15-01-2019) for further processing, and video documentation of methods and outputs was coordinated with Vigyan Prasar, DST, GoI. This work establishes a pipeline for heritage digitization and immersive presentation to conserve and showcase Hampi's monuments.



13) Field Testing of Hybrid Ultra Capacitors (HUC) Powered Solar Lighting Kits and Solar Street Lights for Grid Deprived Rural Areas, Lighting in Varying Climatic Zones of India

Led by the Executive Secretary (PI) and S.N. Jayaram (Co-PI) in partnership with M/s Mesha Energy Solutions, the project installed 876 HUC solar PV lighting kits across nine states and Andaman & Nicobar Islands by March 2019.Installations provided off-grid household lighting to 876 families, with site deployments documented across Karnataka, Nagaland, Odisha, Assam, Himachal, Arunachal, Meghalaya, Uttarakhand, Sikkim and Andaman & Nicobar. Field data on charge/discharge behavior and climatic performance were collected to evaluate HUC reliability in diverse environmental zones. Reported outcomes include improved lighting for un-electrified households, enhanced safety, and reduced kerosene dependence, demonstrated by clustered installations (e.g., Mandya, Kodagu, Denkanal, Gangtok, Port Blair). The project validated HUC technology's potential for scalable, resilient rural lighting solutions.




14) Utilization of Crude Glycerol Obtained in Biodiesel Production as an Alternate to Glycogenic feed Supplement for Dairy Cows

This DST-funded collaboration between ICAR-NDRI and KSCST (PI Dr. Bandla Srinivas) set up laboratory capacity—procured a 50-litre transesterification unit and an AAS—and developed space at NDRI for biodiesel and glycerol evaluation. Biodiesel was produced from various non-edible oils (Pongamia, Simarouba, Mahua, Neem, Jatropha) and waste cooking oil to generate crude glycerol, with feedstock supplies procured and processed for trials. Research included purification, proximate and toxicant analyses, and in-vitro fermentation of TMR fortified with purified glycerol (96 h) with gas production, residues and VFA profiling.Secondary plant metabolites (tannins, alkaloids, flavonoids) in purified glycerol were quantified to assess safety and variability across sources and to inform safe inclusion levels. The study aims to convert biodiesel by-product into a value-added cattle feed supplement to improve energy balance and milk production while linking bioenergy and dairy sectors.





15) Technology communication and awareness through hands-on assessment/ training on agricultural technologies for livelihood opportunities and household nutrition security in the tribal areas of Karnataka

Funded by Vigyan Prasar (Rs. 39 lakhs), KSCST implemented a two-year project in Chamarajanagara district to promote kitchen gardens for nutrition and livelihood among tribal households.Working with KVK Chamarajanagara, the team recruited a field assistant, surveyed beneficiaries using translated questionnaires, and developed a demonstration plot at the KVK for training. Ten interested farmers were identified through surveys; three kitchen gardens were established with seed kits from IIHR and state horticulture inputs, plus seed trays, seed cake and vermicompost. Experts advised on crop selection considering household health needs, and follow-up visits reviewed plant growth and farmer interactions at Bandigowdanahalli and Kolipalya. The project fosters local adoption of kitchen gardens to enhance household nutrition security and livelihood opportunities.

16) Cluster development meeting on Quantum Information Science and Technology (QUST) programme

KSCST organized a DST-funded QuST cluster meeting at the Robert Bosch Centre, IISc (24–26 Sept 2018), convening PIs from 53 selected interdisciplinary projects across premier institutions. Participants presented proposals and budgets to an expert committee; four thematic groups were formed with elected coordinators to consolidate theme-wise reports for DST's PAMC review. Deliberations included technical scrutiny, thematic consolidation, and planning for PAMC presentation; Prof. R. Simon delivered the inaugural address. The meeting facilitated peer review, thematic coordination, and roadmap development for QuST projects supported under DST-ICPS. It strengthened collaboration among academia and DST to advance national quantum research priorities.

Inaugural Address by Prof. R. Simon, Expert committee member and A view of the participants along with Scientists from IISc and DST, GOI

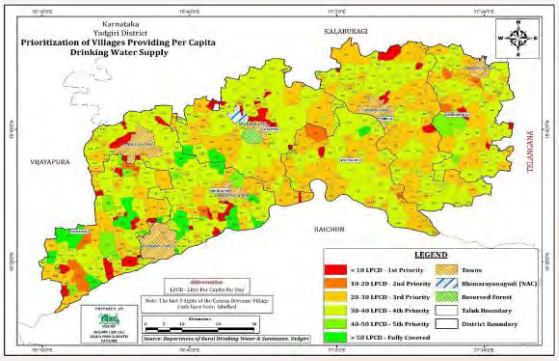
17) International symposium on earthen structures

IISc Bangalore, with KSCST and international partners (Bath, Coventry, Durham, ENTPE Lyon, Earth Building Association), hosted ISES-2018 (22–24 Aug 2018) to discuss research and sustainable practice in earthen construction. The symposium convened practitioners, researchers, designers and students from India and abroad, featuring presentations on materials, climate-responsive design, building comfort, and emission reduction. A diverse set of delegates attended (total 153 registered, 141 attended), including invited international speakers and academic contributors from multiple countries. The event provided an international forum for knowledge exchange on earthen building techniques, policy, and research directions towards sustainable architecture. Outcomes included strengthened networks, shared best practices, and increased visibility for earthen construction research and practice.

KSCST Projects (2019-2020)

1) Natural Resources Data Management System (NRDMS) – Karnataka Project

The NRDMS Centres, established in 1993, provide geospatial data and services for diverse applications such as public health, education, transportation, water quality, and disaster management. In 2019, KSCST officials participated in a meeting with the Additional Chief Secretary of the Government of Karnataka on the use of geospatial technologies for planning and implementation. Following this, about 250 district and taluk-level workshops were conducted to train senior officers in preparing GIS-based action plans. District-wide GIS maps were prepared for multiple departments including health, education, agriculture, social welfare, and animal husbandry. These maps included parameters such as disease distribution, hostel locations, veterinary facilities, stone crushers, and water infrastructure. The initiative has provided administrators with critical geospatial insights for better planning and decision-making.



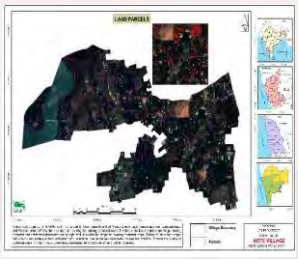
2) Development of Geospatial Web Applications on Karnataka Geoportal for G-Governance (KSSDI Phase II Project)

The second phase of the KSSDI Project, implemented by KSCST and funded by DST and GoK, was launched in April 2013 and concluded in March 2016. Its objective was to provide a web-based geospatial application and decision support system for the Watershed and Health Departments. The project integrated KWDD's Management Information System with a Spatial Data Infrastructure for better planning and monitoring of watershed schemes. The developed State Geo-Portal allows users to access spatial and non-spatial parameters at cadastral or beneficiary levels. It also provides services like Web Map Service (WMS) and Web Feature Service (WFS). KSCST contributed to the National Data Registry, published reports, organized workshops, and demonstrated applications at Zilla Panchayaths.

3) Village Information System (VIS)

The Village Information System (VIS) was initiated in 2014 under a DST-GOI program with KSCST as a partner. It aims to create spatial databases on demography, natural resources, climate, and socio-economic aspects to support village-level planning. Pilot studies were carried out in Belagavi,

Mysuru, Kodagu, and Udupi districts. Mapping covered 13 villages under five Gram Panchayaths and included parcels, settlements, assets, soil, and water parameters. Detailed workflows for generating cadastral base maps were developed and revised based on field inputs. The VIS Atlas was published, and the geospatial databases were made available through an online portal for use by planners and Gram Sabhas.



4) Academic and Industry Interaction Cell (AIIC)

The AIIC at KSCST focuses on improving education quality by supporting student projects, teacher training, and IT-enabled collaborative learning. It launched the 43rd Student Project Programme, inviting proposals from students across Karnataka. The cell also organized awareness and training programs for teachers in multiple districts. E-learning centers were established in 10 government high schools, 10 Ekalavya Model Residential Schools, and 43 Ashrama schools. Virtual laboratories were set up in 10 high schools in backward taluks to enhance science education. The video streaming studio was used to conduct technical talks and student–teacher interactions to promote science learning.

5) Rainwater Harvesting (RWH)

Rainwater Harvesting (RWH) Cell

The RWH Cell at KSCST was established to provide technical assistance for designing and installing rainwater harvesting systems. It develops sustainable solutions for RWH, supports policy formulation, and organizes awareness programs across the state. The Cell has prepared DPRs and provided guidance to government, private, and academic institutions. Training programs were organized for plumbers, engineers, architects, and contractors at the RWH Theme Park in Bengaluru. Around 100 participants were trained in these specialized sessions. The Cell continues to promote water conservation by developing simple, cost-effective, and replicable RWH models.

RWH Help Desk and Support Network: Since December 2011, rooftop rainwater harvesting has been mandatory for most properties in Bengaluru. KSCST, in collaboration with BWSSB, established RWH Helpdesks at its IISc campus office and the Sir M. Visvesvaraya RWH Theme Park. These helpdesks provide technical support, demonstrations, and consultations for citizens, officials, and students. Over 80 training programs, 50 awareness camps, and 100 awareness initiatives were conducted, benefiting more than 2,500 people. DPRs were prepared for RWH systems in 180 BWSSB buildings. The Theme Park attracted over 75,000 visitors, of which 40–50% adopted RWH in their properties.

6) Bioenergy Cell

The Bioenergy Cell at KSCST, supported by KSBDB, promotes awareness, research, and training in biofuels and bioenergy. The revised National Biofuel Policy 2018 shifted focus toward bioethanol and compressed biogas, and KSCST organized a National Conference in Belagavi to deliberate on its implications. Training programs were held in Bagalkote and Chitradurga for BRIDC staff and project assistants on biodiesel production and analysis. The Cell sponsored 98 biofuel-related student projects under the SPP, with 65 selected for seminars. A survey on Used Cooking Oil (UCO) in Bengaluru estimated 54,300 liters available for alternative use in one ward. Research included biodiesel from UCO, Pongamia seed characterization, and oil extraction from spent coffee powder.

7) Energy Cell

The Energy Cell was set up in 2015 to promote renewable energy, energy conservation, and innovative energy projects. Its objectives include providing technical support, organizing workshops, and demonstrating new technologies. KSCST prepared project proposals for rooftop solar plants in schools under KREIS, with REC sanctioning ₹13 crore for 30 schools. The Cell also provided technical support for rooftop solar plants at ICTS, Dharwad Agricultural University, and other institutions. It monitored and prepared tender documents for multiple rooftop installations and energy conservation projects. Through these activities, the Energy Cell has advanced renewable energy adoption across Karnataka.

8) Patent Information Centre (PIC)

The Patent Information Centre (PIC) was established in 2005 at KSCST with DST support to promote IPR awareness and assist innovators in protecting their creations. It focuses on capacity building, IP cell facilitation, patent and GI support, and

strengthening the state's IP ecosystem. PIC has conducted numerous awareness programs, benefitting over 4,365 participants across universities, schools, and government institutions. It has supported the filing of three trademarks and 12 patents, and published books on Geographical Indications in English and Kannada. A UN-WIPO Technology and Innovation Support Centre (TISC) were set up in 2020 to enhance innovation activities. PIC also runs internship programs for UG and PG students in IPR-related research and training.

