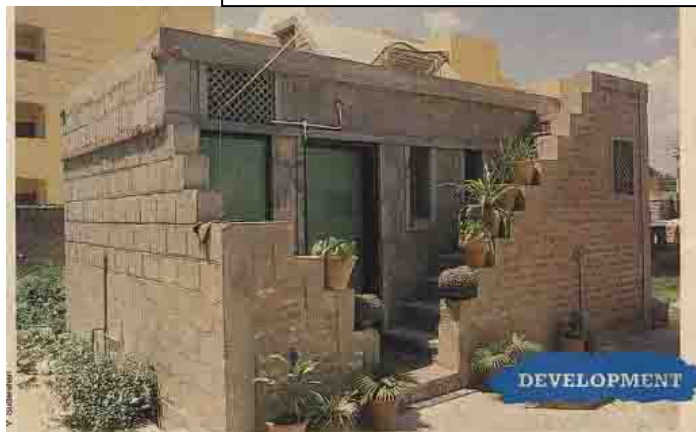


**Nomination of Dr. C.V. Ananda Bose for King Baudouin
International Development Prize**

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DEVELOPMENT

**Building
a model**

The Nirmithi Kendras had a quiet beginning in a Kerala town, and now, after four years, they spearhead a nationwide effort. The aim: to take the fruits of research from the laboratories to the rural builder to make cheaper but good houses available to all. BHARGAVI NAGARAJA writes.

(Top) A low-cost, two-room house designed by the Nirmithi Kendra, Nizamuddin.



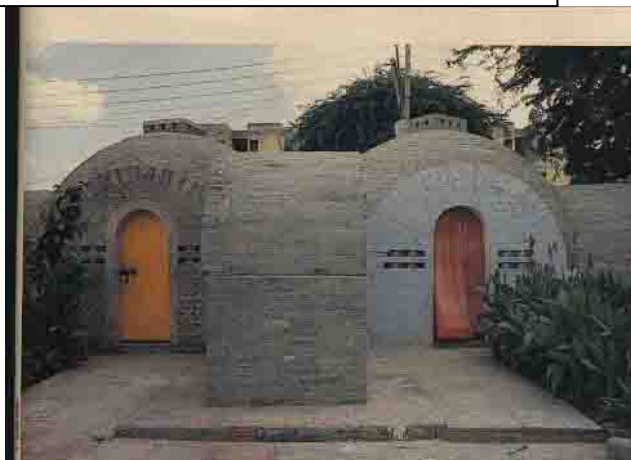
At the Nizamuddin centre, making concrete filler blocks for use in low-cost housing.

RAVINDRAN NAIR, 34 of Thiruvananthapuram, a school teacher, and his wife and daughter, aspire to have a house of their own. Farhat Khan, 48, a textile worker of Mysore, wants to build a house for his aged parents, brother and sister. Prasad Rao of Andhra Pradesh is a 27-year-old engineer whose priorities include his own house, marriage and family, in that order. Ganeshan, 50, is a public sector officer from Tamil Nadu who wants to shift from a busy industrial town to a quieter suburb.

The common factor among them is their natural desire for a roof of their own. Happily for them and countless others, a quiet revolution has taken place in housing in Kerala, facilitating pioneer research and development in affordable building technologies with a saving of up to 30 per cent in costs.

It all started unpublicised in 1986 in Kollam, once a flourishing port town more famed for its cashewnuts than for technology.

C. V. Ananda Bose, the then Collector of Kollam district, was the unorthodox progenitor of the Nirmithi Kendra. With his flair for innovation and articulation, he took the government machinery to the people through the "free-to-field" and "lab-to-land" approach. He tried to do away with red tape to help entrepreneurial ventures among rural



youth, women, Scheduled Castes and Scheduled Tribes, handicapped people and so on.

The Nirmithi Kendra aims to bring the fruits of research in housing from the urban laboratory to builders at the village level. The thrust is on making available modern and affordable housing to the masses. The one-acre plot buzzes with activity, imparting training in proven technologies as much its main function as providing consultancy to those who want a house but are not quite sure how to go about achieving it.

The Kendra trains rural youth and women in house-building skills, including carpentry and masonry, which have been the exclusive vocation of traditional artisans. Over 500 young men and women, many of them Harijans, have been trained here in innovative housing techniques for a six-month period on a stipendiary basis. Most of them have moved away to various aspects of the building trade, working in their own quiet ways to popularise the new ideas.

