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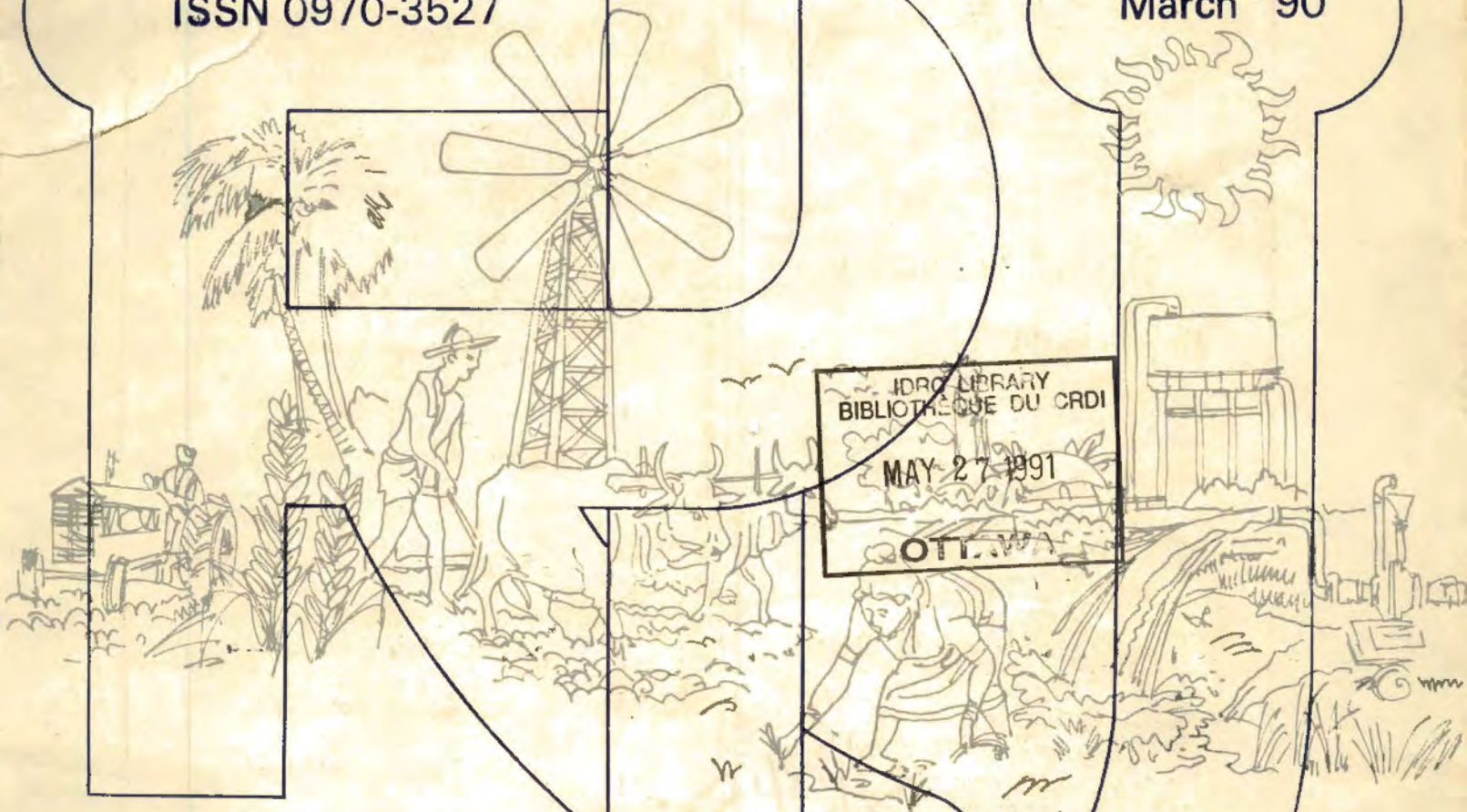

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CONTENTS

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EDITORIAL

It seems that the nation's history of over four decades after independence has failed to provoke and organise the society in articulating its just needs and seeking their rightful solutions. Glib-talking of moving into 21st century and attaining hights of glory in frontiers of science endears only the microscopic community of elite-scientists, their god-fathers, and those at the top of the economic pyramid who reap the benifits of high technology. It would be in the interest of an integrated and healthy nation that such a minority could see the writing on the wall and change their ways to share a small part of their prosperity for lighting the millions of dark and dingy households of the poor. It is well within the means of a country, with profound natural and human resources, rich heritage of culture and tradition to evolve a scientific base and an technological infrastructure which is in harmony with the majority in the society. We have recently elected a new government. Leave apart questions of realities of the process and conflicts of political ideologies, the central theme was that people eminently felt the need for change. In this context it is of great relevance to know what changes are being made, if any, in our scientific and industrial policy and more importantly their quick and judicious implementation. For this is the fundamental question, and will always remain so, in any development action in a scientific world.

Whereas the Dec'89 report on "Current State of Economy & Priority Area of Action" submitted by the Economic Advisory Council to the Prime Minister, has no doubt, to some extent, been able to identify the problems like "Growth in output is not matched by a corresponding growth in employment" (rather the later has steadily declined). It has also, in its recommendations, advocated promotion of labour-intensive industries. But it has not at all been specific in mentioning, in unambigous terms, that what we need is a massive plan of revitalisation of rural industries, traditional crafts and skills to stop the outflow of wealth from villages to urban centres and halt the plunder of natural resources mostly by large industries. There is no dearth of evidence to substantiate this observation. There are a few excellent proponents of this line of thought in the present government, but it is a historical disappointment now that their voices are not being heard. However, we still wish to heartly thank the new government, rather our Railway Minister, for setting a singular example of a radical development action, by ordering opening of KVI product-outlets on railway stations, use of handloom in place of mill cloth in the railway department and booting out plastic tumblers and reinducting earthen cups for serving tea in railway trains. Will the other fellow-ministers and policy makers emulate this example and live up to their grandiose poll-promises ? The nation eagerly awaits for an answer and the time is running out.

Publication List, 1990

1. Rural technology : Report of National Seminar, 1981, 20 papers on Rural/Appropriate Technology.

   English pp 268 Rs. 200/-

2. Renewable Sources of Energy : Proceedings of Short Term in Service Training Programme, 1983, 20 papers on Solar Cookers, Smokeless Cookstoves, Micro Hydro Power, Wind Energy, Biomass and Biogas etc.

   English pp 250 Rs. 200/-

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4. Course Synopsis of ISTE : Summer School on Renewable Sources of Energy. 1984, 12 Papers on Biomass, Biogas, Wind Energy, Solar Energy and Micro Hydel sets etc. and 4 project reports on Solar Water Heater, Solar Cooker and Biogas plant.

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EXTENSION, PROMOTION AND ACCEPTANCE OF IMPROVED COOKSTOVES

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In this paper the authors have discussed the problems regarding exceptance of improved 'Cook Stoves'. Draw backs of improved Cook Stoves. Lastly they have suggested solutions to the problems.

ACCEPTANCE PROBLEMS

As fundamental as raising food for human survival cooking is much more complex than that. Food and cooking practices are embodiment of tradition and means of cultural expression and is greatly influenced by ethical norms, religion and taboos. Thus introduction of new methods and modes into such deep rooted human behaviours as food preparation and nutrition is an highly complex task to accomplish.

An improved cookstoves which as all the desirable qualities which were lacking in the traditional mode of cooking method. Yet even though they are far better still extension problem is there. Even if the stoves are efficient, but the fuel saved usually is not that dramatic and to detect this it will take a long time for the villager to know about reduced cost and labour. Only saving of wood does not seems to be the only factor in their over all acceptance of improved stoves.

These cookstoves even if they are made cheap and are suitable for the poor but this it does not mean they can be accepted by large numbers of people. At the time of implementing these improved cookstoves they were widely adopted but slowly after some time they went out off use and were being used instead for stacking of wood. This sensible effort failed to achieve it goals not because the technology was faulty but due to human behaviour as they are governed by various needs and thinking.

These stoves cannot be accepted by the consumer only because of fuel conservation smokelessness, safety and comfort but they should even satisfy his/her aesthetic appeal or status thus appearance is more important than economic benefits. In each system contradictions are always present, some people may prefer cement stoves to mud ones as they are better to look even though the mud stove is cheaper and easier to build and more efficient. Thus appearance play a vital role in consumers mind.

The stove must fit these local cooking needs very closely. The house wife should be convinced the pots that are needed, types of dishes that can be cooked is it time saving and fuel saving along with the cultural rules that go hand in hand with cooking. Reasons are not far to be seen the traditional fire-place serves as an entire complex of functions within its setting plus cooking of food. If the new stove cannot provide the extended functions or provide different means to accomplish the same task it cannot be

accepted permanently.

BENEFITS

Benefits from using these improved models of cooking are manifold. The main benefits of cookstoves are that they reduce wood consumption, ease the expense and effort of getting cooking fuels. This leads to reduced consumption of biomass which is vital to maintain soil productivity.

They lessen the drudgery for women and children and to prevent deforestation. Smokelessness is a boon to a kitchen which these stoves provide further more they add to the comfort and safety of the cook and its occupants inhaling of gases may later pose health problems. Smoke makes the cooking process very tedious. Chances of getting burnt and scalding are less for the cook and her children so it is the threat posed by fire. Comfort and safety may generally lead to its acceptance.

DRAW BACKS

Lack of flexibility in these stoves is one of the major drawbacks in areas when in certain time of the year women like to favour cooking out doors this is done according to the seasons and convenience. Thus they object using the efficient cookstove due to its non-portability. The cookstoves has holes of fixed sizes they may not fit the available pots. Open hearth is more flexible to fit any sizes of pots and pans.

In these cookstoves the second problem in the fuel requirement one has to chop wood into small pieces as to feed the stove this process is more cumbersome, laborious and time consuming. Open fire is easily kindled than the closed fire inside the stoves.

The design, making and maintenance is all very critical no errors should be made while constructing it i.e. if the fire box is high the stove may burn more wood. Though the improved stoves work very well in lab's they tend to go wrong in the fields. Cleaning and maintenance is important such as cleaning of flues which after sometime get clogged with soot and pieces of food ,this reduces the draft and causes smoke to come out from the front of the stove. After some months of using small cracks may often appear on the surface of the stove thus making it look shabby they may conclude the stove is damaged and can stop using it if appearance was the main motive for its adoption.

Improved cookstoves should be designed to satisfy basic human needs and to provide diverse benefits not only to rely on them as a primary solution to the firewood crisis. The design should be made to satisfy all their needs and aspirations as food preparation and cooking may differ due to cultural rules in a community.

Participation of women should be encouraged so as to make the stoves compactible with the needs and cultural preferences i.e. the height of the stove, placing and sizes of pot holes etc. Some may prefer to sit down and make food others may like to have waist high stoves as to stand and prepare food which will be more convinient and safe if small children are around.

FOR PROMOTION AND EXTENSION OF STOVES

The success or failure of any new product depends on its promotion campaign, the first step in this directions is how they should be produced and distributed, constructed at home, or by industry or should be donated free of cost to the people.

To make the people aware of technology extension agents services should be motivated. Villagers are hesitant to adopt the new method of cooking as it clashes with their socio-cultural values the old way of cooking is very deer to them.