9) KSCST Regional Centre – Kalaburagi

The Regional Centre at Kalaburagi was established in 2016–17 to address science and technology needs specific to the Hyderabad-Karnataka region. Its activities include seminars, workshops, teacher training, and technology demonstrations tailored to local issues. Programs were organized on the International Year of the Periodic Table in schools and teacher training in districts like Bidar and Koppal. Training on geospatial technology for taluk-level officers was conducted across five districts. Workshops on AI and machine learning were organized for PG students and faculty at VTU Regional Centre, Kalaburagi. An institutional agreement with DPIIT, Government of India, was signed in 2020 to support innovation activities in the region.

10) State Awards for Scientists and Engineers

The State Awards for Scientists and Engineers were instituted in 1996 to honor outstanding contributions in science and technology. The awards are named after eminent figures like Sir M. Visvesvaraya, Sir C.V. Raman, Dr. Raja Ramanna, Prof. Satish Dhawan, and Dr. Kalpana Chawla. A high-level committee chaired by Prof. C.N.R. Rao oversees the selection process, with KSCST managing the program. For 2018, 206 nominations were received, and 13 awardees were recommended by the selection committee. The award ceremony was held on 22nd October 2019 at IISc, Bengaluru, presided over by the Chief Minister and senior ministers. The event highlighted the state's recognition of scientific excellence and its role in development.

11) Karnataka State Centre of Excellence in Cyber Security

The Karnataka State Centre of Excellence in Cyber Security was formed in 2017 under KITS with IISc as the anchor institution and KSCST as the implementing agency. It aims to create a safe cyber ecosystem, address skill gaps, and promote collaboration in the cybersecurity sector. Progress included a technical review committee, recruitment of key staff, and capacity-building programs. Outreach activities involved summer schools, career programs in 15 engineering colleges, webinars, and talks with Cyber Crime Cell. Faculty Development Programs on Blockchain and AI in Cyber Security were also conducted. The Centre has emerged as a hub for standardization, training, and innovation in cybersecurity across Karnataka.

12) Field technology communication and awareness through hands-on assessment/training on agricultural technologies for livelihood opportunities and household nutrition security in the tribal areas of Karnataka

This project addresses malnutrition and livelihood challenges among tribal communities in Chamarajanagara district by promoting diverse vegetable cultivation and establishing kitchen gardens. An awareness program with KVK officials engaged 70 households to introduce the approach and its benefits. Thirty farmers-initiated kitchen gardens, with seed kits, vermicompost, seed cakes, and shade nets distributed to support uptake. An 80% success rate was achieved across four villages, demonstrating strong adoption and feasibility. The goal is to mobilize 100 kitchen gardens across the district to strengthen food security. Thirteen vegetable varieties are promoted without chemical fertilizers to enhance household nutrition sustainably.

13) Assessment of Hydrological and Physical Status of Traditional Water Harvesting Systems in Karnataka Using Geospatial Technologies and Measures for Restoration and Rejuvenation

The project evaluates traditional systems such as Kalyanis, Pushkaranis, Gokatte, and Kunte using GPS/GIS to inform scientific restoration and rejuvenation.

A field survey documented about 13,500 structures statewide and created a comprehensive database. Technical reports with recommended measures were submitted to Zilla Panchayaths, Deputy Commissioners, and the RDPR Department. Outputs feed into Jal Shakti Mission, Jalamrutha, and MGNREGA programs to drive on-ground restoration. Reports were also provided to DST for wider circulation

and replication in other states. District-level workshops raised awareness of TWHS importance and informed administrators on their status and needs.

14) A Digital Mini-Spectacle for Showcasing the Glory of Hampi

High-resolution 3D laser scanning of nine Vittala Temple Complex monuments created point clouds, meshes, models, CAD drawings, and AR/VR interfaces for virtual walkthroughs. Scanning and modeling for all nine monuments were completed as planned. Processed datasets were submitted to IIT Delhi and NID Bengaluru for further refinement and interface development. Project outcomes were showcased at the International Heritage Symposium & Exhibition in New Delhi in January 2020. A brainstorming session with ASI and partner institutions defined the scope and priorities for subsequent phases. The work builds a robust digital foundation for conservation, education, and immersive public engagement.

15) International Heritage Symposium and Exhibition

Jointly organized by KSCST, IIT Delhi, and DST, the event showcased IDH-Hampi technologies including 3D models, monument replicas, and AR/VR/MR applications alongside conservation tools. It was held at the National Museum, New Delhi, on 15–16 January 2020. The Union Minister of Culture and Tourism and the DST Secretary inaugurated the symposium and exhibition. The exhibition remained open to the public for a month, and a book on IDH technologies was released. KSCST moderated one of the panel sessions to guide discussions on digital heritage futures. The program broadened awareness and collaboration around tech-enabled heritage preservation.

16) Karnataka Digital Heritage

This project digitally documents 844 DAMH-protected monuments across Karnataka using GPS, 3D laser scanning, and geospatial databases. It also trains officials to use laser-scan outputs for restoration and conservation decisions. An MoU with DAMH was executed and the work order issued in October 2019. Field surveys and 3D scanning of about 45 monuments in the Bengaluru division were completed. Post-processing and geo-tagging progressed in parallel to ensure accurate archival records. Training logistics and permissions were coordinated with the Muzrai Department to streamline field operations.

17) Field Testing of Hybrid Ultra-Capacitor (HUC) Powered Solar Lighting Kits and Solar Street Lights

Sanctioned by DST in May 2017, the project field-tested HUC-powered solar lighting in grid-deprived rural areas under varying climates. Led by IISc, DST, KSCST, and an industry partner, it aimed to validate technology readiness. Data analysis showed excellent performance, and the final report was submitted to DST-GoI. End-user feedback confirmed consistent results across climatic conditions. Industry optimization produced a patented method upgrading traditional lead-acid batteries for faster charging, longer cycle life, and superior load performance. The technology is now ready for microgrids, inverter/UPS systems, electric vehicles, and is under commercialization.

18) Utilization Of Crude Glycerol Obtained in Biodiesel Production as Glycogenic Feed Supplement for Dairy Cows

KSCST and ICAR-NDRI evaluated crude glycerol, a biodiesel by-product, as an alternate glycogenic feed supplement for dairy cattle. The study purified glycerol derived from non-edible oils and waste cooking oils and assessed its effects. A transesterification unit and an atomic absorption spectrometer were installed and commissioned at ICAR-NDRI. Biodiesel was produced from Pongamia, Simarouba, Mahua, Neem, and Jatropha, and refined glycerol was prepared for in-vitro trials. Trials examined fermentation kinetics, energy values, and gas production across purity levels, with in-vivo studies planned next. Findings have been shared through conference presentations and publications, earning a Best Paper Award.

19) Karnataka–Israel Industrial Research & Development Program (KIRD)

Launched under a March 2013 MoU between the Israeli Innovation Authority and KSCST/KSTePS, KIRD supports collaborative R&D between Karnataka SMEs and Israeli companies. The program is guided by a Joint Committee overseeing selection and progress. A technical review on 21 March 2019 assessed first-call projects. Extensions were granted to Blueneem Medical Devices for its Contisphere device addressing female urinary incontinence. Extensions were also granted to Rangsons Schuster Technologies for aerospace flexible hoses with titanium end fittings. Site visits were planned to

verify milestones and guide subsequent support.

20) Energy-Efficient Buildings Workshop – Low-Carbon Materials and Building Systems

IISc and KSCST conducted a six-day workshop from 5–10 August 2019 on low-carbon materials and climate-responsive building systems. Themes included comfort, building energy, climate-change mitigation, and emissions reduction. Participants included engineers, architects, manufacturers, academics, and researchers, with a focus on earthen structures. Eminent speakers from India and the UK presented research and best practices. A follow-on workshop for KARNIK engineers was held at IISc Challakere in February 2020 on sustainable materials and technologies. The programs disseminated knowledge and encouraged adoption of practical, low-carbon building solutions.

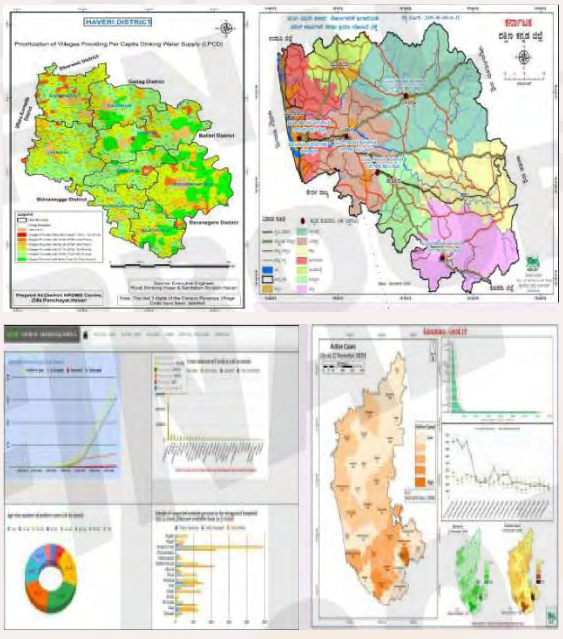
21) Participation in Various Events and Exhibitions

KSCST showcased its programs and technologies at prominent national science and outreach events. These included the India International Science Festival in Kolkata in October 2019. The Council participated in the Pilikula International Full-Dome Film Festival and Planetarium Conference in Mangaluru in November 2019. Activities were exhibited during the DST Minister's "100 Days Success Programme" in Bengaluru in December 2019. KSCST also took part in the 107th Indian Science Congress in Bengaluru in January 2020. These engagements expanded public awareness and fostered stakeholder collaboration around KSCST's initiatives.

KSCST Projects (2020-2021)

1) Natural Resources Data Management System (NRDMS) - Karnataka Project

The NRDMS program in Karnataka, established in 1992, has been providing geospatial data and services for multiple application domains such as health, education, environment, transport, and disaster management. It has consistently updated its datasets to meet growing application needs across sectors. In 2019, more than 250 workshops were held on the use of geospatial technologies for action plan preparation, benefiting over 10,000 officials. GIS-based action plans and reports were prepared for various departments like Education, Health, Agriculture, and Forest. Detailed taluk and district-level maps were created to aid administrators, including identifying infrastructure deficits for the 2021 budget. Key contributions also included a COVID-19 monitoring portal, lake restoration support, and reports on sustainable development goals and minor irrigation revival.



2) Development of Geospatial Web Applications on Karnataka Geoportal for G-Governance (KSSDI Phase II Project)

KSSDI Phase II, implemented by KSCST and funded by DST-GoI and GoK, focused on building geospatial applications to support G-Governance on the Karnataka Geoportal platform. The project particularly assisted Watershed and Health Departments in planning, monitoring, and evaluation using geospatial datasets. It contributed to decision-making processes by integrating data-driven applications. As part of its activities, KSCST was represented in the NSDI-BIS Cadastral Data Content Standard committee. Work was also carried out on implementing the National Data Registry initiated by DST-GoI. Additionally, regular NSDI publications were released, and the team participated in the NDR Review Meet held online in January 2021.