Unlike as in traditional constructions, the accent is on the use of locally available materials: filler blocks or stone masonry blocks using rubble and cement mortar of lean ratio for foundation and walls; funicular shells for the roof which are economical on cement and steel; and tiles for roofing; I. panels,

Kurdi and pre-cast plate floors. The items manufactured locally are: (1) soil cement blocks cast in situ using excavated soil and 5 per cent cement as stabiliser; (2) random rubble stone masonry blocks using stray pieces of stone together with soil and lean mortar; (3) rubble filler blocks using stray rubble available in situ as filler for cast concrete blocks; (4) funicular shells for roofing which use very little steel and which can be cast economically as against reinforced cement concrete roof; (5) ferro-cement door and window frames which use no wood; and (6) arch lintels for doors and windows which require no steel.

Timber is as much a vital ingredient

in housing as it is a dwindling resource material. Kerala has a variety of soft wood, chief among them rubber. Through a certain treatment process the Nirmithi Kendra is attempting to turn out quality timber from these for use in housing.

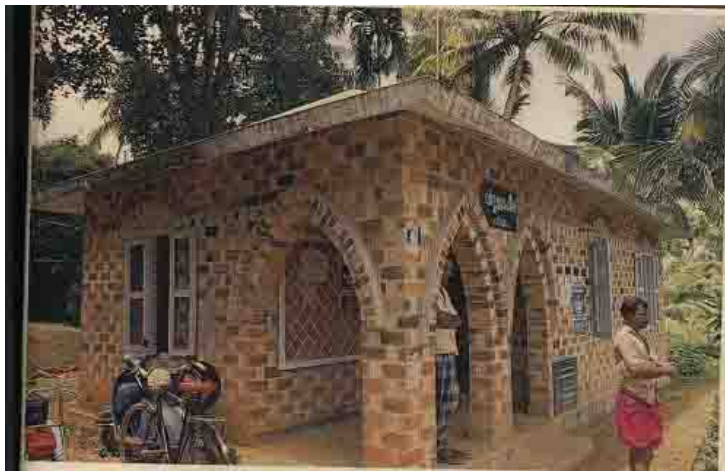
The Kendra's short but eventful track record is self-explanatory. Using these technologies, it has constructed village offices, some "Operation Blackboard" buildings, hospitals, disaster shelters, government servants' quarters, a working women's hostel and even TV relay stations. This has worked towards establishing Nirmithi's credibility.

The Nirmithi Kendra has grown from a model to a movement in the country,



(Top) Aesthetically pleasing one-room affairs, again from the Nizamuddin Kendra.

Ready-to-fit door and window frames in concrete, complete with built-in wall clamps, from Kollam.



move to other areas. Obviously the Nirmithi of today is more complex, more diffused state-of-the-art. So much so that some four models are discernible in the Nirmithi Kendras today: first, the original Kollam model where the District Collector takes the initiative and serves as chairman of the society registered as the Nirmithi Kendra, linking the training programmes with various governmental programmes including the Special Component Plan and the Women's Welfare Fund; second, the non-governmental organisation (NGO) model where the NGO is the nodal agency, administered by a committee as in the case of the COSTFORD model in Thrissoor (Kerala), the Korai model in Kolar and the CTRD model in Mandya (both Karnataka); and the CSR model in Auroville (Pondicherry); third, the model where a housing agency takes the initiative as in the case of Nizamuddin, Delhi, with the alum clearance wing of the Delhi Development Authority has been in the forefront; the Madras Metropolitan Development Authority, the Tamil Nadu Housing Board in Tiruchi, the Tamil Nadu Slum Clearance Board in Madurai, the Tamil Nadu Cooperative Federation in Tiruvelveli, the Madhya Pradesh Housing Board and the Andhra Pradesh State Housing Board, and, finally, the entrepreneurial model where an entrepreneur takes the initiative and steps in as developer and disseminator of building technologies.

It is there an emerging pattern in the



This one is in a Kerala village called Panayam housing the Village Office — thanks to the Kollam Nirmithi Kendra.

The making of cavity blocks in Kollam.

Funicular shells.



Another one-room design from Nizamuddin.

Pre-fabricated low-cost community toilets.