They will like to see demonstration of the stoves before they decide to use them. Some preconcieved notions about fire eruptions if not properly used makes them hesitant.

Women should be made active participants in

designing and decision making process this cooperative interactions is necessary not only for working and cooking on improved stove but to make them aware of the different Heat loss parameters that take place during the cooking process and have adverse effect on the efficiency and performance of the stove. Change in food habits and preparation techniques may also be helpful.

This will improve the functionality of the stove. Hence better result will be gained. Demonstration and classes must be run to make the people understand the new technology which is important. May be demonstration itself may not have the desirable effect but cooking of fancy foods in the village square for sale on improved stoves may attract the masses more for its extension and acceptance. We need the cooperation of the consumer to make any product a success.

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2. Improved Cookstoves: Malcolm Lilywhite, Lynde Lilywhite.
3. Wood Burning cook stoves - Krishana Prasad.

TIPS FOR ENERGY - SAVING

A Careless Driver Could Use Up 280 Litres of Diesel for a 1,000 Kms Journey.
While an Efficient and Alert Driver may Need just 250 Litres.
A Clear Saving of 30 Litres a Trip.

*****

Clutch Driving is Not Only Bad for the Gear Box.
It also Leads to Excess Consumption of Fuel.
It should be Avoided at all Costs;
Break the Habit if that is
What it has become.

*****

Researchers at the PCRA Estimate that the Country Wastes upto
Rs. 2,000 Crores Worth of Petrol Every Year.

APPROPRIATE TECHNOLOGY SOME IMPORTANT ISSUES FOR THE CHOICE OF TECHNOLOGY AND HOW TO TRANSFER IT IN THE DEVELOPING COUNTRIES LIKE INDIA

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Techinical Teachers Training Institute, Chandigarh.

An Introduction to Appropriate technology has been given in this paper. Some of the important issues regarding the transfer of technology which should be borne in mind who is transferring the technology has been discussed. The important problms which are faced by personnels who are involved in rural development and problems has been given.

Appropriate Technology is used as the generic term for a wide range of technologies characterised by any one or several of the following features :

a) Low in capital cost

b) Use local materials whenever possible

c) Create jobs, employing local skills and labour

d) Small enough in scale to be afforded by a small group of farmers

e) Can be understood, controlled and maintained by villagers/users wherever possible, without a high level of Westren - style education.

f) Can be produced at a small workshop, if not in the village itself

g) By the dicussions followed from a group of people of the village/community to bring improvement in the environment.

h) Involving decentralized renewable energy sources, such as wind power, solar energy, water energy, animal power, ocean energy, bio-mass energy, pedal power etc.

i) Are flexible so that they can continue to be used or adapted to fit in changing circumstances

j) Do not involve patents, royalties, consultants' fee, import duties, shopping charges, financial wizards practical plans can be obtained free or at low cost and no further payments is involved.

k) High adaptability to a particular social or cultural environment.

l) Having ultimate goal of spritual, economical and political autonomy i.e. selfdevelopment, selfmanagement and selfsufficiency.

SOME OF THE BASIC CRUCIAL ISSUES WHICH SHOULD BE KEPT IN MIND BY THE PERSONNEL WORKING IN THE AREA OF TRANSFER OF APPROPRIATE TECHNOLOGY FOR FURTHER RECOMMENDATIONS TO THE HIGHER ELITE :

1. There is immence value in spending sufficient time on the site in the area concerned and learning what is appropriate to the people in the situation both for future projects and those in hand. It is essential to talk to

the people who are involved in the project to understand what is appropriate engineering in that situation, and not to manuplate a predetermined solution which is usually inappropriate to the requirements.

2. There is no doubt that in relation to water, and sanitation and building, appropriate technology is essential in major urban areas, but it may not be low technology or intermediate technology that is appropriate.

3. Governments, politicians and administrators have to be willing to encourage slow changes in tribal and ethnic attitudes. The lack of these directives from these quarters probably constitutes the most significance failure in the application of appropriate technology.

4. It has been seen that the major problem is not technical, but social, political, and educational. The intermediate technology development group (I T D G) was set up in 1965, and only now are governments and institutions seriously talking about it. Technology is part of the culture in developed countries and cannot be introduced into other societies without it becoming part of their culture and mentality.

5. To help effect technology transfer it is necessary to speed up gestation periods for getting projects off the ground and for this a more pragmatic approach is needed.

6. There is no need for big projects with modern technology in some areas, but mostly what is needed are simple solutions that Britain had during the industrial revolution-small tools and implements and a lot of common sense.

7. Many people rely on multi disciplinary teams, such as are used in large schemes. But one of the problems of the intermediate technology is the shortage of the technologists and it is not practical to work in the group of five or six with counterparts. Engineers must become multidiciplinary.

8. When the Engineers take off the restraints of conventional wisdom and address themselves to the tasks of fitting industries and its produces to the available human and material resources; when, for instance, they turn their attention to the capital-saving rather than simply making things bigger, more complex and more dehumanized than ever before. This refocusing of efforts does in fact demonstrate the meaning of appropriate technology. What is needed is intermediate technology that lay somewhere between the primitive hand tools of the poor in developing countries, and the highest technologies of the rich countries. The virtual absence of practical knowledge of such technologies constituted a major gap in the aid and development efforts.

9. Smallness and simplicity speaks for itself if one is working with communities that are isolated, where communications are poor, and where industrial culture has few roots. Capital-saving is crucial where capital is the bottleneck and labour is abundant. Without respect for the local cultures and local environment no technology can be deemed appropriate.

10. Ideally, an intermediate technology would be relatively small, simple, capital-saving, and non-violent towards people in poor countries. The term appropriate asks a question: What is appropriate under the given circumstances of economic, social and cultural condition? Intermediate will often be found to be appropriate.

11. If the industrial countries have created the highest material standards of living in the history of mankind, in the process they have created the most vulnerable economics, and the most dependent, even helpless, populations in

the history of mankind. The crisis which confronts the highly industrialized countries has deep roots, and many branches. The industrial countries are in the grip of inflation and economic stagnation. This slowing down or cessation of conventional economic growth is associated with growing unemployment. Exactly why unemployment is growing as fast as it is there are 16 million unemployed in Europe is a subject of controversy.

12. Inflation is not only a consequences of fiscal mismanagement, such as the over-expansion of the money supply, but it is also a symptom of a growing pressure on world resources a signal that the industrialized countries should start moving towards conservation.

13. One path toward more employment, and employment of higher quality, is the decentralization of economic activity, and the progressive re-installation of human skills, ingenuity and creativity in industry, agriculture and services.

14. As far as energy is concerned, conservation is the only rational course that is socially, economically and environmentally sensible and acceptable to the developed world.

ANNEXURE - I

DEFINITION OF PROBLEM

Technological changes has been a crucial factor in the past in expansion of production. This expansion was sufficiently great to call for an increased labour force despite the increased productivity in many parts of the world. The controversies that have been going on for the past centuries were upon the question of how such expansion comes about. On the other hand, this question involves the effects of technological changes through its influence on size of the nation's industrial structure was being changed and the type of economic controls that it has engendered. The two aspects of questions are interrelated.

The broad questions involved are as given below :

1. Is maximum current production compatible with maximum employment?
2. If there is a conflict between maximum employment and maximum production which is to be chosen and why?
3. What is the effect of sacrificing maximum output in the long run on employment ?
4. What is the rate at which employment generation in future is to be discounted?
5. In the measurement of output are all products to be weighted equally?
6. Is the conflict is really between output and employment or is it an imaginary fiction germinating from the dissatisfaction regarding existing income distribution?

The discussion about the questions raised above is given below :

Ous. 1) Some economists assume that such a conflict between output and employment cannot arise. This extreme view is countered by the argument that for any positive real wage there comes a point at which it is no longer worthwhile employing extra workers with a particular machine, though this level may vary from machine to machine. In this case there is a conflict between output and employment which is independent of any institutional or other lower limit of wages. There is another extreme view that a conflict between output and employment has arisen in the past, but also that it must necessarily arise. The capital intensive methods of production , it is claimed, will always involve lower capital per unit of output than the labour intensive methods. The capital output ratio for traditional methods of spinning using 'ambercharkha' may be lower than for factory methods. In cotton weaving the capital output ratio is the lowest for the most labour intensive technique, the flyshuttle handloom, and highest, nearly two and half times as big for

the automatic power loom. The argument here is that the more labour intensive methods also save capital per unit of output in these cases and therefore maximising current levels of employment and output are consistent. This position leads to the necessary conclusion that there is imminnent necessity for further R&D efforts on the labour intensive methods so that they become efficient as compared with capital intensive methods.

Ous. 2. The conflict between current output and current employment is only one aspect of the problem. If the conflict between current output and current employment were inevitable which should be sacrificed? The reasons suggested for sacrificing the output are, in view of protagonists of appropriate technology are given below:

a) Employment creation and the consequential wage payment may be the only mechanism by which income can be redistributed to those who would otherwise remain unemployed, (which shifts the objective of the whole debate);

b) Unemployment is demoralising and it is worth sacrificing production to reduce the evil;

while all these arguments may be relevant in short run, the serious objection to the thinking of current maximising employment at the cost of output is that sacrifice of now employment may lead to much greater gains in future. Maximising current production, though tolerating more non employment now may enable generation of jobs later than would otherwise have been possible. If there is a conflict between output and employment, it must be noted that output is useful not only for itself, but can be used to generate more employment. To raise employment now may means sacrificing not only output now but also rate of generation of employment in future. This means that at some future date the level of employment will be lower than it would have been.

Ous. 3. There is considerable difference of opinion as to the long run effects of the inter-temporal trade off in favour of increased employment in future. The path which maximise growth of output is also that which maximise employment. It is claimed that this is the experience of many nations including the experience of current Asian countries. The dissatisfaction felt on the rate of employment creation, it is contended, has its origin in relation to the desire and need for mere current employment, rather than in some sacrifice that has taken place, of employment for output. On the other hand some of the economists have contested that rapid rates of output growth have been realised with minimal or no increase in employment. Here the increasing capital intensive of production may have been more than offset the additional resources available for investment in their effects on employment creation.

Ous. 4. Generally technical progress takes a form which involves increasing labour productivity so that the rate of growth of employment is less than the rate of growth of output. The rate of growth of employment may be very low and less than the growth of population in which case the unemployment problem will worsen. Further there may be rigidities and frictions in the operation of the economy which prevent the adoption of optimal investment policies in respect of the gains from increased rate of growth of output.

Ous. 5. There are also allied philosophical issues which require consideration. Can employment in future be valued on the bases as current employment? Is it not reasonable to discount future employment like future outputs? Is it not possible to place a premium on exhaustion of resources for current outputs? What is the value of current output? Can all products be values with same weightage? Is it not more reasonable to give higher weightage to outputs which find their to sustain the basic needs of non-employment? What is the value of over produced goods? How much the problem of income redistribution can be tagged on to the output employment

conflict? Can correction of present inequities (arising from past actions) of income generation be justified to deprive the future generation the benefits from present optimal ivestments? All these are relevant questions which come up in the contest of the choice of technology.