3) Help Desk and Support Network – Rainwater Harvesting, Groundwater Recharge & Water Management Programme for Bengaluru City

The Government of Karnataka mandated rooftop rainwater harvesting in Bengaluru from December 2011, and KSCST, with BWSSB, set up a helpdesk to promote its adoption. The program organized training sessions for architects, plumbers, contractors, and engineers to build technical capacity. It played a role in revising RWH policies and spreading awareness across Bengaluru. More than 150 awareness programs were conducted, reaching a wide audience including NGOs, officials, and citizens. Demonstrations at

the RWH theme park engaged nearly 50,000 visitors, including students and dignitaries. As a result, about 40–50% of visitors benefitted and implemented RWH in their premises.

4) Academic and Industry Interaction Cell (AIIC)

The AIIC promotes collaboration between academia and industry through student projects, workshops, multimedia, and e-learning centers. Under the 44th Series of Student Project Programme (SPP), over 4,600 proposals were received from 160 institutions across Karnataka. The council also implemented virtual laboratories in 11 government schools to enhance education quality in backward taluks. Further, e-learning centers were set up in 10 Ekalavya Model Residential Schools and 43 Ashrama schools with KSCST support. Activities included teacher training, digital content updates, and development of 3D experiments and animations. Outreach efforts also involved online classes, rural school programs, and science competitions benefitting over 2,000 students.

5) Energy Cell

Established in 2015, the Energy Cell focuses on awareness, conservation, and innovation in renewable energy. Its objectives include technical support for projects, capacity building for ESCOM executives, and demonstrations of new energy technologies. The cell has been active in promoting decentralized power generation systems. It extended technical and management support for renewable energy projects in institutions and communities. Field visits were conducted to tribal settlements in Mysore, Chamarajanagar, and Kodagu districts to explore Solar PV Hybrid Ultra Capacitor-based power plants. These proposed plants aim to support livelihood activities, supply drinking water, and power street lights.

6) Bioenergy Cell

The Bioenergy Cell, established in 2011 with KSBDB, promotes bioenergy research, awareness, and industry collaboration in Karnataka. Activities included organizing webinars for World Biofuel Day and regional programs on biofuel policies. A national conference on bioenergy was conducted in Belagavi, and surveys were carried out on used cooking oil availability. The cell also coordinates with 33 research and demonstration centers, holding regular review and evaluation meetings. Reports on agro-waste as potential biofuel feedstock were prepared for policymakers. During COVID-19, the cell innovated by producing herbal-based sanitizers and soaps to support public health needs.

7) Karnataka State Centre of Excellence in Cyber Security

Formed in 2017 under KITS, the CoE in Cyber Security fosters awareness, skill development, and industry collaboration. Anchored by IISc and implemented by KSCST, it aims to address skill gaps and promote safe practices. Outreach efforts covered 8,296 students and 242 teachers across 10 districts. Research activities included a hackathon on cybersecurity in digital India with AI/ML and Blockchain. The CoE also launched a faculty development programme to support research proposals. Additionally, it initiated India's first government-backed cybersecurity startup accelerator, H.A.C.K., and partnered with industry for the Cyber Maatrika initiative.

8) Utilization of Crude Glycerol Obtained in Biodiesel Production as an Alternate to Glycogenic Feed Supplement for Dairy Cows

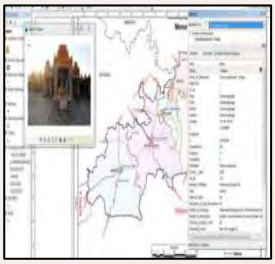
This project explored the potential of using crude glycerol, a biodiesel byproduct, as a feed supplement for dairy cows. Crude glycerol was obtained from Jatropha and Pongamia biodiesel production. Purification protocols were developed, producing up to 150 ml of purified glycerol per liter of crude. The biodiesel and glycerol were tested for quality and performance parameters. Animal trials were conducted successfully using the purified glycerol supplement. Results indicated the feasibility of replacing conventional glycogenic feed with purified glycerol.

9) Assessment of Hydrological and Physical Status of Traditional Water Harvesting Systems in Karnataka Using Geo-Spatial Technologies and Measures for Restoration and Rejuvenation

The project aimed to map traditional water bodies like Kalyani, Kunte, and Gokatte using geospatial technology. A statewide field survey documented about 13,500 traditional water harvesting systems. Technical reports were prepared for each district with recommendations for restoration and rejuvenation. These reports were submitted to Zilla Panchayaths and the RDPR Department for implementation. The findings were integrated into programs such as Jalamrutha, MGNREGA, and Jal Shakti Abhiyan. Reports were also shared with DST-GoI for possible replication across other states.

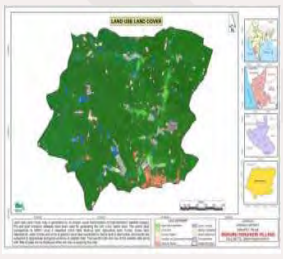
10) Karnataka Digital Heritage

The Karnataka Digital Heritage project focuses on digitally documenting 844 protected monuments across the state. Techniques like GPS, geo-tagging, and 3D laser scanning were used for survey and documentation. Surveys were completed for 105 monuments in Bengaluru division and 69 monuments in Mysuru, Mandya, and Chamarajanagar. The outputs were presented to state ministers and officials for heritage conservation planning. Secondary data collection and scanning at Srirangapatna monuments were initiated. Post-processing of the laser scan data, including registration and point cloud generation, is ongoing for use in restoration and preservation




11) Village Information System

The Village Information System project was designed to compile spatial data on demography, natural resources, climate, land use, and socio-economic aspects to aid village-level decision-making. KSCST partnered in this DST-funded initiative to validate and standardize data requirements for cadastral-level mapping. A document titled *Preparation of Digital Base Maps from Cadastral Maps and RS Data Products* was prepared, detailing workflows using cadastral maps, satellite imagery, and field surveys. Final reports and maps of 13 villages were submitted to the Government of India for consideration. Gopalapura Gram Panchayath in Bengaluru Urban district was surveyed and mapped in October 2020. This methodology is under review for wider application in village mapping by GoI.

12) Patent Information Centre (PIC)

The Patent Information Centre (PIC) was set up at KSCST in 2005 with DST-TIFAC support to raise awareness and assist in protecting Intellectual Property Rights (IPR). Its work spans patents, copyrights, geographical indications (GI), and industry-academia interaction for IP commercialization. During this period, PIC established 15 IP Cells across institutions in Karnataka. It supported the filing of trademarks, patents, copyrights, and provided over 100 IP consultations. More than 50 awareness programs and workshops were conducted, benefiting 4,800 people. The center also signed MoUs with CIPAM and DPIIT to establish a UN-WIPO Technology and Innovation Support Center and collaborated with other organizations for capacity building.


13) Karnataka – Israel Industrial Research & Development Program

The Karnataka–Israel Industrial R&D Program was launched in March 2013 under an MoU between the Israeli Innovation Authority, KSTePS, and KSCST. It aims to provide financial support for small and medium-scale industries in Karnataka to partner with Israeli companies. The program focuses on co-developing and commercializing innovative products. It has been a platform for fostering international collaboration in technology development. One major outcome was the innovation of *Contisphere*, a device for treating Female Urinary Incontinence, by BlueNeem Medical Devices Pvt. Ltd. This success highlighted the program's potential to enable impactful healthcare innovations.

14) Establishing SHG/FPO Enterprises to Address Malnutrition and Provide Rural Livelihoods in Yadgir District

This project seeks to reduce post-harvest losses of fruits and vegetables, which account for 20–30% of production in India. It addresses malnutrition, particularly among women and children, while simultaneously creating rural livelihoods. The project works by establishing Self-Help Group (SHG) and Farmer Producer Organization (FPO) enterprises in Yadgir district. These enterprises employ fuel-efficient bio dryers to process produce into nutritious food products. The processed foods are intended to supplement nutrition while reducing wastage. The initiative is being implemented with support from CST, IISc, and the Karnataka Comprehensive Nutrition Mission (KCNM).

15) Establishment of Schedule Caste and Schedule Tribe Cells in State Science and Technology Councils

The SC/ST cell was created to promote appropriate technologies for the socio-economic development of marginalized groups. It works to assess natural and human resources while enhancing skills for community growth. A core objective is to encourage micro-enterprises and provide sustainable livelihood opportunities. Efforts include identifying suitable training programs tailored to local needs. Currently, a tool is being developed to identify such localized training and skill-building opportunities. The project remains focused on ensuring inclusive growth through science and technology interventions.

16) Creation of "National Centre for Skill Building in Sustainable Technologies"

KSCST, in collaboration with CST, IISc, established the Centre for Bio-energy and Low Carbon Technologies (C-BELT) at IISc Challakere campus. The aim is to build capacity and skills in sustainable technology development. Training programs are regularly organized for engineers and architects to promote adoption. The technologies developed emphasize cost-effectiveness, energy efficiency, and eco-friendliness. Over 1 lakh houses in India, including 20,000 in Bengaluru, have been constructed using these methods. This highlights the large-scale impact and adoption of sustainable housing technologies promoted through the center.

17) Centre of Excellence in Aerospace & Defence (K-tech CoE A&D)

The K-tech CoE in Aerospace and Defence was set up by the Department of Electronics, IT, and BT, Government of Karnataka in collaboration with VTU and KSCST. It provides specialized training to create industry-ready manpower for the aerospace and defence sector. The centre operates from VTU's regional office in Bengaluru. Courses combine theoretical knowledge with practical training using advanced software tools and processes. Aerospace industry experts deliver the programs, ensuring alignment with industry standards. Graduates acquire skills in air vehicle development, contributing to Karnataka's strategic industry growth.

KSCST Projects (2021-2022)

1) Natural Resources Data Management System (NRDMS) – Karnataka Project:

NRDMS, established in 1992, supplies geospatial data and services across domains such as health, education, environment, transport, water, disaster planning and administration. It supports Panchayat Raj Institutions and urban bodies with seamless GIS-ready spatial data for planning and decision-making. The program provides geospatial inputs to state planning offices and issued COVID advisories and an SDG report for Karnataka. NRDMS has seen steady growth in demand for data and services and remains a core state facility for spatial analysis and actionable information. Its outputs feed into multiple state programmes and help mainstream geospatial use across departments.

Karnataka Geoportal: The Karnataka Geoportal delivers geospatial data and services online to stakeholders and hosts a National Data Registry sub-portal and cloud services for NSDI. It acts as the primary web-accessible platform for sharing spatial datasets and supports cross-agency data discovery and use. The portal underpins many state-level GIS initiatives by providing centralized, searchable geospatial assets. It enables wider accessibility of non-personal datasets and supports transparency and planning across departments. The Geoportal is a keystone of the state's spatial-data infrastructure.