Making ferrocement panels for the toilets.



thanks to the interest and initiative of S. K. Sharma, Chairman and Managing Director of the Housing and Urban Development Corporation (HUDCO). During a visit to the Kollam centre he noticed the funicular shell roof of a toilet in the Kendra complex and recognised in it the beginnings of practical and affordable building technologies. In time HUDCO initiated the spread of Nirmithi Kendras to other parts of the country, at the district level. Today there are 108 centres — 86 of them in Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry, Port Blair and Goa. Thirty-five centres are fully functional. Proposals for setting up more centres in Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat and Maharashtra are being processed.

Since the Kendras are meant to serve at the grassroots level, they are to be set up mainly in the districts with potential for the construction work force — either raw hands or semi-skilled manpower — so that each centre invigorates more activity and spreads the message.

HUDCO has given Rs. 2 lakhs as financial support to each Kendra and up to a hectare of land on the average has been obtained from the State Governments. HUDCO also extends support to ensure that the entire exercise is result-oriented.

Men and women between 20 and 35 are identified and drawn from the local populace for the programme. After the training some of them work in projects handled by the Kendras while the rest



The shape of things to come: another from the drawing boards in Nizamuddin.

Inside one of the structures built as a substitute for hutments. This mini-complex is for five families, which share a kitchen and bathrooms.

An archway made of concrete filler blocks.



responses to Nirmithi? It seems to be doing better in South India. This could perhaps be traced to the South's tradition of people's participation in civic issues.

So, the question now arises whether the network of Nirmithi Kendras provide a shot in the arm to housing by positively economising on building costs. Estimates of building costs reveal that of the total cost, 67 per cent goes to material and 33 per cent to labour (which is not affected by different construction methods). Of the 67 per cent, 18 per cent goes to cement, 9 per cent to steel, 13 per cent to bricks, 10 per cent to timber and 17 per cent for electricity, plumbing, painting and so on.

Research studies by the Central Building Research Institute (CBRI), the National Building Organisation (NBO), the Council for Scientific and Industrial Research (CSIR) and so on have shown that a material cost reduction of 30 to 35 per cent can be achieved by using low-cost technologies and locally available materials, substituting to a great extent traditional materials such as cement, steel, blockstones, timber and so on.

A further saving in transportation and storage of steel, cement and so on is expected, as locally available materials will not carry such overheads.

Such materials adapted to practical applications are economical considering the price rise of materials such as cement, steel and bricks by 240 per

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cent to 400 per cent by 1990 since 1970. Projections show that the price rise may be to the tune of 800 per cent by 1990.

Therefore, by the substitution of materials a 35 per cent reduction in costs is possible. In specific cases this may even be 40 per cent. Traditional footing or raft foundations need deeper excavation, extensive supports and shoring, and more steel and concrete. Arch-type foundations using bricks are cheaper by 50 per cent.

The amount of steel needed to fabricate a funicular shell roof is 0.2 per cent as compared to 1 per cent to 2 per cent of concrete needed in normal beam and slab construction. Specifically, cement consumption is reduced from 18 per cent to 5 per cent and steel from 9 per cent to 1 per cent.

The relevance of such affordable and accessible technologies in slum upgradation cannot be minimised. There also exists the argument for the wide application of such technologies to facilitate accessible and affordable shelter to more people. But the first step here will be to sensitise the conventional building trade itself. With more awareness and constant interaction, a marriage of traditional and non-traditional skills can be achieved.

Today the new methods are yet in an experimental stage. Their application has been limited to some low-cost, low-rise housing projects. As such they may play a complementary role in the wider building activity. They cannot

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In the beach area of Kollam, dwellings for fishermen, built by Nirmithi.

Mud and cement blocks with rocks as fillers.

Another low-cost structure from the Nizamuddin centre.



substitute or replace reinforced cement concrete construction.

HUDCO's regional head for Karnataka, Goa and Andhra Pradesh K.T.V. Achar says Nirmithi methods are the sure and safe way of achieving effective and socially-satisfying housing development.

HUDCO's southern zone Executive Director V. Suresh suggests that the curriculum of engineering and architecture be recast to include some of the Nirmithi Kendra's widely applied and successful techniques. He sees the need for expertise at the artisan level (being achieved at the Nirmithi Kendra), at the professional level where engineers and architects are trained and at the supervisory level where diploma holders too learn about the skills.