Ous. 6. The complexity of issues involved and the absence of discussion on many of these issues raises serious apprehensions on whether the 'APPROPRIATE TECHNOLOGY' is still not a native approach which has steered clear of real issues.

In a few years we shall either be governed by an aristocracy, or, what is still more likely, by a contemptible democratical oligarchy of glib economists, compared to which the worst form of arstocracy would be a blessing.

Samuel Taylor Coleridge

NEEM PLANTATION IN DESERT THROUGH 'JALTRIPTI'

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The authors has discussed about the principles of 'Jal Tripti', basic construction of 'Jal Tripti' and its advantages.

To survive and to grow satisfactorily, presence of adequate moisture in the soil is essential for new plantations. Arid areas are seriously lacking in the availability of adequate irrigation water and due to light textured soils and various adverse climatic factors moisture losses are very high in the form of percolation, seepage and evaporation thereby creating dry conditions in the upper soil layers which is deterimental to saplings since most of the saplings during establishment stage draw moisture from the upper soil layers. The retention of applied water around roots of saplings in these areas is a very challenging task. To cope with the problem of retention of applied water around roots of saplings during establishment stage, a new device named 'Jaltripti' has been developed which is very cheap (approx. Rs. 6/- per unit) and for the fabrication of which no technical help or very special raw material is required because of which small and madium farmers and smateurs can easily adopt it.

Structure of Jaltripti :

Very simple in structure, this device is made up of two earthen flower pots of same height and different diameters (Fig. 1). The

double wall earthen pot

diameter of outer pot is kept approximately 25cm at the top and 18cm at the base. The diameter of inner pot on top and at base is kept approx. as 15 and 12cm, respectively. The height of the pot is kept as 30cm (Since it is prepared on potter's wheel approximate dimensions have been given because some variations in the measurements can be there). The dimensions of inner pot have been kept slightly bigger than the size of polythene bags used for raising plants in nursery which are usually 25cm long and have a 10cm diameter. The overall size of the pot has been suggested keeping in view the convenience in use and handling. Both the pots are joined together at base and the basal portion of inner pot is kept almost open. The external side of the outer pot is made impervious with the help of some enamel paint or cement curing.

Principle of working :

The device works on two simple principles :-

1. Soil moisture tension and plant roots create suction force which draw moisture towards it from the neighbouring high moisture zones.
2. Earthen pot has many micro-pores in its wall which do not allow water to flow free but allow its seepage in the direction where suction develops.

Use of Jaltripti :

At the place where planting has to be done a 60-70cm deep pit of about 30cm diameter is dug. Approximately 20kg well rotten farm yard manure, 50-100g B.H.C. and about 100g single super phosphate is applied in this pit. Now 'Jaltripti' is fixed in this pit such that the brim of 'Jaltripti' comes in line with the field surface. A sapling alongwith soil received from nursery is transplanted in the inner pot of 'Jaltripti'. The water is filled in the space between two pots and the circular surface of water is covered by a polythene sheet or earthen lid to avoid direct evaporational loss of water.

Performance of plants during establishment :

An experiment was carried out at Central Arid Zone Research Institute, Regional Research Station, Bikaner for comparative performance of Neem (**Azadirachta indica**) plants in 'Jaltripti' (a new moisture saving device) in comparison to other conventional devices from October 1987 to November 1988. The treatments were replicated four times in RBD. It was observed that neem plant grows well under 'Jaltripti' wherein all the growth parameters were higher in comparison to others. During the period of study a total of 39 irrigations @ 31 per irrigation per plant were applied over and above the rainfall received during the period, and it was found that there was no mortality in 'Jaltripti' plants whereas in other treatments (bentonite, pond sediment, Jalshakti and control) only 75% plants could survive. The effect of frost during winter and hot winds during summer was minimum on the plant growth in 'Jaltripti' in comparison to other treatments. This was due to constant regulated supply of moisture to the plant.

The higher plant height and collar diameter were recorded in 'Jaltripti' followed by bentonite. The plant height was maximum (100.00 cm) in 'Jaltripti' which was 34.9, 66.0, 53.7cm higher than the plants planted with bentonite barrier, pond sediment barrier, Jalshakti application and control, respectively (Table 1). The application of bentonite barrier gave a height of 65.1cm which was 47.8 percent higher over pond sediment barrier, the treatment achieving lowest height but could not compete with the plant height attained in 'Jaltripti'. The highest collar diameter of 1.83cm was recorded in 'Jaltripti' which was 0.72, 0.76, 0.89 and 1.07cm higher over bentonite, control, Jalshati and pond sediment, respectively. Thus experiment showed that plantation with 'Jaltripti' gives better survival and growth of the plant than conventional methods.

Table on page No. 11

TABLE - 1

Growth parameters of Neem as affected by different treatments during establishment.

Treatments	Height of plants (cm)	Collar diameter (cm)
Control	62.3	1.07
Pond Sediment Barrier	34.0	0.76
Jalshakti	46.3	0.94
Bentonite Barrier	65.1	1.11
'Jaltripti'	100.0	1.83

Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist.

John Maynard Keynes

WOOD BURNING COOK-STOVES (CHULHAS) IN RURAL INDIA

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Fuelwood supplies for cooking and warmth are getting scarce due to indiscriminate cutting of wood, with consequent environmental hazards. Since the traditional method of cooking food on cook stoves made of mud will continue in rural areas, one of the immediate solutions to the problem is the development of new/improved models of fuel efficient smokeless cook-stoves (chulhas as they are called in India). A number of fixed and portable types of 'chulhas' have been developed in India to meet the varying needs of rural women. The case study presents the efforts made in the transfer of technology of these chulhas in rural areas to mitigate the problem of fuelwood scarcity; to effect time saving in cooking; and to eliminate health hazards and drudgery of women due to smoke. It has been experienced that education, incentives and availability of maintenance and repair services near the doorsteps of the beneficiaries are the major factors in the successful transfer of this technology.

Introduction

In rural India, about 90 percent of the energy consumed is in the households for cooking of food. The biomass fuels used for this purpose is mainly fuel wood. Agricultural residues and animal-dung cakes are also used to some extent. It has been estimated (1984-85) that over 133 million tonnes of fuel-wood is burnt annually in the existing inefficient cook-stoves (CHULHAS)* generally made of mud. These stoves used in over 112 million homes in the country, waste considerable energy due to undirected and wavering flames inadequate aeration and excessive fuel feed required to maintain continuous burning. As a result the overall combustion efficiency or percent heat utilisation (PHU) of these stoves ranges from 2 to 10 percent only. The enormous waste of fuel-wood and resultant degradation of forest, foliage and agro-residues can be well imagined. Women who are the primary users of this household energy are subjected to drudgery by way of walking long distances and spending more time in search of fuel-wood, especially the poor who are obliged to fossick for this daily need as they cannot afford to buy fuel. This section of rural population is perhaps facing the 'energy crisis' in its true sense. Another consequence of the stove is the long hours spent on cooking in smoke filled kitchen (sometime in one room hutment), causing eye inflammation and consequential diseases, blackening of utensils and kitchen walls.

The need

All this brings to focus the need to take specific remedial measures at the earliest. Since such cook-stove will continue to be the basic cooking appliance for many years to come, one of the ways of effecting considerable saving in fuel-wood, conserving the forest and tree wealth and eliminating the drudgery of women, is the development of higher efficiency cook stoves*. The

* The word 'CHULHA' in India signifies wood burning cookstove.

challenge was, however, the development of a variety of models to suit varying needs, type of fuel used, size of beneficiary family and their economic status, food habits and life style of people staying in diverse rural settlements and habitats. Keeping these needs in view, a number of models of fixed type (constructed in the kitchen itself on the lines of conventional style chulha) and the portable type of improved and efficient wood burning cook-stoves were designed by the scientists and innovators of social voluntary agencies.

The technology

The improved/new model cook-stove incorporates an optimised size of combustion chambers, air inlet, grate, baffles and dampers. Many models have a chimney (normally clay pipe made by local potters, asbestos or sheet metal).

Apart from fuelwood, most of these chuluhas can use animal-dung cakes, fuel briquettes or coal. The parameters of construction and improvements are based on combustion efficiency and heat transfer aspects. For example, the model developed by the Indian Institute of Technology (IIT), Delhi has the following features (see figure) :

Fuel	- Firewood
Items required for manufacturing	- Mud, Rice husk to serve as binder, Clay pipe
Efficiency	- 24 percent (the chulha can be constructed with the help of moulds)
Features	- two pot chulha - dimensions : 80cm x 40 cm x 19.5cm (Optimised for minimum space and maximum efficiency) - air flow is easy to adjust - holes designed to fit the cooking vessels. - Two easily adjustable dampers

Transfer of technology

The Department of Non-conventional Energy Source (DNES) of the Government of India (GOI) plays a pivotal role in the transfer of technology for various non-conventional energy sources including cook-stoves. To this end, the DNES has launched a 'National Project on Demonstration of Improved Chulha'. The project is designed as a programme for women and by the women so that they themselves become the change agent.

4.1 DNES has adopted a multi-model and multi-agency approach for transfer of technology and laid down criteria for improved cook-stove designs based on thermal efficiency (15-30 percent), locally available materials for construction and the cost factor.

4.2 DNES provides subsidy as incentive to beneficiaries and promoters towards adoption of improved/new model stove.

Case of Village Panthawada, Dhanera Taluka (Banaskantha District), State of Gujarat.

The project 'promotion of improved/efficient cook-stove' was initiated by the Rural Development and Research Society, Pantnawada a constituent of Rural Development Society (with its headquarters at Ahmedabad) with a view to undertake large scale demonstration and extension of improved cook-stove in a cluster of villages within radius of 7kms. of Panthawada.

The project area (village) is located about 170 km from Ahmedabad and about 70 Km away the nearest district centre (Palanpur). This area is sligtly isolated from the main stream of State life. Panthawada has a population of 2781 with 687 households. This is a rocky area with the underground water upto 60 metres depth. The life is thus very difficult. Income of these families is very meagre. The traditional means of livelihood is rainfed agriculture, and sheep and goat rearing. Some of the families are engaged in stone breaking. Majority of the population

Model	Subsidry provided , Type of beneficiaries		Contribution by beneficiaries
	Weaker Section of society & hilly areas	Others	
Fixed Type	Full cost of hardware (including chimney, grates etc.)	Full cost of hardware (including chimney, grates, etc.)	Labour, mud, bricks straw and time needed to instal the stove)
Portable Type	75 % of the cost	50 % of the cost	Balance as may be required.

belongs to the weaker section of society. 30 percent of the families are below poverty level. Literacy among women in the village was recorded as seven percent of population.

5.1 Keeping in view the criteria for selection of improved and efficient stove, a model appropriate to the village culture was identified. The local 'potter-woman' was enthused to make the new stove for trial. She was also the first women in the village to be convinced of the utility of this model in terms of its being emitting out of kitchen and quicker in cooking time. Her services were first utilised to demonstrate the making of new stove to five families. Being a women who had already used this new stove for her own cooking, she herself was a result of demonstration. These five families were given one improved stove each free of cost for trial and self-assessment. These families had identical economic status and food habits. Their cooking time, quantity of fuel utilization for cooking and utensils used (their size and material) were also practically similar. While introducing the improved model, the existing traditional stove in use was not dismantled.