Data Monetization Initiatives (Karnataka): KSCST has been appointed nodal agency to design a framework for monetizing non-personal government data held by departments. The initiative distinguishes indirect (internal efficiency) and direct (external sharing/sales) monetization pathways to create economic value from data. KSCST is tasked with proposing policy, certification standards, privacy checks, audits and accountability mechanisms for safe data sharing. The framework aims to unlock new business opportunities while protecting citizen privacy through clear rules and processes. This will enable responsible external use of anonymous datasets and support innovation and services.

2) Rainwater Harvesting Cell

The RWH Cell provides DPRs, technical guidance and designs for rooftop harvesting and groundwater recharge, servicing over 500 institutions. In 2021–22 it submitted DPRs for institutions including AAI, ICMR, ESI hospitals, ASI monuments and HAL among others. A dedicated Help Desk in Jayanagar partners with BWSSB to run awareness and training for architects, plumbers and the public. Since inception 85 training and ~20 awareness programs have been held, reaching over 50,825 beneficiaries (including 30,000 students). The cell combines technical design support with large-scale capacity building for urban water management.

3) Academia and Industrial Interaction Cell (AIIC)

KSCST's Student Project Programme (SPP), running since 1977–78, supported 1,190 proposals in the 44th series and awarded 87 "Best Project" prizes; 4,000 students participated in concluding events. The 45th series (2021–22) received 5,191 proposals with plans to support 1,300–1,500 projects after expert evaluation. The Faculty Project Programme (FPP) invites matured SPP outcomes to scale up and commercialize, with 94 proposals under review. AIIC also established 73 e-learning centers in KREIS institutions to strengthen IT-enabled collaborative teaching. Complementary outreach includes a new Kannada radio series on AI and regular celebrations of National Mathematics and Science Days.

4) Bioenergy Cell

The Bioenergy Cell promotes renewable energy projects and provided DPRs and management support for tribal non-timber forest product enterprises. It supported KREIS schools by designing and commissioning 10 kWp rooftop off-grid solar PV systems across residential schools for e-learning. The cell links technical advisory services with implementation to scale decentralized renewable solutions in government institutions. It also collaborates with stakeholders to translate bioenergy outputs into livelihood and institutional energy support. Activities span DPR preparation, technical oversight and capacity building for renewable installations.

5) Patent Information Centre (PIC)

Established in 2005, PIC promotes IPR awareness, supports institutions in protection of inventions, and fosters an entrepreneurship ecosystem. It has run 60+ workshops on patents, trademarks, copyrights, industrial designs, plant variety protection and GI for students, faculty and startups. PIC hosts a Technology Innovation Support Center (TISC) in partnership with CIPAM/DPIIT for paid online patent database searches. The centre helps set up IP cells in academic institutions and offers policy and technical input to strengthen institutional IPR practices. Its outreach builds capacity for commercialization and protection of innovations across Karnataka.

6) Schedule Caste and Schedule Tribe (SC/ST) Cell

KSCST's SC/ST Cell organizes training, webinars and hands-on workshops aimed at skill development and social inclusion for marginalized groups. Programs included a bio-energy webinar, research methodology workshops (111 research scholars), and construction/plumbing hands-on training for tribal youth. Workshops on social-science research methods and skill mapping were run with participation from tribal and women's university students. The cell focuses on creating employment-linked training and building local capacities in vulnerable communities. Its activities combine technical, vocational and research-oriented training to broaden opportunities.

7) Karnataka Digital Heritage

Karnataka Digital Heritage uses 3D laser scanning to digitize monuments, producing point clouds, mesh models and CAD drawings for virtual walkthroughs and restoration.To date 550 of 844 identified monuments in Bengaluru, Mysuru and Kalaburagi divisions have been scanned, with geo-tagging and photo-linked data underway. The program supports conservation, research, and public access through precise digital archival of heritage assets. Outputs enable reconstruction, immersive presentation, and technical documentation for restoration planning. This initiative marries heritage management with modern geospatial and 3D technologies.

8) KSCST Regional Centre, Kalaburagi

The Kalaburagi regional centre conducts local S&T activities including 3D scanning of heritage monuments and RWH workshops for engineers and contractors. It organizes regional celebrations of National Mathematics and Science Days and hosts outreach and training programs tailored to the division. The centre acts as a local implementation hub to extend KSCST programs and capacity building into the region. Regional operations support replication and scaling of state initiatives at district level. It strengthens local engagement and technical delivery across the Kalaburagi division.

9) Establishing Bio Dryers at Yadgir

This initiative installs fuel-efficient bio dryers in Yadgir to reduce post-harvest losses, add value to produce, and create

rural livelihoods. Activities include product identification, specification development, site preparation and SHG engagement to develop market-ready products. Socio-economic studies and partner engagement are underway to identify suitable SHGs for product making and value-chain roles. The targeted market entry was planned for August 2022, linking technology adoption to nutrition, income and reduced waste. The project combines appropriate technology with local enterprise promotion.

10) Centre of Excellence in Cyber Security (CySeck)

CySeck promotes cybersecurity awareness, skilling, R&D funding and startup support to build a secure digital ecosystem. Awareness campaigns, bilingual newsletters and training have been complemented by skill programs—827 students trained and 278 in a Capture-The-Flag Grand Challenge. Internships were facilitated for 106 students, including placements at NCIIPC, and industry partnerships (e.g., NASSCOM) support capacity building. The centre engages government (CeG) to align CoE capabilities with e-governance cybersecurity needs. CySeck nurtures talent, industry linkages and government collaboration for state-level cyber resilience.

11) Centre of Excellence in Aerospace & Defense (CoE, A&D)

Launched to upskill engineering graduates in aerospace and defense, the CoE (with VTU & KSCST) offers hands-on courses blending theory and lab exposure. Courses are delivered by industry experts and focus on air vehicle development, software tools, and practical processes relevant to A&D manufacturing. The initiative aims to create a skilled workforce ready for industry roles and to support the state's A&D ecosystem. It strengthens academia-industry linkages and provides career pathways in high-technology sectors. CoE activities emphasize applied training and employability in aerospace and defense.

12) Scientific Audit of the Schools Coming Under Karnataka Residential Educational Institutions Society (KREIS)

KSCST conducted a scientific audit of KREIS residential schools to identify system deficiencies and improve managerial and educational practices. The audit team includes experts from ISEC, IISc and NLSIU and complements departmental efforts to enhance school administration. KSCST supports establishing e-learning centers and science activities across ~826 KREIS schools to uplift quality of education for SC/ST/BC rural students. The audit findings will guide improvements in schemes, infrastructure and program delivery for residential education. This work links evidence-based evaluation with targeted capacity building in disadvantaged school networks.

13) State Scientists and Engineers Awards - 2019

KSCST facilitates the annual selection and presentation of State Scientists & Engineers Awards instituted by the Government of Karnataka since 1996. For the 2019 awards, KSCST invited nominations (160 received) and helped select 13 eminent awardees through a committee chaired by Shri A. S. Kiran Kumar. The awards presentation was held on 11 March 2022 at Vidhana Soudha, recognizing significant contributions to state S&T development. KSCST's role ensures transparent selection and public recognition of scientific talent in Karnataka. The awards promote scientific excellence and incentivize research and innovation statewide.

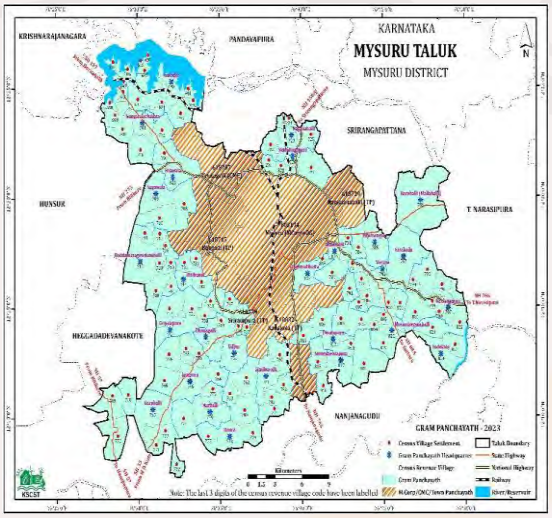
14) Karnataka Israel program for Research & Development (KIRD)

Under an MoU with Israel's Innovation Authority, KIRD funds industrial R&D collaborations between Karnataka SMEs and Israeli partners, providing conditional low-interest loans repayable after commercialization. The program supports tech commercialization with financial assistance and joint selection by a Joint Committee chaired by GoK officials. In its first call, conditional loans were approved for Blue Neem Medical Devices (₹90 lakh) and Rangsons Schuster Technologies (₹250 lakh) for medical and aerospace products respectively. Blue Neem completed clinical trials awaiting approvals; Rangsons Schuster has commercialized its aviation flexible hoses. KIRD fosters international technology partnerships to accelerate industrial R&D and commercialization in Karnataka.

KSCST Projects (2022-2023)

1) Natural Resources Data Management System (NRDMS) – Karnataka Project

Established in 1992, NRDMS has been providing geospatial data and services for diverse applications like public health, education, water management, elections, and disaster planning. In 2022, it co-organized the UN World Geospatial Information Congress and conducted a virtual pre-event with experts from academia, government, and industry. A Geospatial Action Plan was prepared for multiple state departments to aid in developmental activities. NRDMS also supported Zilla/Taluk Panchayat boundary delimitation in Kodagu and developed the Gram Panchayat Atlas 2023 for Karnataka. During the Assembly elections, NRDMS centres created analytical maps to aid logistics and administration. Other initiatives included supporting Jal Sanjivani, Jalamrutha, disaster management, asset tracking, and continuous updating of PRI and election jurisdiction data.



2) Rain Water Harvesting (RWH) Cell

Set up in 2005–06, the RWH Cell provides technical support for rainwater harvesting and groundwater recharge across Karnataka. It has assisted over 500 institutions, including government buildings, universities, industries, schools, and residential complexes, in planning and installing RWH structures. Major projects include large-capacity systems at Gulbarga University, KSDL, Mysuru Airport, and residential apartments, among others. The Cell also runs RWH Help Desks in collaboration with BWSSB, offering public guidance and training for engineers, architects, and plumbers. In 2022–23, it conducted awareness programs, exhibitions, technical talks, and training, reaching thousands of students and citizens. The initiatives have promoted sustainable water conservation practices at institutional and community levels.

Participants of the RWH Training Program

Dr U T Vijay, Executive Secretary, KSCST, discussed RWH with the Retd SE, BWSSB

3) Academia and Industry Interaction Cell (AIIC)

The AIIC supports student and faculty engagement with science, technology, and industry. Under the Puneeth Satellite Programme, it enabled Karnataka school students to participate in the national "75 Student Satellites Mission." Activities included quizzes, essay contests, painting, and poster competitions in all 31 districts,

with winners selected for visits to Sriharikota. AIIC also organized National Mathematics Day 2022 across Karnataka schools and colleges and National Science Day 2023 on the theme *"Global Science for Global Wellbeing"*. As part of Azadi ka Amrit Mahotsav – Vigyan Utsav, it conducted monthly science-themed webinars. AIIC also promoted science education in tribal regions through camps, workshops, and simple experiments to build teaching and learning capacity. These efforts strengthened science outreach, innovation, and student participation in national missions.