S. K. Sharma points out that getting the schedule of rates, quantity analysis and rate analysis done will be difficult if, so, can HUDCO initiate credibility tests? HUDCO recommends the use of those technologies that are proven in performance and durability in the housing projects it finances. It must also be argued that all building technologies codified are not necessarily those in use. Many good, even traditionally proven, methods are not codified. For example, the Australian Building Code recognises mud architecture, unlike in India. Therefore we shall have to operate responsibly on various levels — at the Nirmithi Kendra and on the professional front — and make available to the house-owner a package that is acceptable, accessible, affordable and aesthetic," says Sharma.

Ananda Bose sees a need for technology to be demystified. Only then will people understand it and relate to it. Other architects and construction engineers see the Nirmithi Kendra methods and technologies as being technically acceptable for application in residential low-cost constructions built according to the climate, environment and available resources in the region.

Of the various methods being propagated today, some are echoes of the past, says N. Vilas, an engineering consultant. The structural concept of arch supports in foundations, for example, can be seen in old bridges, ancient temples and so on, used in an age when reinforced cement concrete was unknown," he says.

As for making efforts to ensure their practical application, finance and technical agencies recommend the use of cost-effective technologies, although executing agencies do not always do so. What more needs to be done to sustain widespread interest in such activity, and when, where and how, are questions that have been only partially answered. ■

A high profile

EVEN as the Kollam Nirmithi Kendra works in a most unostentatious way, its counterpart, the Building Centre in Nizamuddin, Delhi, is a high-profile centre touching on the glamorous.

Geodesic domes using hollow-core fibre concrete panels or, simply put, circular structures using a combination of lines and triangles, glint in the afternoon sun on a rooftop awash with the summer sun. The domes were first designed by American architect Buckminster Fuller for a utopian city with one single dome as its roof.

Interestingly, even as the question of practical applicability arises one is informed that the same domes roofed the entire Bharatiyam village

have surprising strength and jute and bamboo pads with soil and slurry as a binder to produce compact stabilised soil blocks, are some of the axcept-standring high-tech yet low-cost and location-specific technologies being used here.

Anil Lal, architect, is in charge of the Building Centre. He uses a number of techniques, borrowing from the conventional and the unconventional — like Laurie Baker's methods — and puts in his own bit. The result is arches on roofs, arches in foundations, vault-shaped structures, stone-masonry blocks instead of bricks with mud as a binder; soil blocks or bricks in vault roofs and so on.

In a way there is more experimentation here and one wonders



where the Nehru centenary celebrations concluded last year. During a subsequent visit, a sports camp was being run under them. Arguably, the domes can be useful in housing.

With considerable help from the slum clearance wing of the Delhi Development Authority, and from HUDCO, the Building Centre, situated on a one-hectare plot, is dotted with a number of demonstration buildings of various shapes and sizes using materials and technologies ranging from fly ash and rice-husk ash bricks, stone and mud blocks, hollow concrete blocks, funicular shells of concrete and brick fabrication.

Thrift — beams, thermocole-core concrete blocks and RCC panels, paper honeycomb and egg crate systems as fillers, using cardboard and throwaway egg crates which

whether a surfeit of technologies will lead to confusion. No doubt the durable ones will endure.

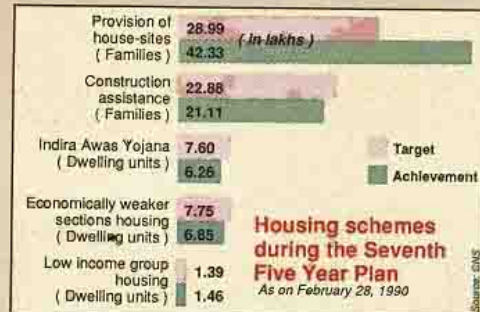
The centre is to serve as a laboratory for the students of the Habitat Polytec, established jointly by HUDCO and the slum clearance wing of the DDAs. The Polytec aims to train students in planning, designing and building human settlements, both urban and rural, within the social environment.

Above all, it is of strategic importance — situated as it is right under the nose of the authorities — and has contributed to the trickle effect of being, recognition and encouragement. ■

B. N.

At the Bharatiyam complex in Delhi, geodesic domes designed by the Nizamuddin centre.