5.2 Indicators : The use of improved stove, its performance and impact on households (women) were recorded in terms of :

1 fuel consumption in traditional stove as against the improved stove;

2. time consumed in cooking while using both the above stoves;

3. opinion of target families (women) about general performance and usefulness of the improved stove; and

4. replication (induced/self)

5.3 Input : The following table provides information about efficiency of improved against traditional stove :

Aspects	Traditional stove	Improved stove	Mean fuel/time saved per day/family	Value fuel/time saved in one year
Fuel Consumption/day(Kg)	4.75	3.25	1.50	*547.50
Time spent on cooking the reference meals (minutes)	138.00	100.00	38.00	-
Time spent on cleaning utensils (minutes)	20.00	10.00	10.00	-
Total time saved in cooking and cleaning	-	-	48.00	minutes/meal

* if food cooked daily.

The new stove was found to be superior and beneficial in terms of time taken for cooking and cleaning utensils (48.00 minutes per meal) and it did not spread smoke in the kitchen. Taking into account that two meals are prepared a day by a family, the saving of time per annum per family works out to about 26 man days, thus conserving women's energy which could be channelled for other household/productive purposes or caring of children. Similarly, the saving of fuel amounted to about 550 kg of fuel-wood per family annually worth Rs. 300 (US $ 20) per year per family.

5.4 The above experiment was vigorously followed by training programme through method demonstration, posters and flash-cards. The services of the women-potter and the women of five families (op.cit) were utilised to demonstrate the making and using of new stove. As a result, 50 families of the village adopted the new stove.As a matter of fact, the potter women were more enthusiastic as it was a new and lucrative business for them to earn both from incentive from the Government of India and the sale proceeds.

5.5 Advantages of the new chulha perceived by the beneficiary women were recorded as follows:-

	Advantages	% of women beneficiaries (responding
1.	Could use all types of fuel	100
2.	Could keep the kitchen walls clean at lower costs	100
3.	No smoke emission	100
4.	Soot deposition on vessels reduced leading to saving of time on cleaning and washing vessels	100
5.	Could attend to children and husband while cooking	99
6.	Could cook two items simultaneously	100
7.	Saving of time on cooking	95
8.	Fuel saved	95
9.	Reduction in attention (need to feed the stove)	93
10.	Cost of construction within their means	85

Even during short span of using the new stove, the adopters expressed their satisfaction about it and more so its availability in the village.

Observations

While introducing the improved model, the already existed traditional stove was not demolished. The women themselves started comparing these two and it became self-repellant. Another interesting point to be noted here is that the dimensions for making of stove were not stated in inches or centimetres, but the size of blocks, sticks, palm and thumb rule. This was necessary keeping in view the low level of literacy among women.

The energy saving/conserving programme through new chulha was tied with the ongoing Integrated Rural Development Programme of the Block (DWCRA - Development of Women and Children in Rural Areas, TRYCEM - Training for Rural Youth for Self-Employment and MNP-Minimum Needs Programme).

Efforts we made to supplement the wood-stove programme by biogas energy programme for those who had 2-3 heads of cattle, so that in due courses they may switch over to biogas stove.

Instructions on 'dos and dont' were prepared especially towards repairs and cleaning of chimney to avoid its logging due to soot deposit.

Introduction of improved cook-stove, however, had its own non-scientific peculiarities. Some of the old ladies (generally the mother-in-laws) were opposed to adopting this even though they were

convinced of its advantages. These ladies were of the view that new stove will result in their daugher-in-laws finishing their routine cooking and utensils cleaning work in much shorter time thereby permitting them to enjoy by gossiping and idling away the time. They mentioned that during their youth, they were subjected to heavy load of work and drudgery on this account so why they should accept such a device.

The beneficiary being a woman, she has to depend upon the social approval of mother/mother-in-law or the husband and payment of material cost. It has been experienced that in many cases, the household has no capacity to pay even Rs. 25-30 (about US $ 2) and so to go without it. Full subsidy towards material cost should, therefore, be available to household below poverty level.

Experience in transfer of technology

Introduction of new stove means much more to the womenfolk. It is breaking their age old habit of using traditional stove, requiring her to skillfully manipulate their dampers for best fuel efficiency, regular removal of ashes from the grating and flue passage and keeping the chimney clean. This not only reads initial demonstration, but training in making and using of such stoves. The 'change' has to be introduced gradually by convincing them about the overall benefits.

The use of mould for constructig the chulha simplifies the procedure, keeping the dimensions generally standardised. This also simplifies the demonstration and training as it helps in 'do it yourself' easily.

The popularisation programme in a locality should ensure local availability of mould, chimney, dampers and grating rods, and trained women to undertake construction.

Women beneficiaries and field workers must be explained the vital dimensions especially of the flue holes to emit the smoke. This programme, therefore, requires training in know'-how' and 'know-why' and monitoring of field level functionaries.

A lady field extension worker is the best motivator and a woman masson is the best skilled worker to instal it, but the movement of such women in different villages is often problematic (one woman mason therefore, must be atleast trained in each village).

People's participation is must and they must contribute towards the cost in cash, labour and material.

If the height of chimney is less than 2 metres, the chulha will prone to develop smoke trouble. Since the chimney cover costs Rs 7 (US $ 0.50) people prefers to go without it.

All field functionaries and extension workers should first adopt the new stove themselves for their own cooking.

Historical and cultural factors must properly be understood. It is these which will give to a large extent the successful innovation and its popularisation in the villages.

During sowing and harvesting seasons, rural households are too busy to give any priority/urgency for constructing new stove. Rainy seasons also hampers such popularisation drive.

The transfer of technology should be done through women organisations and vouluntary social agencies and its adoption through Integrated Rural Development Programme (IRDP)

Special audio-visual, posters, charts, brochure and other extension aids be prepared in local language.

Last, but not the least, simultaneous efforts be made to propagate energy plantation near the habitat; introduce family and community size biogas plants, compaction of agro-residues etc.as per local situation.

Conclusion

More than 90 percent households in villages use traditional inefficient cook stove and burn fuel-wood and animal-dung cakes for cookig food and warmth. The fuel-wood scarcity in itself is the strongest point in

the promotion of improved design stove on a crash basis.

'Smokeless village' programme as envisaged by the Government of India, will bring about a radial change in life style of women in rural areas providing them solace from drudgery and a healthy environment. This is the smallest, though a significant benefit of technology which can reach even the poorest household with minimum effort and cost.

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ARE HALF OF HEALTH RESOURCES WASTED ?

Althrough no systematic study has been undertaken to estimate the extent of waste of rsources in the health services, there is little doubt that it is considerable. Outright waste of all national health resources is said to be as high as 50%. If even half of the waste is due to low productivity and poor utilization of personnel, it would be resonable to expect a substantial reduction from better personnel management.

Report of a WHO Expert Committee.

PALM TIMBER AS A STRUCTURAL MATERIAL

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Specific Weight, Modulus of Elasticity and Ultimate Strength in Tension, Compression and Edge Shear of Palm and other common structural wood, namely, Sal, Sesame and Teak have been experimentally found and reported in this paper. These value have been compared with well-known varieties of structural timbers of Europe and America. Palm timber has been observed to be the strongest of all the Indian varieties and compares favourably with other structural wood of the world, yet costwise it is the cheapest. The traditional practice of using Palm for structural and other purposes in the rural areas of our country needs to be further encouraged as in addition to boosting rural economy it maintains the ecological balance as well.

INTRODUCTION :

In the rural areas of our country Palm timber is being used extensively as a structural material for inclined. roof supporting purpose for many centuries. Palm trees grow almost vertically as a single trunk from bottom to top and as such long members of structural timber are available just by longitudinal sectioning and simple dressing of sap wood from it. These are then used as Ridge pieces, common Rafters, Purlines and Battens for the inclined roof supporting structures. All these sections are selected and designed by the traditional rural craftsmen with the skill and experience handed down to them from their ancestors. No published data are available regarding the strength and stiffness of Palm timber so that rational design of the roof supporting members could be made. With a view to assess the strength of Palm timber against various modes of failure as a structural material and its physical properties such as Specific Weight, Modules of Elasticity, Ultimate Tensile and Compressive strength (both parallel and perpendicular to the longitudinal grains) and Ultimate longitudinal Shear Strength were found experimentally. For comparison corresponding strength values of three other common structural wood, namely Sal, Sesame and Teak were also experimentally determined. On the basis of experimental results on five test specimens of each timber for every type of physical property it was observed that Palm timber is the strongest and yet the cheapest of the Indian varieties. It also compares favourably with the stronger varieties of structural wood of Europe and America. If used under cover of rains, well-seasoned palm timber with a coating of coal tar on it has been seen to last more than a hundred years. Owing to its slow rate of burning, Palm wood is not suitable for fuel, hence palm groove is less likely to be cut prematured by clandestine wood cutters in the jungle areas. Compared to any other structural wood bearing trees palm occupies minimum ground space and also offers minimum shade to the crop underneath, makes it suitable for growing on the boundaries of the paddy fields and near home-stead lands in rural areas. Besides the utility of palm-juice as a drink and for khandsari purposes and its leaves for roof covering purposes is well known.

MATERIALS AND METHODS :

A-1. Specific Weight of freshly-cut Sap wood and Heart wood of Palm.

From the trunk of freshly felled palm trees samples of sap and heart wood were cut using a fine teeth Iron saw and these were collected inside marked polythene bags. Within a few hours these samples were taken out of these bags and weighed on a common balance (Avery-301/BCD/22915, Made in England). The volumes of each of these samples were then measured using graduated measuring cylinders, by water displacement method. In order to remove all air bubbles sticking to the specimens before dipping into water of measuring cylinder, these specimens were previously soaked in water and just before dipping them into measuring cylinder the excess water of the specimen were absorbed by wrapping them with blotting paper. Altogether sixteen observations on four specimens of sap and heart wood were taken and the results are given in Table-1.

A-2. Specific Weight of Palm, Sesame, Teak and Sal timber (Air-dry).

Following the same procedure as in the case of A-1, Specific Weight of well-seasoned and air-dry heart wood specimens of Palm, Sesame, Teak and Sal (three samples of each) were measured and their values have been given in Table-II. Table-IIA shows the Specific Weight of other timbers of Europe and America with that of Palm entered in the last column for comparison.

B-1. Tensile Strength of Palm, Sesame, Teak and Sal Timber.

As shown in Figure-1 of Appendix-I five specimens of each timber were fabricated from well-seasoned and flawless logs of wood. All the dimensions marked A_1 to F_2 were measured in millimeters using Vernier Callipers and Micrometer Screw Gauge. The following minimum dimensions were maintained for each of the specimens :

Overall length	Y	=	350mm
Grip Length	A	=	76mm
Tapering portion	B	=	50mm
Thickness	F	=	15mm
Central parallel portion	C	=	100mm
Transverse length	D	=	30mm
Transverse Neck length	E	=	18mm

While preparing the specimens care was taken not to hit hard on the specimen with any hand-tool. Finishing operation upto the desired dimension was done with hand operation of chisels and sand papers. The longitudinal axis of the specimens were kept parallel to the natural longitudinal grains of the timbers.