4) Bioenergy Cell

Established in 2011, the Bioenergy Cell promotes research and awareness in biofuels and renewable energy. During the 46th Series of Student Project Programme (SPP), it invited around 150 student projects on bioenergy for evaluation and support. A progress review meeting was held at UAS, GKVK, Bengaluru, where coordinators and NGOs presented district-level biofuel activities, fund utilization, and technology adoption. The Cell also facilitated internship projects, including biodiesel production from fish oil by engineering students. To promote awareness, it set up biofuel stalls at exhibitions such as Sutturu Matt in January 2023, displaying non-edible oil seeds, biodiesel, and seed cake. The Cell continues to link academic research with practical demonstration, promoting sustainable energy solutions across Karnataka.

5) Energy Cell

KSCST established the Energy Cell in 2015 to promote renewable energy projects and provide technical and management support for their implementation. A major initiative under this was the Non-Timber Forest Products Collection Enterprises (NTFPCE) sanctioned by the Ministry of Tribal Affairs, with a budget of Rs. 746.16 lakhs. The project involves setting up Honey, Amla, and Shikakai processing units at Mysuru and Koppa LAMP Societies to ensure fair prices for tribal collectors and prevent exploitation. KSCST coordinates with CFTRI, UAS, and IIHR to provide technical support, while STWD funds the program. Progress includes signing an MoA in December 2022, site assessments, and release of the first instalment of Rs. 224 lakhs in March 2023.

6) Patent Information Centre (PIC)

Established in 2005, PIC–KSCST works on Intellectual Property Rights (IPR) awareness, training, and facilitation across Karnataka. It runs the Technology Innovation Support Center (TISC) in collaboration with CIPAM and DPIIT, providing prior art searches, training, and assistance in IPR filings. In 2022, PIC received the Special Citation Award at the National IP Awards. It coordinated the 12th batch of the KIRAN IPR Scheme, training 43 women, of which 22 cleared the Patent Agent Exam. In 2022–23, about 100 applications were handled for prior art searches, leading to 2 patents granted, 1 provisional filed, 5 trademarks, and 4 copyrights. PIC also established 11 new IP cells (total 60 active cells) and conducted workshops, staff training, and awareness programs reaching over 4,600 participants.

7) Scheduled Caste and Scheduled Tribe (SC/ST) Cell

KSCST set up the SC/ST Cell in 2020 to promote inclusive science and technology initiatives for marginalized groups. It developed the "Training Finder – KSCST" web and Android application to link skills, agroclimatic zones, and employment opportunities. The Cell organized a training programme on post-harvest technologies of fruits and vegetables with IIHR for SC/ST communities and supported the Safai Karamchari Commission in identifying equipment for waste management. It also participated in the National Conclave on S&T for Rural Empowerment at IIT Guwahati in 2022, showcasing its initiatives. The Cell continues to focus on sustainable livelihoods, skill-building, and research opportunities for SC/ST communities.

8) KSCST Regional Centre, Kalaburagi

Established in 2014–15, the Regional Centre at Kalaburagi addresses local challenges in Kalyana Karnataka through S&T interventions. In 2022–23, it organized Earth Day, World Environment Day, Biofuel Day, Engineers' Day, and Mathematics/Science Day, engaging schools, colleges, and local institutions. Awareness programs on rainwater harvesting, skill development, and agricultural income improvement were conducted in partnership with KVKs and engineering colleges. The Centre also prepared a DPR on RWH and groundwater recharge at Gulbarga University, showcased activities at BUILDTECH-2022, and conducted multiple training workshops for farmers, youth, and students. It acts as a vital regional hub linking KSCST's programs with local needs.

9) Establishing SHG/FPO enterprises to address malnutrition and provide rural livelihoods in Yadgir District, Karnataka

DST, GoI sanctioned Rs. 4.75 crores for KSCST to establish SHG/FPO-based enterprises in Yadgir district to combat malnutrition and provide rural livelihoods. Implemented with IISc–CST and Sri Aurobindo Society, the project uses fuel-efficient biomass dryers to preserve fruits and vegetables, reducing post-harvest losses. The objectives include nutrition security, livelihood opportunities for SHGs, women empowerment, and value-added market linkages. KSCST handles financial management and procurement, CST focuses on technology and training, while SAS manages marketing and SHG formation. Baseline surveys have been completed, and trial dehydration of banana and tomato is underway. The project is expected to provide fortified foods at subsidized rates while generating local employment.

10) State Awards for Scientists and Engineers

The State Awards for Scientists and Engineers, instituted in 1996, recognize outstanding contributions in various S&T fields, named after luminaries like Sir M. Visvesvaraya, Dr. Raja Ramanna, Sir C.V. Raman, Prof. Satish Dhawan, and Dr. Kalpana Chawla. KSCST manages the nomination and selection process on behalf of the Government of Karnataka. For 2020 and 2021, a total of 330 nominations were received, and 28 eminent scientists and engineers were selected. The award function was held on 23rd March 2023 at IISc, Bengaluru, with Dr. C.N. Ashwath Narayan presenting the awards in the presence of Bharat Ratna Prof. C.N.R. Rao. The awards honored achievers across physical, chemical, medical, agricultural, engineering sciences, science education, and technology innovation, showcasing Karnataka's scientific excellence.

11) Centre of Excellence in Cyber Security (CySeck)

Established in 2017 under Karnataka Innovation & Technology Society, CySeck (anchored at IISc) promotes a cyber-safe environment by bridging industry, academia and government. Its mandate covers outreach, skills development, standardization, R&D support and startup

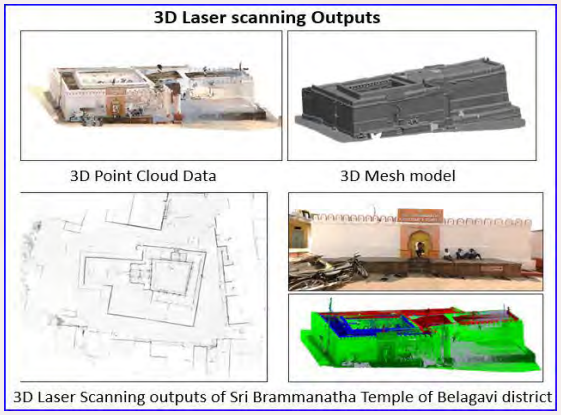
acceleration in cybersecurity. Key achievements since April 2022 include a year-old monthly newsletter (Cyber Vartika) with wide reach, seed grants to selected research proposals, and the second cohort of the H.A.C.K. accelerator supporting 14 startups. CySeck signed MoUs with industry mentors (VMware, Dell), ran secure-coding and blockchain trainings for government developers and police, and supported curriculum and faculty training for diploma cybersecurity specializations. The centre continues dual tracks of outreach and industry/startup engagement to build capacity and foster innovation.

12) Centre of Excellence in Aerospace & Defense (COE, A&D)

Launched in 2017 (K-tech initiative) with VTU, KSCST and Dassault Systèmes, the CoE A&D provides industry-aligned training, prototyping and skill development for aerospace and defense. It offers a range of courses — from short orientation and foundation internships to advanced, project-based and embedded semester modules — taught by industry expert faculty and lab trainers. The Centre supports R&D projects, prototype creation, and industry collaborations, and is structured with dedicated systems engineers and faculty across avionics, structures, mechanical systems, simulation and digital labs. It also hosts industry familiarisation programmes, such as the delegation visit from Bhutanese media to showcase facilities and expert interaction.

13) Karnataka Digital Heritage (KDH)

KDH digitally documents protected heritage monuments using 3D laser scanning and geospatial technologies to produce 3D point clouds, mesh models and CAD drawings for virtual walkthroughs, restoration and virtual tourism. From April 2022 to March 2023, it completed scanning of 798 monuments across Bengaluru, Mysuru, Kalaburagi and Belagavi divisions (out of 844 identified), and field-scanned 322 monuments in six districts of Belagavi division. Post-processing (registration, cleaning, mesh/CAD generation), geo-tagging and linking spatial/non-spatial data with photographs are in progress. The laser-scanned data serves as a valuable resource for conservation, reconstruction and interactive heritage presentations.



3D Laser Scanning outputs of Sri Brammanatha Temple of Belagavi district

14) Scientific Audit of the Schools Coming Under Karnataka Residential Educational Institutions Society (KREIS)

At the Social Welfare Department's request, KSCST conducted a scientific audit of Karnataka Residential Educational Institutions Society (KREIS) schools to identify systemic deficiencies and improve management practices. An expert team (ISEC, IISc, NLSIU) inspected infrastructure and facilities across ~40 schools, assessing buildings, classrooms, labs, libraries, ICT, sanitation, water, kitchens, hostels, accessibility, STP, solar/electrification and hygiene standards. Detailed data were collected from about 29 schools and the draft audit report is under preparation, aiming to recommend pragmatic upgrades and administrative improvements for smoother day-to-day functioning.

15) Providing Information And Communication Technology (ICT) Infrastructure For Digital Literacy In Karnataka Residential Educational Institutions Society (KREIS)'S Residential Science Pu Colleges Under HAL CSR Funds.

KSCST, with CSR support from HAL, initiated a project to establish ICT infrastructure in 79 KREIS residential science PU colleges, later reduced to 61 due to price escalation. The infrastructure included laptops, desktop AIO computers, projectors, networking systems, and sets of library books. HAL sanctioned ₹3.64 crores and KREIS contributed ₹16.6 lakhs towards administrative and related costs. In the first phase, 45 colleges were equipped, and reports were submitted to HAL, while the second phase will cover the remaining 16 colleges. Technical inspections by officials from HAL, KREIS and KSCST confirmed compliance with specifications. Principals and teachers reported significant improvements in academic tasks and expressed gratitude, noting the systems would support students in academics and competitive exams like CET, NEET, and JEE.

16) New Projects

Two new projects have been sanctioned. The first, Pharmaceutical Industrial Effluent Treatment through Plasma Process (₹48.83 lakhs, 24 months), will upgrade wastewater treatment in partnership with IISc and KAPL Bengaluru. It aims to integrate plasma-based advanced oxidation with the activated sludge process to recycle 50 KLD of wastewater, demonstrated through a 5 KLD pilot model. The second, Drafting of the Indian Geo-Spatial Data Accessibility, Storage and Sharing Bill 2022 (₹29.42 lakhs, 6 months), in collaboration with NLSIU Bengaluru and approved by DST, GoI, seeks to strengthen geospatial infrastructure. It will address data sharing and accessibility, formulate standards for storage and formats, and guide the use of geospatial data, products, and services.

KSCST Projects (2023-2024)

1) Popularisation of Science

KSCST ran an active Popularisation of Science programme during 2023–24 with focused events for mathematics and science outreach. National Mathematics Day (22 Dec 2023) was celebrated at Science Gallery Bengaluru with ~130 students/teachers and a five-day Ganitha Mela (18–22 Dec 2023) engaged ~300 BBMP and government school students through dances, Lilavathi plays, puzzles and hands-on activities. Vijanana Harate outreach (30 Aug 2023) and a teachers' training (13 Sep 2023) broadened school-level engagement in Bengaluru. National Science Day 2024 (theme: "Indigenous Technologies for Viksit Bharat") included an on-the-spot painting event (17 Feb) and a state celebration (28 Feb) at IISc with ~300 participants. District-level NSD activities were held across 31 districts coordinated with NRDMS officials, including essay, painting, model competitions, quizzes and technical talks. These events combined public outreach, teacher capacity building and student engagement to popularize STEM statewide.