A national strategy



CONCEPTS of housing in India are a changing. Most of the structures created by engineers and architects in the past four decades have converted cities and towns into concrete jungles, depriving the dwellers of functional utility. The designs emphasised more on the exterior of the structure than comfort and privacy inside. Now, with growing awareness about housing being one of the basic elements for the development of society, attitudes are changing. Recent efforts seem directed towards meeting the housing needs of the poor who are unable to afford a house with their own resources.

The new National Housing Policy, to be approved by Parliament during its next session, stresses the need for cost-effective technologies for the urban and rural poor. Planners have realised that to meet the challenge cost-effective technologies and locally available building materials are essential, but there is general reluctance among builders, designers and engineers to use them. To promote cost-effective building technologies, the Government recently established an autonomous body Building Materials and Technology Promotion Council (BMTPC), under the Ministry of Urban Development. And to ensure the availability of land for housing the urban poor, the Urban Land Ceiling Act of 1976 is also being amended.

With population growth the demand for land is also growing. At the beginning of the Seventh Plan the housing shortage in the country was estimated at 2.47 crore units, 1.88 crores of them in the rural areas. With this backlog the problem has reached a crisis point with

six lakh absolutely homeless households and over 1.4 crore unservicable houses and over 5.12 crore persons living in slums and squatter settlements. Cost-effective housing technologies seem to be the only answer.

The approach paper for the Eighth Five-Year Plan emphasises the need to plan human settlements and stop up activities in the housing sector, which have been impaired by high cost and limited resources. The Planning Commission's task force on housing and urban development has indicated that if the construction activity is not stepped up the housing gap would grow. It is estimated that during the Eighth Plan

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period about 1.6 crore houses will have to be constructed and 58 lakh dwelling units upgraded, a majority of them (1.2 crore) in the rural areas where the scene is grimmer.

The first Government intervention to reduce construction costs was made in 1954 when the National Buildings Organisation (NBO) was set up. It was to work in close cooperation with the research and development and professional institutions in the field. The NBO also functions as the United Nations Regional Housing Centre for the Economic and Social Commission for Asia and the Pacific (ESCAP). Among the NBO's functions are the collection and dissemination of information about advances in building techniques and housing promotion of rural housing through research, training and demonstration; augmentation of and improve-

ment in the production of traditional building materials; and encouragement of new building materials industries.

Realising the gravity of the situation, the Government launched a number of social housing schemes. Those for the economically weaker sections and low income groups have not achieved the desired measure of success for want of funds. The ambitious scheme of allotment of house sites to landless rural labourers and construction assistance also suffered a setback on account of unrealistic allocations.

According to experts, of the existing 2.5 crore households in need of durable shelter only a small percentage is homeless. They are to be provided

THE progenitor of the Nirmithi Kendra concept, C. V. Ananda Bose, was recently presented the special Habitat Award of the Central Government for his initiative in launching the massive low-cost housing project for rehabilitating cyclone victims. The Kollam Nirmithi Kendra also won the award for being the first centre in the country to promote cost-effective housing technology.

The 39-year old Ananda Bose talked to *Frontline* about how, as collector of Kollam district, he got the idea, how it evolved, and what its strengths and weaknesses are. He is now Director of the Kerala State Nirmithi Kendra and Secretary, Board of Revenue, Kerala.

The idea of establishing a centre for cost-effective construction grew out of the File-to-Field venture — taking the administration to the people — the first of Bose's ideas to win national acclaim. Under this scheme, the Collector and other officials would spend a day in a village or town, receiving petitions and acting on them immediately wherever possible. It was found that most of the petitions were for land and houses. Given the limited resources available to the Collectors for the purpose, construction costs had necessarily to be lowered by using local material and cost-effective building techniques. In this need lay the genesis of the Nirmithi Kendra, says Ananda Bose. A Kendra was set up at Kollam as a voluntary organisation with considerable input of talent from non-government organisations and individuals which gave it the flexibility and ability to avoid procedural delays, the bane of the governmental system. Institutions and individuals such as the Structural Engineering Research Centre and architect Laurie

metler by the Government on a priority basis. The second group is of people sharing houses with others or living in unserviceable 'kuchis' or 'semi-pucca' houses. This sector is being aided in upgrading the accommodation. The Housing and Urban Development Corporation (HUDCO) has launched schemes to give loans to these sections.