Universal Testing Machine (WPMA, Werkstoffprufmaschinen (VEB), Leipig) was used for measuring Ultimate Tensile Strength of the timber specimens. The specimens were held in grips such that equal length of portions A_1 and A_2 were held by the fixed and movable jaws of the machine. Before the specimen were loaded, care was taken to see that the axis of load coincided with the axis of the specimen by keeping the ends A_1 and A_2 centrally with respect to the concentric circles inscribed on the fixed and movable jaws of the machine. The loading was gradually increased with a steady deformation rate of 5mm, per minute. The loading was automatically stopped after the specimen either yielded or broke from the central region C. The load-deformation graph and the maximum load reached were plotted by the machine and the maximum load was also read from the dial. The broken/yielded specimen were carefully dislodged from the grips by loosening the fixing nuts of the Jaws and measurement C, E, and F were taken after carefully placing the broken portions together in the original alignment. Ultimate nominal Tensile Strength were calculated and Table-III shows the comparative values of tensile strength of Palm, Sal, Sesame and Teak wood.

B-2. Compressive Strength of Palm, Sesame, Sal and Teak Wood.

(a) Parallel to the Grain and (b) Perpendicular to the Grain.

Five specimens of each timber in the shape of rectangular parallelepiped as shown in Figure - 2, Appendix - I, were cut from flawless and well-seasoned logs of wood. Measurements G,H and K were taken with the help of Vernier Callipers. The specimens were made separately for 'Parallel to the Grain' and 'Perpendicular to the grain' compressive tests, taking due care while cutting from the stock and were accordingly marked with black ink. Loading was done on the same 10-ton Universal Testing Machine after replacing the tensile load applicator by the compression test jaws. The longitudinal dimension K, was maintained at 50mm. as minimum and transverse dimensions G and H at 27mm. as the minimum. The deformation rate was kept low at 5mm/minute. As soon as the machine indicated no increase in the value of load for about 60 seconds with visual sign of the specimen either cracking or bulging out laterally, further loading was stopped. For loading the specimen perpendicular to the grains the specimen was placed on the jaws with the longitudinal dimension, K perpendicular to the load axis but centrally with respect to the loading axis. The ultimate Compressive Strength parallel to the grain is shown in Table - IVA and those of perpendicular to the grain in Table-IVB.

B-3. Longitudinal Shear Strength (Edge Shear Strength)

A special load applicator was fabricated for this test as shown in Figure-3 Appendix-I. The specimens for this test were also suitably made from well-seasoned logs of Sal,Sesame, Teak and Palm as shown in Figure-4, Appendix-I. Transverse holes of 10mm. diameter (centres of these holes lying on the load axis) were drilled at distances of L_1 and L_2 from the respective edges. The diameter of the pin, d of the load applicator was slightly less than the hole diameter, d, and the length of grip of the circular portoion of the applicator was kept more than 60mm. All these dimensions were measured by Vernier Callipers and Micrometer Screw gauges. The specimens were loaded in the vertical position taking care that the bolts were horizontal and symmetrically placed with respect to the wooden specimen such that loading axis coincided with the longitudinal axis of the specimen. The deformation rate was maintained at 5mm./minute and immediately after the specimen was seen to have failed at any one end by double shear action of the edges the experiment was stopped for the specimen. The actual thickness t_1 and t_2 of the slice of timber coming out of the edge were carefully measured for calculating the shear area under load. The Edge Shear Value of all the four types of timber are shown in Table-V.

C-1. Modulus of Elasticity of Timbers.

Long rectangular prismatic bars of dimensions A,B and 1 as shown in Figure-5 of Appendix - I were made from well-seasoned timbers (Sal, Teak, Sesame and Palm). Care was taken to see that the longitudinal grains were parallel to the length of the bar in every case and the faces A and B were at right angles all through the length of the bar and their mean values were taken. The length, I was measured with a metre scale and this bar was kept over the knife edges on a firm horizontal table as per Figure - 6, Appendix-I. The bar was placed on the knife edges at L distance apart, centre to centre and a mirror scale S, was kept at mid-span (L/2) and initial reading on the mirror scale level with the top face of the bar with no load on it was taken. There-after the locations of two knife edge supports and the mirror scale stand were marked on the table with a chalk. The deflection at mid-span for loads of 1kg. to 5kg. were taken on the mirror scale at intervals of 1kg. This experiment was repeated with the same

specimen kept in position II for the same span L. (The face A which was horizontal in position - I will become vertical in position - II.)

The Modulus of Elasticity E, (Kg/sq.cm.) was calculated using the relation :

$$\delta = \frac{W L^3}{48 EI},$$

Where,

δ = deflection at mid-span, L/2; cm.

W = load applied at mid-span; Kg.

I = area moment of Inertia of the transverse section of the bar; cm^4.

The mean value of E as calculated for positions I and II are tabulated in Table-VI, for Palm, Sesame, Sal and Teak. Table - VII shows the physical properties of the conventional Indian structural wood (Palm, Teak, Sal and Sesame) along with those of common structural wood of Europe and America.

EXPERIMENTAL RESULTS :

Tables- I to VII.

TABLE - I : Specific Weight of Freshly-cut Sap and Heart wood of Palm

A- Mean of 15 observations of 5 different specimens of Sap wood

=

= 1/15(0.855 + 0.839 + 0.848 + 0.779 + 0.803 + 0.803 + 0.780 + 0.775 + 0.775 + 0.729 + 0.729 + 0.729 + 0.825 + 0.825 + 0.825)

= 0.7946.

B- Mean of 4 observations of freshly-cut Heart wood.

= 1/4 (1.15 + 1.166 + 1.191 + 1.1255)

= 1.1905.

Therefore ratio of specific weight cut Heart wood to Sap wood of Palm

= 1.1905/0.7946 = 1.4982.

TABLE - II, Comparative values of Specfic Weight of Air-dry and Well-seasoned Teak, Sal, Sesame and Palm timbers.

Sl. No.	Name of Timber specimens	Weight in grammes	Volume in c. c.	Sp. Weight gm / cc	Mean of 3 values gm / cc	Mean of 3 values lbs/cft.
1	2	3	4	5	4	7
1.	Teak	20.2	30	0.6733		
2.	do	21.5	30.5	0.7049	0.6718	42
3.	do	18.8	29.5	0.6372		
4.	Sesame	14.5	19	0.7630		
5.	do	16.5	20	0.8250	0.792	49.4
6.	do	15	19	0.7890		
7.	Sal(Sakhua)	23.4	28	0.8357		
8.	do	23.4	28	0.8357	0.846	52.81

Table Contd....

1	2	3	4	5	6	7
9.	do	26	30	0.8666		
10.	Palm	20	19	1.057		
11.	do	19.8	19	1.042	1.040	65
12.	do	19.5	19	1.026		

TABLE - IIA, Comperative values of Sp. Wt. of Timber from Abrod

(Table - D, 1, Page - 411 of Reference - I)

Name of Timber	Ash Orega-on	Cedar Western Red	Douglas Fir	Hemlock Western	Hickory True	Locust Black	Maple Red	Oak White	Pine Long-leaf
Sp. Wt. gm/cc	0.55	0.33	0.48	0.42	0.73	0.69	0.54	0.67	0.58
lbs/cft.	34	2	30	26	46	43	34	42	36

TABLE - III Ultimate Tensile Strength of Common Indian Structure Timber

Teak, Sesame, Sal and Palm (Kg/cm^2)

Sl. No.	Name of Timber	S_{ult} = Ultimate Tensile Strength = (Breaking Load Kg)/(Nominal C/S Area (cm^2)					
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Mean Value (Kg/cm^2)
1	2	3	4	5	6	7	8
1	Teak	1980/2.29 = 686	2120/2.92 = 726.2	2020/2.88 = 700.90	1990/2.85 = 697.75	2240/2.90 = 771.88	716.56
2.	Sesame	1260/1.74 = 723.74	1370/1.63 = 843.00	1420/1.74 = 826.09	1390/1.70 = 818.60	1300/1.68 = 773.80	794.80
3.	Sal(Sakhua)	1770/1.66 = 1064	2050/1.63 = 1261.20	2020/1.72 = 1173.70	1800/1.66 = 1084.30	1790/1.69 = 1091.40	1128.30
4.	Palm	2140/1.87 = 1142	2330/1.78 = 1311.37	1820/1.71 = 1063.08	1690/1.67 = 1009.07	1890/1.60 = 1181.25	1141.00

Table IV A Ultimate Compressive Strength of Common Indian Structural Timber, Teak, Sesame, Sal and Palm Parallel to Grans (Kg/cm²)

Sl. No.	Name of Timbers	S_{ult} = Ultimate Compressive Strength = (Breaking Load Kg.) / Nominal C/S Area (Cm²)					
		Sample 1	Sample 2	Sample 3	Sample 4	Sample5	Mean Value
1.	Teak	6720/ 12.35 = 544.12	6900/11.56 = 596.85	7500/12.14 = 617.89	6715/11.38 = 590.00	6800/12.15 = 559.67	581.71
2.	Sesame	6141/10.77 = 569.61	6360/10.74 = 591.88	6040/10.75 = 561.88	6400/10.74 = 595.79	6250/10.78 = 579.66	579.76
3.	Sal(Sakhua)	6250/9.91 = 630.99	6300/9.73 = 647.95	6350/9.79 = 648.48	6150/9.67 = 635.98	6400/9.72 = 658.70	644.42
4.	Palm	5850/7.78 = 751.53	5880/7.56 = 777.53	5880/7.71 = 762.64	5920/7.86 = 753.18	6000/7.73 = 776.19	764.21

Table IV B Ultimate Compressive Strength of Common Indian Structural Timbers, Teak Sesame, Sal and Palm Perpendicular to Grains (Kg/cm²)

Sl. No.	Name of Timbers	S_{ult} = Ultimate Compressive Strength = (Breaking Load Kg.) / Nominal C/S Area (Cm²)					
		Sample 1	Sample 2	Sample 3	Sample 4	Sample5	Mean Value
1.	Teak	2260/17.80 = 132.94	3500/16.91 = 212.89	3200/16.48 = 194.17	3440/17.72 = 194.13	2960/16.56 = 178.74	182.57
2.	Sesame	2940/12.81 = 229.59	4200/12.58 = 333.61	3440/12.69 = 276.95	3800/12.96 = 293.20	3620/12.78 = 283.25	283.31
3.	Sal(Sakhua)	2500/11.98 = 208.75	2490/12.21 = 203.89	2640/11.93 = 221.29	2760/12.18 = 226.60	2600/12.25 = 212.24	214.55
4.	Palm	6860/20.50 = 334.63	7050/20.75 = 339.79	6800/20.24 = 335.96	6760/19.88 = 340.00	7100/20.76 = 342.00	338.48

Table V Ultimate Longitudinal Shear Strength (Edge Shear) of Common Indian Structural Timbers, Teak, Sesame, Sal and Palm (Kg/cm²)