2) Training Programme in Network Techniques (Innovation in Teaching)

KSCST organized targeted teacher-training to improve teaching quality in tribal and remote regions. A three-day state-level science & mathematics model-making workshop for Valmiki Ashram school teachers was held at Dharwad Regional Science Centre (3–5 Aug 2023) with ~50 participants. A district-level three-day workshop for Uttara Kannada high-school teachers ran from 17–19 Aug 2023, inaugurated by the District Chief Accountant, also with 50 participants. Student exposure included a 2 June 2023 visit by 60 Vijayapura government high-school students to IISc (SERC, CAF, Mechanical & Aerospace departments). These activities combined hands-on pedagogy, institutional visits and local teacher capacity building to strengthen learning in underserved areas.

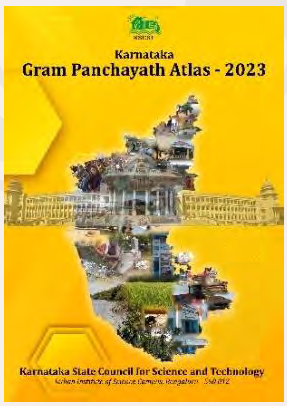
3) Student Projects Programme (SPP) & Faculty Project Programme (FPP)

KSCST continued the long-running Student Project Programme to promote student innovation; in the 46th series 1,494 projects were sponsored and 443 shortlisted for state seminar/exhibition (204 for seminar, 239 for exhibition). The state seminar & exhibition (11–12 Aug 2023 at Alva's IET) showcased the 443 projects and recommended 57 projects for "Best Project of the Year"; RV College of Engineering won "Best Performing College." The 47th series (initiated Nov 2023) received ~6,051 proposals across 108 branches, with evaluations underway by experts from IISc, NAL, CMTI, TDC-IISc and industry. Under the Faculty Project Programme (launched Mar 2022), all 16 sanctioned FPP projects completed; final review was held on 5–6 July 2023 and reports/UCs submitted. Together SPP and FPP foster student and faculty research, bridge academia–industry linkages and

identify practical solutions to regional challenges.

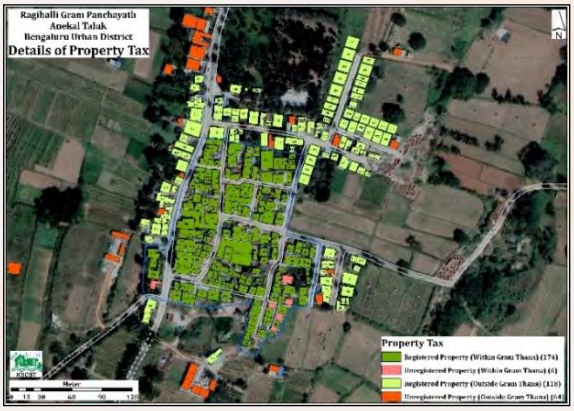
4) Natural Resources Data Management System (NRDMS) – Karnataka

NRDMS continued as the state's geospatial backbone, supplying mapped data and analytics across health, agriculture, education, water, disaster planning and governance. NRDMS supported Karnataka Assembly Election-2023 with detailed analytical maps (polling stations, vehicle movement, sector officers, flying-squad and facilities) submitted to District Election Officers. Five-year geospatial action plans were prepared across sectors (Health, Agri, Education, PRIs, Forest, Horticulture, Veterinary, Women & Child Welfare, BC/Minority Departments). NRDMS produced flood-prone habitation analytics and coordinated with NDRF and disaster systems during floods/landslides, and prepared airport-height zoning maps for Sambra Airport (Belagavi). The unit also mapped PHC/CHC jurisdictions, sand-mining/quarry locations for Mines & Geology, and village-level LPCD/borewell/water quality maps for Rural Drinking Water & Sanitation programmes. NRDMS outputs included an SDG performance report covering five SDGs with 52 indicators for Karnataka districts.



5) Village Information System (VIS)

VIS generates cadastral-level digital village datasets (demography, land use, natural resources, socio-economic parameters) to support micro-planning and PRIs. KSCST co-authored a workflow with Anna University for creating digital base maps from cadastral maps and RS products and completed field survey and mapping for Ragihalli Gram Panchayat (Anekal taluk). Objectives include 1:2,000 village-scale maps, unique habitation/dwelling IDs, roof and building-dimension mapping, and statistical analyses aligned to welfare programmes (health, sanitation, LPG, Aadhaar, bank/mobile access). An Android data-collection app was developed for buildings, roads, water sources and utilities supporting online/offline capture, photos and export to spreadsheets. VIS maps cover 23 parameters (LU/LC, road network, utilities, sanitation, household amenities, occupation, caste, income, building age/types, vehicles, livestock etc.) to enable targeted provisioning and planning.



6) Karnataka Digital Heritage (KDH)

KSCST's KDH programme scaled 3D laser-scanning and geospatial documentation of state archaeological monuments to create point clouds, 3D meshes and CAD drawings for virtual walkthroughs and conservation support. During 2023–24 KSCST completed 3D scanning of 530 protected monuments across Bengaluru, Mysuru, Kalaburagi and Belagavi divisions, and scanned ~70 monuments in Uttara Kannada & Vijayapura against targets in Belagavi division. Division reports (Mysuru, Kalaburagi, Belagavi) were submitted to the Department of Archaeology, Museums & Heritage (DAMH), and outputs were showcased to the tourism minister and to Karnataka entrepreneurs in the USA (13 Oct 2023). A list of 280 DAMH monuments selected for the Namma Smaraka conservation scheme was prepared and KDH outputs were presented across districts during "Namma Smaraka Darshana" programmes. Deliverables include 3D models, HTML viewers and CADs to support conservation, virtual tourism and stakeholder engagement.

7) Patent Information Centre (PIC)

PIC (since 2005) and the Technology Innovation Support Centre (TISC) at KSCST promote IPR awareness, prior-art searches, patent filing guidance and IP cell formation across academia and industry.

In 2023–24 PIC signed an MoU with NRDC (Vishakhapatnam) to support commercialization and exchanged the MoU during a tech-transfer symposium at CIT Bengaluru (14 Mar 2024). PIC facilitated establishment of ~17 new IP cells (total 76 to date), ran ~80 IPR programmes benefiting >6,000 participants and supported filing of >700 IPR applications (patents, designs, copyrights, trademarks). Activities included a brainstorming/workshop (29 Feb 2024) to strengthen IP cells, VTU faculty training on a new "Research Methodology & IPR"

credit course (≈250 faculty trained) and initiation of GI filing work (e.g., Honnavar Betel leaf). PIC is also preparing proposals to build IP ecosystems across government engineering and polytechnic colleges in coordination with DTE and IISc.

8) Pharmaceutical Industrial Effluent Treatment — Plasma Process (Pilot)

This industrial collaboration aims to upgrade pharmaceutical ETPs by improving activated-sludge performance (via BioWin® modeling) and demonstrating a high-throughput cold-plasma advanced oxidation system to recover ~50 KLD process water for secondary uses. Lab-scale demonstration (5 KLD) will quantify pharmaceutical pollutant degradation, integrate BioWin modelling and propose treated-water reuse plans. IISc–KAPL interactions continued through site visits and questionnaire exchanges (IISc visit to KAPL 19/02/24). Three sets of ETP samples (Dec 2023, Jan & Feb 2024) were analyzed for 18+ parameters; LC-MS profiling identified pharmaceutical residues at inlet/outlet. Modeling using measured flows and ETP dimensions is underway and literature studies on antibiotics removal via AOP/cold plasma and biological agents are informing design.

9) Establishing SHG/FPO Enterprises to Address Malnutrition & Rural Livelihoods — Yadgir

DST sanctioned Rs.4.75 crore project (2021) to KSCST with IISc CST and Auro Centre to prevent post-harvest losses, enhance nutrition security, and create SHG/FPO-led value-addition enterprises. A Fortified Energy Food production centre has been renovated and equipped; product extrusion and quality testing were completed by STEER Bangalore, KAU Thrissur and IIHR (nutrients, heavy metals, pesticides, micronutrients). An expert committee selected plant & machinery; a 45 KVA transformer was installed (Mar 2024) to meet additional power load. Tender evaluation identified the L1 bidder and work orders issued for machinery supply & installation, with commissioning expected by end-May 2024. The project emphasizes nutritive product processing, women's livelihoods, and market linkage for preserved/dehydrated horticultural products using green energy approaches.

10) NTFP Collection & Processing Enterprises (Mysuru & Koppa)

MoTA and STWD sanctioned processing units for Honey, Amla and Shikakai at Karnataka State LAMPS Federation (Mysuru) and Koppa LAMP Society (Chikkamagaluru), executed by KSCST with technical partners (CFTRI Mysore, UAS-

GKVK, IIHR). Objectives: local primary processing, fair pricing, storage/transport support, and sustainable income for tribal collectors while protecting resource bases. MoAs signed among STWD, KSCST and LAMPS societies; site assessments were completed and PIC/Technical & Project Implementation Committees formed for oversight. Civil works for honey plant renovation (KRIDL) were entrusted (~Rs.45 lakh) and tenders invited for a 1,000 kg/day honey processing & bottling plant at Mysuru. The project prioritizes institutional processing, market access, and livelihood security for tribal communities.

11) Energy Cell Activities

KSCST's Energy Cell promotes renewable energy, bioenergy and technology adoption, coordinates BRIDC/ Biofuel Parks, and provides technical support for rooftop and biofuel projects. Key 2023–24 actions included a techno-economic feasibility report for 450 kWp rooftop PV at Karnataka Soaps & Detergents and technical support for hostel rooftop PV in Bengaluru Rural. A two-day hands-on Biofuels training at UAS-GKVK (11–12 Apr 2023) and World Biofuel Day events (10 Aug 2023) raised sector awareness. KSCST co-organized a biofuel feedstock suppliers' meet (20 Jan 2024) and the ISEMS-2024 international conference (1–2 Mar 2024). Under SPP 46th series, 77 bio-energy student projects were sponsored, supporting research and entrepreneur support in bioenergy.

12) SC/ST Cell

Established 2021, the SC/ST Cell promotes technology adoption, skill upgrading and micro-enterprise creation for marginalized communities through cluster surveys and targeted training. Activities in 2023–24 included preliminary field surveys across multiple SC/ST clusters (Jenu Kuruba, Malekudiya, Susheelnagar, Kaladgi, Kuppalli, Singanamane, Lingadahalli) and follow-up recommendations for sustainable skill development. Training programmes included "Nutrient Management of Horticulture Crops" for SC/ST progressive farmers across six districts (22–23 Feb 2024, ICAR-IIHR) and "Modern Innovative Embroidering Skill Training" (12–13 Mar 2024 at Susheelnagar GP, Bellary). The cell advances livelihoods, agronomic skills and enterprise development tailored to community needs.