For the rural landless to whom sites have been provided by State Governments, HUDCO gives 50 per cent of the cost not exceeding Rs. 3,000 at 6 per cent interest, the amount repayable in 11 years. Loans are also provided to rural families with a monthly income of Rs. 700 for a dwelling unit costing Rs.

15,000 including the cost of land. Massive rural housing programmes have been launched in 18 States through loans from HUDCO. Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Kerala and Tamil Nadu are taking advantage of this.

INNOVATIVE TECHNOLOGIES

The cost of construction using conventional methods ranges between Rs. 200 to Rs. 250 a square foot which hardly 15 per cent of the people can afford. It is claimed that with the use of innovative technologies and locally available materials this will come down by half. Reduction of cost also depends on the type of material used for walls,

roofing doors and windows, water supply and sanitation and final finishing.

The greatest hurdle in the way of wider acceptance of these technologies has been their propagation and the fact that the Government agencies are themselves not using these cost-effective technologies. With the setting up of the BMTPC the situation is expected to improve. Indications are that appropriate changes in specifications and contract documents will be made to encourage Government and other agencies to use innovative technologies and materials.

As a first step the Council will concentrate on utilising the thousands of

The Nirmithi man

Baker provided the expertise and training.

The need for such an institution was enhanced by the floods that year, remarks Ananda Bose. All the 20 shelters allotted to Kollam district were built by the Nirmithi Kendra at less than the estimated cost. This achievement established the validity of the concept, Ananda Bose says.

The Kollam Kendra also built about 100 houses and provided technology for those who wanted to build on their own. The completion of a colony with 40 houses at Klappana — which had to be done within Rs. 6,000 each — with the help of the beneficiaries themselves led to the acceptance of the Nirmithi concept.

After the floods came the drought. In Kollam district alone, 300 tanks, each with 5,000-litre capacity, had to be built. Private agencies were charging Rs. 4.50 a litre for synthetic tanks and the moment Nirmithi entered the field, it came down to Rs. 350. After a few tanks were constructed by Nirmithi it slumped to Rs. 250. Nirmithi was able to do the ferro-cement tanks for 85 paise a litre. As the Government had given Rs. 1 per litre, it was able to make a small profit, says Ananda Bose.

The Kollam Nirmithi then embarked on mini-water supply systems for schools, hospitals and Harijan and tribal colonies. With just Rs. 20,000 it could dig a well, build a ferro-cement tank and fit a pump. These systems proved popular and enhanced the credibility of the Kendra.

Training masons, carpenters and other artisans is an important part of the Kendra's charter. The first batch

had a drop-out rate of over 60 per cent. Masons and carpenters were sceptical and unwilling to change their ways. But it was a different matter when the Kendra's technology proved beneficial and the demand for it grew. So much so that the construction workers' union was petitioning the Government to reserve 50 per cent of the intake in the Nirmithi Kendras for retraining existing craftsmen. Now, 25 per cent of the intake is reserved for them.

The Nirmithi Kendras in the States are now training engineers and architects as well as government officials. Cost-effective construction has to seep into this crucial 'middle level'



C. V. Ananda Bose... establishing centres for cost-effective construction.

where much decision-making is done, says Ananda Bose. Kerala has a Nirmithi Kendra in each district, a State-level Kendra providing the backup. These Nirmithi have built village offices, disaster shelters, schools, industrial estates, working women's hostels, Jayams mandapams, a TV relay station at Pathanamthitta and several government buildings including the Sub-Collector's residence at Thiruvalla.

The success of the Nirmithi Kendras lies in their decentralised approach and flexibility. Cost-effective techniques leave little room for error and call for good craftsmanship. Many of the techniques do not take into account local resources, and a special effort has to be made to this end, notes Ananda Bose.

For cost-effective construction to take root properly, says Ananda Bose, the existing civil engineering and architectural courses have to be changed. The syllabus of the National Council for Educational Research and Training (NCERT) should introduce the concept at the school level itself, he feels. Building by-laws have to be changed so that local authorities do not stand in the way of such constructions. The public works codes have also to be modified so that the Nirmithi methods can be incorporated into governmental constructions. The Kerala Government is already taking action along these lines and has sought Central Government help.

The Nirmithis in Kerala have had varying degrees of success. Some have done very well and others have still to grow. But none has remained idle and all are self-sustaining, says Ananda Bose. ■

N. GOPAL RAJ
in Thiruvananthapuram