Sl. No.	Name of Timbers	S_{ult} = Ultimate Compressive Strength = (Breaking Load Kg.) / Nominal C/S Area (Cm^2)					
		Sample 1	Sample 2	Sample 3	Sample 4	Sample5	Mean Value
1.	Teak	480/7.75 = 61.90	550/9.20 = 59.75	510/9.07 = 56.25	490/8.35 = 58.44	520/8.63 = 60.27	59.24
2.	Sesame	900/11.63 = 77.42	800/9.19 = 87.00	840/9.38 = 89.83	760/9.54 = 79.66	770/9.57 = 80.45	82.77
3.	Sal(Sakhua)	1080/10.78 = 100.69	1000/10.73 = 93.24	1020/10.20 = 100.00	1210/12.78 = 94.60	980/9.28 = 105.60	98.82
4.	Palm	1150/12.05 = 95.45	1270/12.77 = 98.49	1320/12.38 = 106.65	1280/12.18 = 105.09	1110/11.56 = 96.02	100.54

Table VI Modulus of Elasticity of Common Structural Timbers of India, Teak, Sesame, Sal and Palm (Kg/cm²)

Sl. No.	Name of Timber	Mean Values of E (Kg/cm²) Based on Two Specimens of Each Timber		
		Position - I $E_1 \times 10^5$	Position - II $E_2 \times 10^5$	Mean of E_1 & E_2 $\times 10^5$
1.	Teak	0.943 x	1.188 x	1.065 x
2.	Sesame	0.697 x	0.655 x	0.676 x
2.	Sal(Sakhua)	0.983 x	1.141 x	1.060 x
4.	Palm	1.982 x	2.010 x	1.996 x

Table VII Physical Properties of Foreign* and Indian Varieties of Structural Timbers

(*Serial 1 to 9 have been taken from Ref. 1)

Sl. No.	Name of Timbers	Sp. Weight gm/cc (lbs/cft)	Ult. Tensile Strength in Kg/cm²(Psi)	Ult. Comp. Strength parallel to grain Kg/cm²(psi)	Edge Shear Strength Kg/cm²(psi)	Mod. of Elasticity E(Kg/cm²) (psi)x10⁶
1.	Ash (Oregon)	0.545 (34)	892 (12700)	425 (6051)	126 (1790)	0.096 x (1.36 x)
2.	Cedar(Western Red)	0.336 (21)	541 (7700)	353 (5020)	61 (860)	0.079 x (1.12 x)
3.	Douglas Fir (Coast)	0.480 (30)	823 (11700)	522 (7420)	80 (1140)	0.135 x (1.920 x)
4.	Hemlock (Western)	0.42 (26)	710 (10100)	437 (6210)	82 (1170)	0.105 x (1.490 x)
5.	Hickory (True)	0.736 (46)	1385 (19700)	630 (8970)	150 (2140)	0.153 x (2.180 x)
6.	Locust (Black)	0.69 (43)	1363 (19400)	478 (10180)	174 (2480)	0.144 x (2.050 x)
7.	Maple (Red)	0.54 (34)	942 (13400)	460 (6540)	130 (1850)	0.115 x (1.640 x)
8.	Oak (White)	0.67 (42)	977 (13900)	495 (7040)	133 (1890)	0.114 x (1.620 x)
9.	Pine (Long leaf)	0.576 (36)	1034 (14700)	593 (8440)	105.50 (1500)	0.140 x (1.990 x)
10.	Teak (Indian)	0.671 (42)	716.50 (10188)	581.70 (8271)	59.24 (842)	0.107 x (1.512 x)
11.	Sesame (Indian)	0.792 (49.25)	794.80 (11302)	579.76 (8243)	82.77 (1177)	0.068 x (0.950 x)
12.	Sal (Sakhua Indian)	0.846 (52.80)	1128.20 (16043)	644.40 (9160)	98.82 (1405)	0.106 x (1.505 x)
13.	Palm (Indian)	1.04 (65)	1141.40 (16230)	764.20 (10867)	100.54 (1430)	0.1996 x (2.830 x)