13) Comprehensive Screening & Health Management of Sickle-Cell Anemia (Tribal Districts)

KSCST supports Karnataka's implementation of the National Sickle Cell Elimination Mission with a project targeting screening of ~2.56 lakh people (2011 census baseline) across Mysuru, Chamarajanagar and Kodagu over two years. The programme's aim is mass

screening, diagnosis, referral and health management for tribal populations; committee reviews and progress discussions have been held at IISc's Department of Applied Physics. KSCST coordinates technical inputs, progress monitoring and linkages with state health agencies to meet mission targets and improve tribal health outcomes.

14) Karnataka Regional Centre — Kalaburagi

KSCST's Regional Centre at Kalaburagi advances S&T outreach and local development across Kalyana Karnataka region via events, advisory meetings and capacity building. 2023–24 highlights include World Bee Day at UAS Raichur (20 May 2023), an Advisory Committee review (09 Jun 2023), National Doctors' Day (03 Jul 2023), farmer awareness at Gobbur B (25 Jun 2023), and district-level NMD/NSD celebrations. The centre hosted CIYoN-2023 Nutri-cereals festival (23 Dec 2023) and workshops on soil & water conservation (29 Feb 2024). It organized health, hygiene and nutrition workshops, a national conference on Functional Glass & Ceramics (1–2 Mar 2024) and other events to address local priorities through S&T interventions.

15) Scientific Audit of KREIS Schools

Commissioned by the Social Welfare Department, KSCST conducted a scientific audit of Karnataka Residential Educational Institutions Society (KREIS) schools to identify administrative, infrastructural and educational gaps and recommend corrective measures. Objectives included assessing KREIS' role for marginalized students, identifying constraints (financial, infrastructural, administrative) and recommending improvements in education quality and management. The final audit report was submitted to the Principal Secretary, Social Welfare (Major Manivannan, IAS) on 19 Dec 2023; follow-up visits are planned to review new KREIS initiatives in operational schools. The audit supports systemic reforms to strengthen residential education governance and outcomes.

16) ICT Infrastructure for Digital Literacy in KREIS PU Colleges (HAL CSR)

Under HAL CSR (project cost ~Rs.3.64 crore), KSCST deployed ICT infrastructure—laptops, projectors, library books, network connectivity and computer labs—in 61 KREIS PU colleges to implement digital literacy. Vendor selection was through GeM and rollout included two inspection phases (May & Sep 2024) with inspection reports submitted to HAL; HAL also inspected selected colleges. Project activities are complete and centers are under daily maintenance, enhancing digital access and learning resources for residential PU students statewide.

17) Centre of Excellence — CySecK (Cybersecurity) & CoE in Aerospace & Defense

CySecK promotes cybersecurity awareness, skills, research and industry collaboration via social campaigns, outreach and training. Highlights: 38+ awareness sessions (6,000+ audience), a comic handbook for youth, Cyber Haasya Sanje events (13 shows reaching 20k+), three FDPs for lecturers, industrial visits, the Samgacchadwam webinar/Master Class series, and the Digital Defenders CTF with ~9,900 registrations (top-25 awarded). Initiatives also launched BrowseSafe DNS, CISO-KA platform and MSME IT/OT security workshops while supporting research projects and H.A.C.K. startup cohorts. CoE-Aerospace & Defense focuses on capacity building and industry readiness (internships, workshops, virtual engineering courses, and awareness programmes) to nurture manpower and startups in aerospace/defense sectors.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18) State Scientists & Engineers Awards (2022–23 cycles)

KSCST operationalized the state S&T awards (Visvesvaraya, Raja Ramanna, C.V. Raman, Satish Dhawan, Kalpana Chawla categories) on behalf of DST, GoK. Nominations were invited in July 2023 and 330+ nominations were received across categories (144 for 2022; 187 for 2023 in combined reporting). The selection committee (chaired by A. S. Kiran Kumar) met on 1 Dec 2023 and recommended 28 eminent scientists/engineers across the award categories; recommendations submitted to Government for approval. The awards process recognizes exemplary scientific contributions and the presentations will be scheduled after Government confirmation.

19) Workshops / Exhibitions / Seminars / Conferences

KSCST actively participated in national and state events to showcase programmes and connect with stakeholders. Key events included IISF-related exhibitions (17–20 Jan 2024), Bengaluru Tech Summit (29 Nov–1 Dec 2023) and World Environment Day (5 Jun 2024) and other targeted seminars such as the RWH Jubilee seminar and Brand Bengaluru (dates in 2024).

KSCST officials served as liaison officers at G20 events and interacted with academia, industry, teachers and students at national fora to amplify KSCST initiatives. These engagements provided platforms for outreach, partnership building and dissemination of KSCST's projects and research.

KSCST Projects (2024-2025)

1) Comprehensive Screening and Health Management of Sickle-Cell Anemia in Tribal Districts of Karnataka

The project aims to screen 2.56 lakh tribal population in Mysuru, Chamarajanagar, and Kodagu under the National Sickle Cell Elimination Mission. It covers 238 PHCs with 422 spectroscopy devices for testing, counselling, treatment, and IEC activities. A Command Center for Sickle Cell Data was inaugurated at IISc, Bengaluru, with IOCL and KSCST. Awareness programmes, including folk activities, were held in tribal areas to sensitize communities. A state-level IEC and screening programme was organized at HD Kote, Mysuru, on 18th January 2025. Over 400 tribal members, ASHA workers, and students participated, reinforcing outreach and free treatment efforts.

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2) Establishing SHGs / FPOs Enterprises to Address Malnutrition and Provide Rural Livelihood in Yadgir District, Karnataka

This DST-supported project (2021–24, ₹4.75 Cr) is jointly implemented by KSCST, CST-IISc, and ACPN to reduce malnutrition, prevent wastage of horticultural produce, and provide rural livelihoods. Key interventions include forming/strengthening SHGs and FPOs, using fuel-efficient technologies for preservation, developing marketing strategies, and training stakeholders. A fortified energy food production centre with full infrastructure and advanced machinery has been set up at Yadgir. Four food variants (Children, Adolescent, Adult, and Family) were developed, tested for quality, and FSSAI certified. Trial production is complete, commercial production and marketing are in progress, and patent and trademark applications have been filed.

3) Establishment of Non-Timber Forest Products Collection Enterprises (NTFPCE) Processing Centers at Mysuru and Koppa

This MoTA- and STWD-supported project, executed by KSCST with CFTRI, UAS-GKVK, IIHR, and Forestry College, aims to process NTFPs like honey, amla, and shikakai to ensure fair prices, reduce exploitation, and improve tribal livelihoods. A 1000 kg/day honey processing and packing plant has been commissioned at Mysuru LAMPS and

is under trial run. Flooring for amla and honey plants at Mysuru is completed, while renovation works are ongoing at Koppa LAMP Society with KRIDL support. Licenses for Amla Squash and Osmotic Dehydration were obtained from IIHR. Tendering and evaluation completed. Established shikakai, amla, and honey bottling plants at Mysuru and Koppa.

4) Patent Information Centre (PIC)

The Patent Information Centre (PIC) was established at KSCST in 2005 with DST-TIFAC support to create awareness and provide assistance on IPRs including patents, copyrights, and GIs. A Technology Innovation Support Centre (TISC) was set up in 2020 to strengthen training and prior art search facilities. KSCST signed MoUs with NRDC (2024) for commercialization of IPRs and with DCTE, IPTeL-IISc and BeST (2024) to build an IP ecosystem in Government Colleges. PIC has established 90 IP Cells across Karnataka, conducted 300 IPR programs benefiting over 20,000 participants, supported filing of 2,500+ patents (100+ granted in last five years), and carried out 350+ prior art searches. It received the National IP Award 2021 & 2022 (special citation) from the Indian Patent Office. Under the DCTE MoA, 80 faculty were trained as IPR coordinators, leading to filings from Govt. Colleges. PIC also identified 12 potential GI products, filed applications for “Rani Ele” and “Rani Pepper,” initiated studies on other goods, and facilitated 39 GI Authorized User registrations with value-addition trainings. Overall, PIC KSCST has significantly strengthened the IPR ecosystem in Karnataka through awareness, training, filings, commercialization support, and GI promotion.

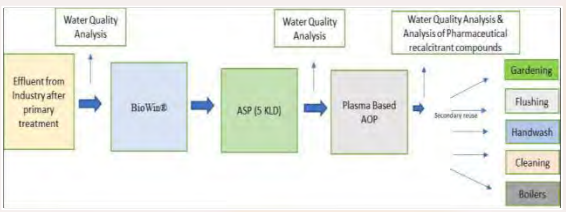
5) Women Scientist Scheme – 13th WISE KIRAN IPR

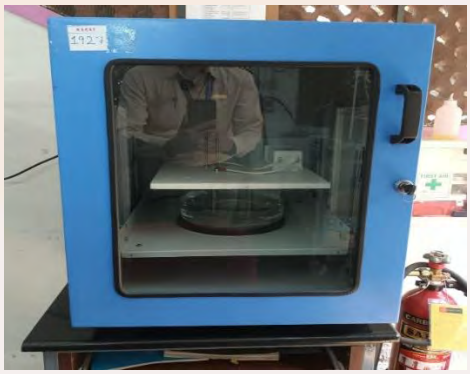
PIC KSCST, in association with TIFAC-DST, GoI, is implementing the 13th batch of the WISE Internship in IPR (KIRAN IPR) programme for women candidates in science, engineering, medicine, and allied areas. This one-year programme provides orientation and 11 months of on-the-job training in IP law firms/organizations across southern states to build careers in IPR. In February 2024, 22 candidates from the southern region were deputed for training. A two-day Patent Drafting Workshop was organized at KSCST on 25–26 July 2024 to prepare candidates for the Patent Agent Exam. Regular monthly attendance and

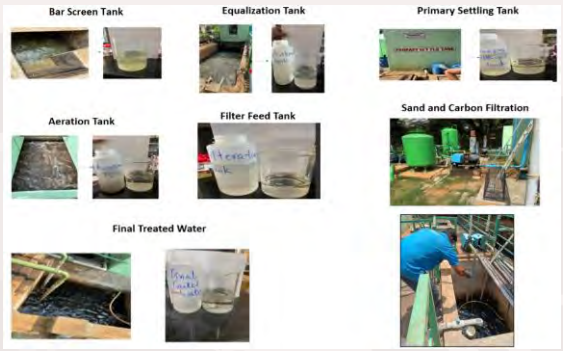
progress reports are being submitted to TIFAC, DST.

6) Pharmaceutical Industrial Effluent Treatment through Plasma Process for Improved Recycling

Executed by KSCST in collaboration with CST, IISc, Bengaluru, and industry partner KAPL, sanctioned by DST, GoI with a total cost of ₹50.95 lakhs. It proposes a two-step treatment (improved ASP using BioWin® modelling + cold plasma advanced oxidation system) to decontaminate pollutants and microorganisms, enabling reuse of treated water. A 5 KLD lab-scale demonstration is being implemented to improve ASP, quantify pharma pollutant degradation, and evolve a reuse plan. Water quality analysis and LCMS studies have confirmed antibiotic presence in ETP, with AOP and cold plasma treatment under progress. The project aims to reduce BWSSB water dependence, promote recycling, and achieve Near Zero Liquid Discharge with lower energy consumption.