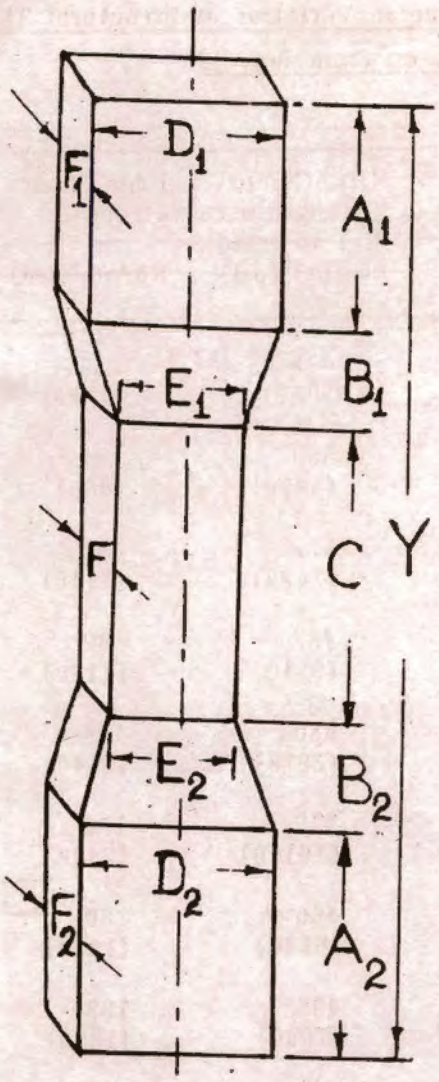


FIG. I SPECIMEN FOR TENSION TEST

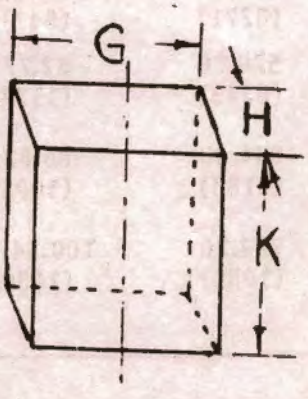


FIG. II SPECIMEN FOR COMPRESSION TEST

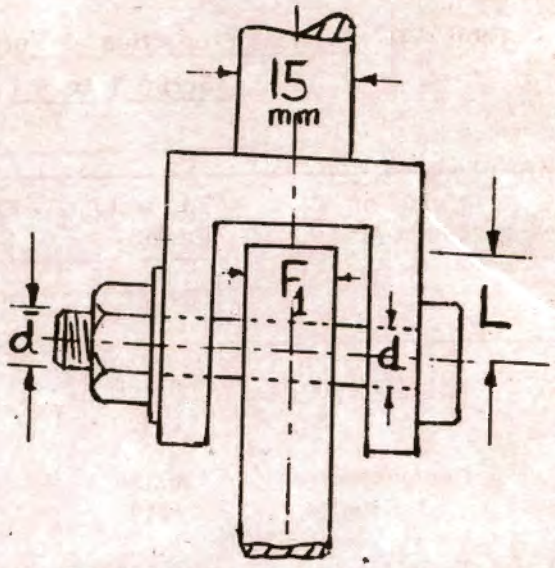


FIG. III LOAD APPLICATOR FOR DOUBLE SHEAR TEST OF TIMBER SPECIMEN

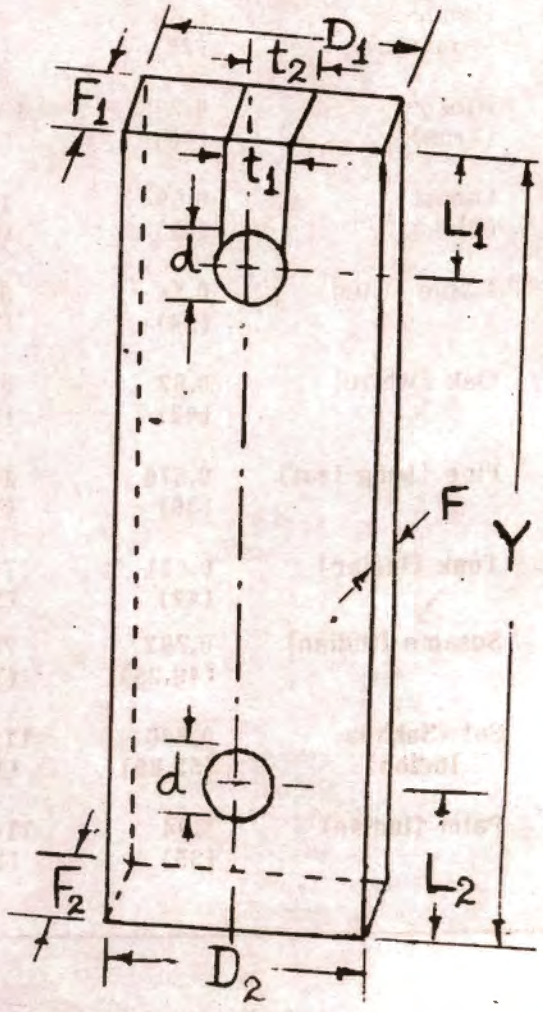


FIG. IV SPECIMEN FOR EDGE SHEAR TEST

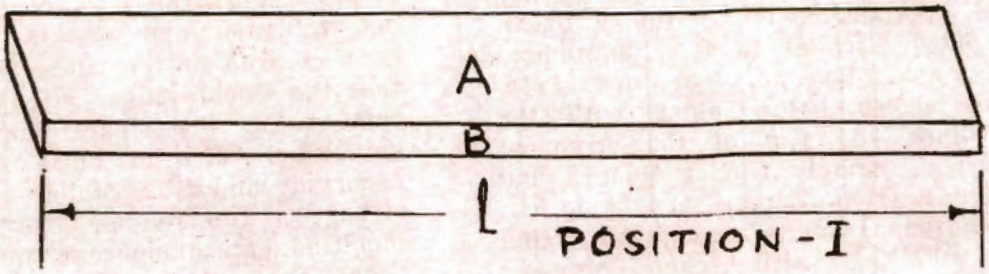


FIG. V SPECIMEN FOR DEFECTION TEST OF WOODEN BEAMS

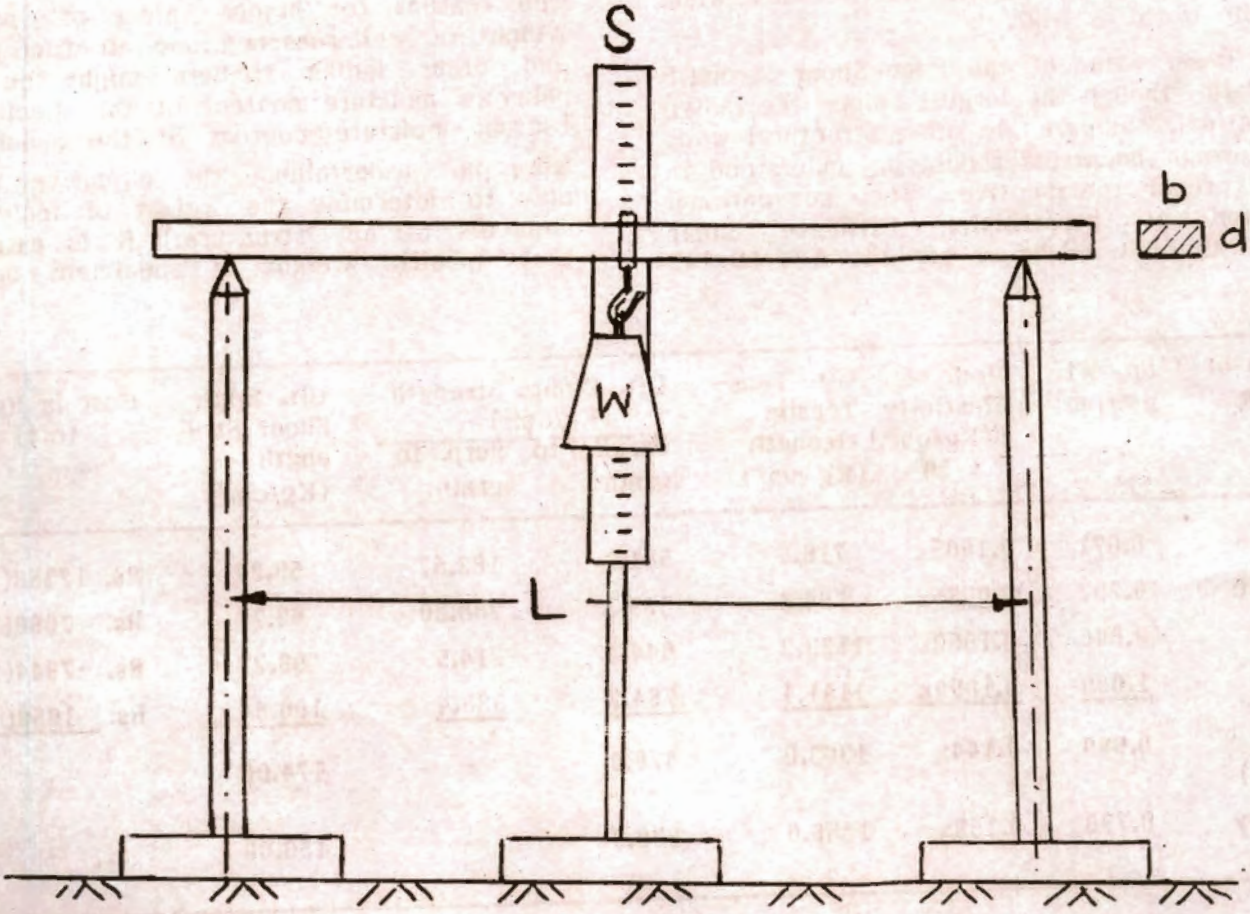


FIG. VI MODULUS OF ELASTICITY OF TIMBER BY DEFLECTION TEST

CONCLUSION

The mean values of Specific Weight, Modulus of Elasticity and Ultimate Strength in Tension, Compression (both' parallel to the grains' and 'perpendicular to the grains'), and Edge Shear parallel to the longitudinal grains of Teak, Sesame, Sal and Palm timbers are shown below along with the published values[1] of two of the strongest structural wood, namely Locust (black) and Hickory (True) from Europe and America. The local optimum values among the Indian timber are underlined with broken lines and global optimum values among the Indian as well as foreign timbers are underlined with firm lines

Ever a cursory look on the optimum values reveals that Palm timber is the strongest and yet the cheapest of all structural timber of India and stands out quite distinctly among the strongest varieties of the structural wood of the world as well.

The lower value of the Edge Shear Strength of Palm (though the largest among the Indian varieties), compared to other structural wood of foreign countries should be understood in the proper perspective. The conventional method of ascertaining Ultimate Shear Strength of wood is as per the ASTMD-143 specifications, where the specimen fails under single shear, where as the modified technique adopted by the author as explained in para B-3, the specimen failed in double shear. The stress concentration effect due to steel bolt pressing against a small contact area of the timber hole and the fact that the Double Shear Strength is always less than twice the single Shear Strength, the calculated value of Edge Shear Strength as reported might be smaller than the actual strength. The main objective behind the modified arrangement of measuring the Edge Shear Strength was to ascertain the safe distance of the centre of both hole from the nearest edge of timber for the purpose of making any structural joint. Considering the above two factors, the actual values of the Edge Shear Strength of Palm and other three local varieties of timber would have been higher than the reported values.

The reasons for higher values of Specific Weight of well-seasoned and air-dried Palm and other Indian timbers might be the unknown moisture content of the specimens. (actual moisture content of the specimens were not ascertained, the objective being only to determine the weight of individual members of any structure.) It is assumed that Specific Weight of specimens having

Name of timber	Sp. Wt. gm/cm^3	Mod. of Elasticity E(Kg/cm^2) x 10^6	Ult. Tens-Tensile strength (Kg/cm^2)	Ult. Comp. Strength (Kg/cm^2)		Ult. Edge Shear Str-ength (Kg/cm^2)	Cost in Rs./m^3 (cft)
				Parallel to grain	Perp. to grain		
Teak	0.671	0.1605x	716.5	581.7	182.57	59.24	Rs. 12358(350)
Sesame	0.792	0.0675x	794.8	579.3	288.30	82.77	Rs. 7698(218)
Sal	0.846	0.1060x	1128.2	644.4	214.5	98.22	Rs. 7944(225)
Palm	1.040	0.1996x	1141.4	764.2	338.4	100.54	Rs. 1059(30)
Locust (Black)	0.690	0.144x	1363.0	478.0	-	174.00	-
Hickory	0.736	0.153x	1385.0	630.0	-	150.00	-

upto 12% moisture content would be only marginally less than the reported values of Table - II.

All the above figures, however incomplete they may be, establish the superiority of Palm timber as a structural material over all the Indian and foreign varieties of common but costlier wood. The wisdom of our ancestors in the use of Palm timber for basic roof supporting and other indoor load bearing purposes has been established. The age old rural tradition of growing palm trees on the homestead lands, on the banks of ponds and boundaries of paddy fields near the residential localities bear testimony of the farsightedness and rational outlook of the villagers from the management and ecological point of view. Wrong demand and emphasis on conventional forest grown timbers for structural and other purposes has caused large scale denudation of the jungle areas leading to present ecological problem. Using palm timber for all the rural structural needs will not only be economical but may reduce clandestine and indiscriminate felling of the forest trees as well. Palm wood being much less combustible but much more durable than bamboo makes it a better choice as a structural material and uniqueness of Palm tree for its multi-facetted utility be understood by our countrymen in general and our national government in particular.

Further research on other aspects of Palm timber as regards its time dependent mechanical properties for long time activity and the most economical section for bending, shear and compression applications as well as effective preventive maintenance against weathering and white ant menace needs to be carried out.

REFERENCES

Davis, H.E.,Troxell, G.E. and Wiskocil, C.T., THE TESTING AND INSPECTION OF ENGINEERING MATERIALS. McGraw-Hill, Third edition.pp.411-413. New York. 1955.

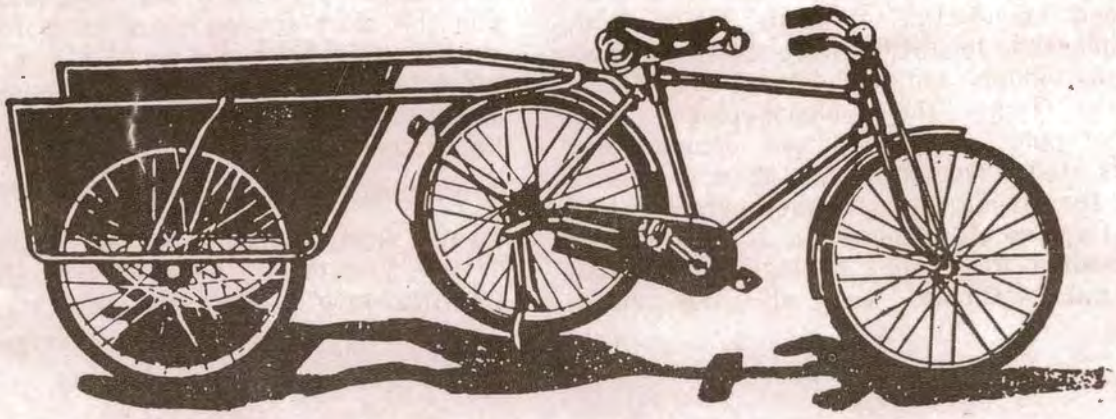
MEDIA INFLUENCE

The media are more interested in poll, paid commercials, photo opportunities... than in housing, poverty, education, health and the city's infrastructure.

Richard Wade

Information on Rural Technology Products/ Processes

TWO WHEEL CYCLE TRAILER



Inadequate transport facilities constitute a significant factor hindering the productivity of the rural poor. In India where rural road infrastructure is poor and road services are expensive, large amount of household time and energy are devoted to meet essential transport requirements. With the limited resources available for the extension of the rural road network, the high cost and limited availability of motor vehicles, non motorised methods are likely to continue to provide the major means of rural transport.

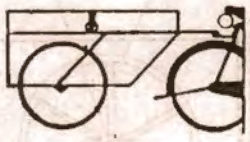
Looking towards the problem focussed on the improvement of existing technologies, in particular the bicycle, which in India is widely used as a load carrier as well as a means of personal transport. There are approximately 25 million bicycle in use in India about 70% of them in rural areas where ownership extends to the poorer sections of the communities.

Centre for Development of Rural Technology at Institute of Engineering and Rural Technology, Allahabad., has developed a TWO WHEELED TRAILER which can be attached to a bicycle that is effective on paved or unpaved roads.

ABOUT THE PRODUCT

The trailer consists of a strong, light weight T-iron steel frame, heavy duty stiffend

Modern hitch mechanism facilitates attachment / detachment of trailer with bicycle.



wheels made of angle iron fitted with cycle rickshaw type and tube and a quick release hitch mechanism which has been developed to ensure that it is simple to use, durable and fits in all makes of Indian Bicycle. In addition to a basic chassis model, it has two main load container options-a general purpose sheet steel tray or a tank for moving liquids, allowing the trailer to meet a range of needs. New load containers designs can be developed to meet specific requirements within a maximum carrying capacity of 150 kg.

SALIENT FEATURES:-

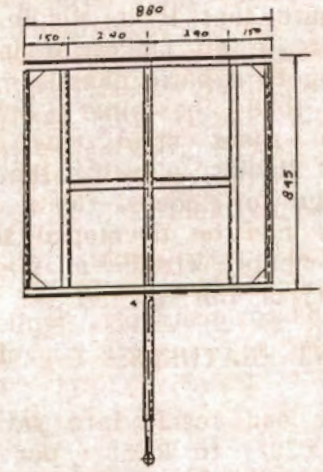
* It can result into saving of at least Rs.20/- to Rs.50/- per day, on cartage short-haul loads (upto 150 kg.), depending upon goods transported, distance and other factors.
* It reduces dependence and therefore uncertainty on hired transport.
* It is suitable for rural/semi urban/ urban areas and can be used by any class of people.
* It can be easily attached and detached with an ordinary bicycle.
* It works satisfactorily in all climates.
* There are no chances of overturning or disbalancing in loaded and unloaded conditions, both.
* It can be easily repaired and maintained at an place.
* It's fabrication is easy. It can be fabricated in a workshop having welding set and other basic tools. However a set of jigs and fixtures, designed for the purpose, would ensure greater productivity and quality.