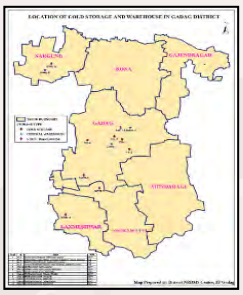






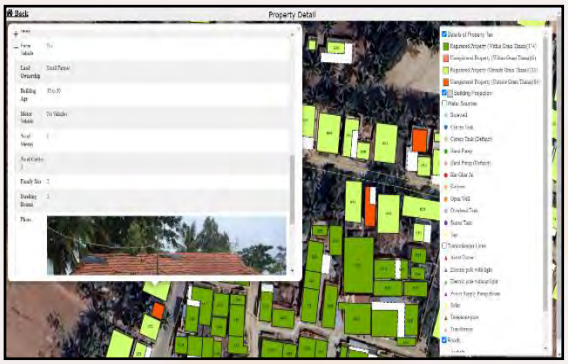
7) Natural Resources Data Management System (NRDMS) – Karnataka Project

The NRDMS – Karnataka Project (est. 1992) provides geospatial data and services for planning in sectors like health, agriculture, education, disaster management, and governance. District centres supported the 2024 Parliamentary Elections, prepared action plans, PHC maps, epidemic and flood-prone habitation maps, groundwater studies, and site selection for storage, water supply, and infrastructure. They aided programmes like Jal Sanjivani, Jal Jeevan, Jalamrutha, Amrit Sarovar, NREGA, and Swachh Bharat through GIS-based planning. Police mapping, land-use mapping, and digitization of boundaries improved law enforcement and administration. A state-level workshop on Geospatial Applications (IISc, April 2025) with 750 officials participated. Dr. Shalini Rajneesh, IAS, Chief Secretary of Karnataka, inaugurated the event.



8) Village Information System (VIS)

The Village Information System (VIS) project provides digital spatial data on demography, natural resources, land use, and socio-economic aspects to support village-level planning and decision-making. KSCST, with Anna University, developed a workflow for generating digital base maps using cadastral maps, satellite imagery, GPS, and field surveys. VIS mapping of Ragihalli Gram Panchayath has been completed with 37 VIS reports available on the KSCST website, along with a webmap for Ragihalli village showcasing geospatial data layers. A proposal to extend VIS to other villages in Karnataka has been submitted to RDPR, GoK.



9) Karnataka Digital Museum

The Karnataka Digital Museum (KDM) project, launched after the Karnataka Digital Heritage programme, documents antiquities in Government Museums using 3D laser scanning and geospatial technologies. A MoA with DAMH was signed on 4th July 2024 to create 3D models, CAD drawings, geo-tagged databases, and virtual walkthroughs. A Project Advisory Committee with IISc, DRDO, and KSCST experts guided scanner demonstrations, technical evaluations, and procurement. 3D scanning of sculptures, manuscripts, inscriptions, and Hoysala carvings was carried out at Government Museum, Hassan in March 2025 using Artec Leo. After tender evaluation, M/s. Altem Technologies Pvt. Ltd. was finalized, scanners supplied, and training completed. KDM was inaugurated at Lakkundi Museum, Gadag district by the Hon'ble Chief Minister of Karnataka Shri. Siddaramaiah and Hon'ble Minister for Tourism Shri H. K. Patil.

10) Water Technology / Rainwater Harvesting (RWH) Cell

KSCST promotes RWH and groundwater recharge by preparing DPRs, conducting awareness programmes, and offering technical guidance. DPRs were prepared for Mysuru Airport, ISEC, KSDL, Government Engineering College Bidar, PDA Kalburgi, HDMC parks, CAG, EMPRI, and MOOG Industries. About 6,477 people benefited through 43 awareness events at the RWH Theme Park and three BWSSB training programmes for engineers, architects, and plumbers. Two RWH Helpdesks at Jayanagar and IISc provide guidance, workshops, and consultations. From 2024–25, large-scale outreach included Bala Mela at Doddaballapura, Presidency University, IISc Open Day, and BWSSB's Cauvery Aarthi, with over 6,400 visitors. Nearly 40–45% of visitors adopted RWH, and ~750 public queries were addressed, strengthening water conservation across Karnataka.

11) Academia and Industrial Interaction Cell (AIIC)

The Academia and Industrial Interaction Cell (AIIC) manages KSCST's flagship **Student Project Programme (SPP)** initiated in 1977–78 to encourage innovation among students. In the 47th Series, 6,043 proposals were received, 1,530 approved with funding of ₹77.39 lakh, including 124 projects supported by ART-Park and 57 biofuel projects by KSBDB. Mid-term evaluations of 1,419 projects were conducted, and 354 were showcased at the State-level Poster Presentation & Exhibition (August 2024, Kalaburagi), where 48 projects won "Best Project" awards. The 48th Series was initiated in October 2024. Under the **Faculty Project Programme** (FPP), 11 projects worth ₹43.46 lakh were supported, some showing

commercialization and IPR potential. A ₹17.5 lakh project was sanctioned to JNCASR, and notable outputs included bioplastics, smart IV monitoring, and an autonomous e-kart. Science outreach for rural schools with IISc research scholars benefited SC/ST/BC students from KREIS institutions. KSCST also hosted Assam's "**Mukhya Mantrir Bigyan Pratibha Sandhan**" (97 students), celebrated National Space Day 2024 across Karnataka (2,600+ students), and organized workshops for teachers and students on mathematics and science. Further collaborations included conferences, workshops, science camps, and participation in the India International Science Festival 2024 at IIT Guwahati.

12) National Mathematics Day and National Science Day 2025

KSCST celebrated National Mathematics Day 2024 at IISc, across districts, and in collaboration with academic institutions/NGOs, engaging over 12,000 students and teachers through lectures, demonstrations, exhibitions, and hands-on sessions to inspire interest in mathematics. National Science Day 2025 was celebrated at IISc on the theme "Empowering Indian Youth for Global Leadership in Science and Innovation for Vikasit Bharat", with activities including painting and essay competitions (600+ students, 42 awards), technical talks, and demonstrations, fostering scientific attitude and innovation among youth. Shri. N. S. Boseraju Hon'ble Minister of Minor irrigation and Science & Technology Government of Karnataka is inaugurated the National Science Day 2025 programme

13) KSCST Regional Centre Activities, Kalaburagi

Established to foster innovation, research, and socio-economic development in the Kalyana Karnataka region. It organized awareness programmes such as World Earth Day, World Environment Day, National Technology Day, National Space Day, and Engineer's Day with student competitions and outreach activities. Workshops on health, hygiene, nutrition, mathematics teaching, and energy efficiency benefitted ASHA workers, teachers, and students, while technical sessions on groundwater recharge reached over 200 farmers. Quizzes and competitions further promoted scientific temper among youth. In addition, collaborative project proposals were submitted to VTU on hydrogen research and renewable energy integration, and a DST-NCSTC proposal on science communication for soil and water conservation was presented to support sustainable agriculture.

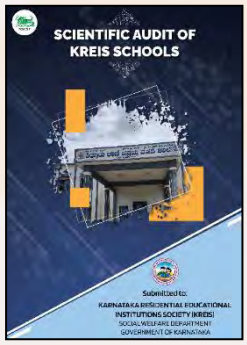
14) SC/ST Cell

Established in 2021-22 with DST support, promotes relevant technologies for the socio-economic development of marginalized communities through skill development and resource assessment. Activities include workshops on graphic designing for youth, particularly women, in Kalyana Karnataka, and training programs on solar energy, electrician skills, nursery techniques, mushroom cultivation, and value addition across multiple districts. The Cell developed a survey Android app and Version 3.0 of the "Bheem Kaushalya" app with district-wise recommendations. Field visits and surveys were conducted in Bidar, Dakshina Kannada, and Uttara Kannada to assess skill needs, traditional knowledge, and socio-economic conditions. Activities were showcased at the DST Expert Committee review meeting at CMFRI, Kochi. These initiatives aim at sustainable livelihoods and micro-enterprise creation for SC/ST communities.

15) Scientific Audit of KREIS schools

KSCST conducted a Scientific Audit of KREIS schools at the request of the Social Welfare Department to identify system deficiencies and support improved school administration. The audit focused on the

role of KREIS in serving marginalized communities, assessing financial, infrastructural, educational, and administrative challenges. Visits were made to schools in Tumakuru and Chitradurga (12–13 July 2024) to study new initiatives, with inputs gathered from principals, teachers, staff, students, and stakeholders. Recommendations were provided to enhance managerial practices, infrastructure, and education quality. The audit emphasized bridging academic excellence and creating future opportunities. The final report was submitted to the Executive Director, KREIS on 27th November 2024.



16) Providing ICT infrastructure for implementation of digital literacy in KREIS residential science PU colleges under HAL CSR Funds

KSCST, under HAL CSR funds, established ICT infrastructure to implement digital literacy in 61 KREIS Residential Science PU Colleges across Karnataka at a project cost of ₹3.64 crore. The facilities include laptops, projectors, library books, network connectivity, and computer labs with all-in-one desktops. The project has been fully completed, with regular maintenance of the centers ensured. National Productivity Council (NPC), under DPIIT, GoI, was assigned to conduct the impact assessment. NPC completed the study and submitted the report to HAL. Impact assessment was carried out in 12 selected KREIS PU Colleges across districts including Kalaburagi, Yadgir, Vijayapura, Bagalkote, Dakshina Kannada, Udupi, Hassan, Chikkamagaluru, Kodagu, Chikkaballapur, Tumakuru, and Bengaluru Urban.

17) State Scientists and Engineers Awards

Instituted by DST, GoK in 1996 in the names of Sir M. Visvesvaraya, Dr. Raja Ramanna, Sir C.V. Raman, Prof. Satish Dhawan, and Dr. Kalpana Chawla, are operationalized by KSCST to honor eminent scientists and engineers of Karnataka. For 2022 and 2023, over 330 nominations were received, and the selection committee chaired by Shri A.S. Kiran Kumar recommended 28 awardees. Government approval was accorded, and the awards function was held on 26th September 2024 at J.N. Tata Auditorium, IISc, Bengaluru.

Shri Siddaramaiah, Hon'ble Chief Minister, presented the awards in the presence of Bharat Ratna Prof. C.N.R. Rao, Shri N.S. Boseraju, Hon'ble Minister, Prof. G.

Rangarajan, IISc Director, and other dignitaries. The event witnessed participation of over 700 invitees.

18) Webinar Series

As part of its Golden Jubilee (1975–2025), KSCST is organizing a year-long webinar series from January to December 2025, along with other S&T activities, to showcase the STI ecosystem and its role in the state's development.

The series covers diverse themes, beginning with STI Ecosystem (29th January 2025), Application of Nanotechnology and Materials Engineering (25th February 2025), Water Technologies (22nd March 2025), and Intellectual Property Rights (26th April 2025). Further webinars include Empowering a Sustainable Tomorrow through Innovation (14th May 2025) and Climate Change and Sustainable Development (16th July 2025). These knowledge-sharing sessions aim to engage stakeholders across sectors for holistic growth.

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