CONSTRUCTIONAL MATERIALS

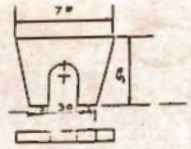
M.S. Pipe, Sheets, Cycle wheels, M.S.Section etc.

ANTICIPATED LIFE

10 years (approx).



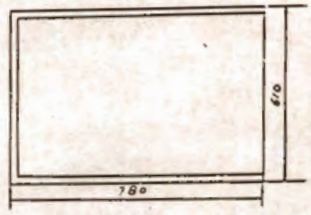
Plan



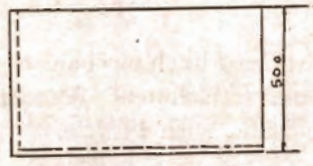
Elevation
Detail of C

Plan

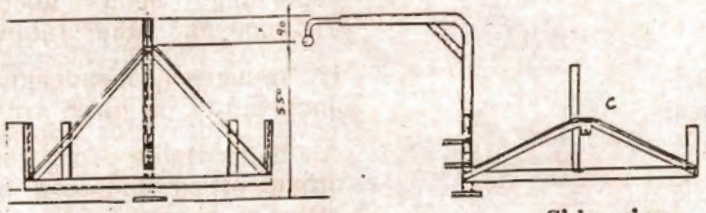
Elevation



Plan

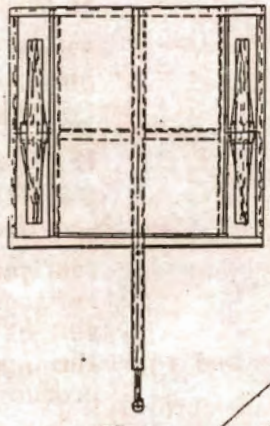


Tray (Wooden)
Elevation

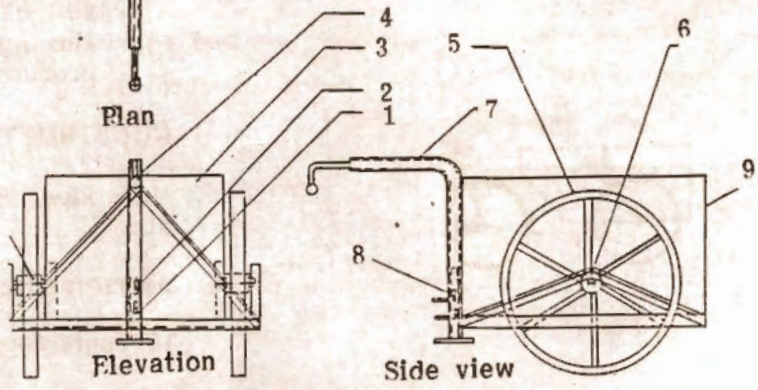


Main Frame
Elevation

Side view



Plan



Elevation

Side view

BENEFITS & ECONOMIC VIABILITY

The principal intended users of the product are rural households which experience difficulties in the transport of their commodities and goods. This includes small and marginal farmers, village artisans and other who face the problems of high cost and time delays in the transport of essential household requirements, as well a agricultural inputs and outputs, fuel, raw materials etc. It also includes the large numbers of traders, vendors and transporters who currently use bicycle or a range of hired alternatives to transport their wares. Landless labourers also stand to benefit from the use of the cycle trailer in the provision of transport services, either through self-employment of wage-employment.

In each case cycle trailer can create significant reductions in the time and energy devoted to transport, while simultaneously enhancing the carrying capacity of traditional transport means. Analysis of the trailer's operations shows that its running costs amounts to between Rs.1 to Rs. 1.65 per day. Results from field trails conducted in different locations throughout India reveal that transport saving (or additional revenues) between Rs.10 to Rs. 20 per day, minimum, are achievable using the trailer.

For further information contact:

CDRT, IERT, 26 Chatham Lines, Allahabad-02

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AIDS - NO COUNTRY CAN FIGHT ALONE

The global fight against AIDS will take many years and it will require political and health leaders alike to have the strength of commitment necessary to make difficult decisions, to stand firm against unreasonable fear and to maintain the consistency and unity of action that are absolutely vital for a global fight against this global threat.

No country can fight AIDS on its own. The leadership necessary to coordinate our efforts can come only from the World Health Organization. WHO is the linchpin holding together our individual efforts and guiding them into a genuinely unifield global atack on AIDS.

Diplomatic World Bulletin.

IMPROVED WATER MILL

The improved Water Mill is a very useful device for the people living in the villages, particularly on the hills. It works by using available water power and the power generated at the prime-mover is transfered by flat belt and pulley system to the grinding unit to turn the stone for making flour. In addition to this, the power available at primemover can also be use for operating rice huller and small machines like chaff cutter, sugar-cane crusher, grinding, drill and sawing etc.

The improved Water Mill consists of three units :-

1. Turbine Unit
2. Grinding Unit
3. Rice Hulling Unit.

TURBINE UNIT :

Two kinds of turbines are available. One is made of wood and the other of metal. The wooden blades can be made by the miller or carpenter. The metal runner requires more skill and a small basic workshop is needed for fabrication. In this unit horizontal wheel with a vertical shaft will be installed and the power available at the shaft will transfered by flat belt and pulley system to the point of application i.e. for operating grinding or rice hulling unit.

The shape of blades in the wooden runner will be flat and grooved type while in the metal runner it will be spoon shaped.

GRINDING UNIT :

The grinding unit can be placed any where at the side of the turbine unit. It is necessary to have enough space for the pulley and way to run grinding unit independently. In this unit a pair of grinding stone are installed horizontaly. The grinding stone will be fixed on a strong plate form made out of stones or bricks masonary. Stones or bricks masonary wall hold two wooden beam one for the bearing and shaft to carry the grinding stone and another beam is required for the lifting mechanism.

RICE HULLING UNIT :

Rice huller is a machine for removal of husk (called hulling) from paddy grains and to produce clean rice. Rice hulling unit is easily operated by the improved water mill. The hulling unit can be installed at the side of the turbine unit. The place where the rice hulling unit installed, should be at least 3 meters away from the turbine unit. A foundation of wooden structure or masonary is required for mounting the rice-huller. The power will be transfered by flat belt pulley system from the prime-mover. A little adjustment is needed for the alignment in the hulling mechanism.

CONSTRUCTION MATERIALS :

12 gauge M.S. Sheet, 38mm. M.S. Shaft, bearing, bush, belt, wooden frame and hardware etc.

WEIGHT :

About 100kg (including wooden frame).

CAPACITY :

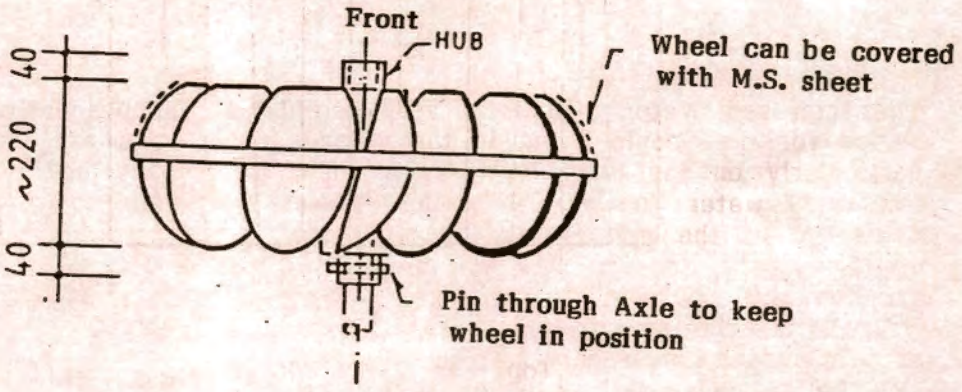
Wheat grinding - 30 to 40kg/hour

Rice hulling - 40 to 50kg/hour

OTHER ADVANTAGES :

METAL RUNNER DETAILS

TURBINE WHEEL



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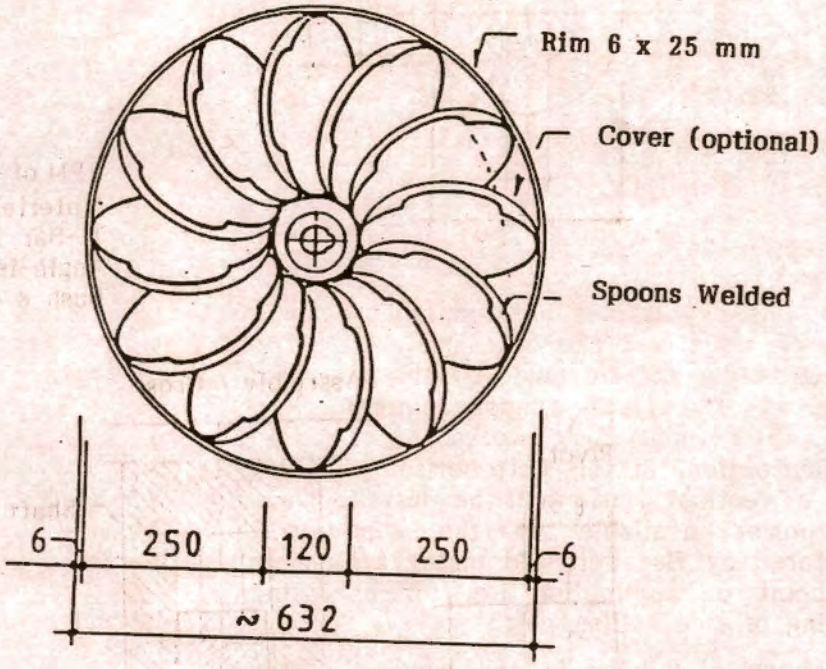
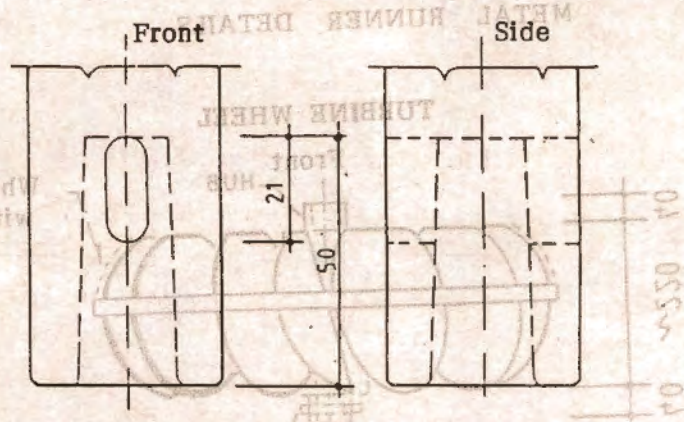
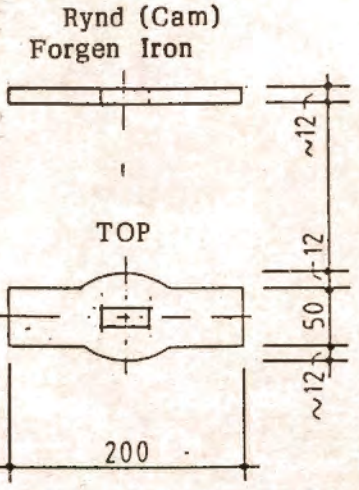


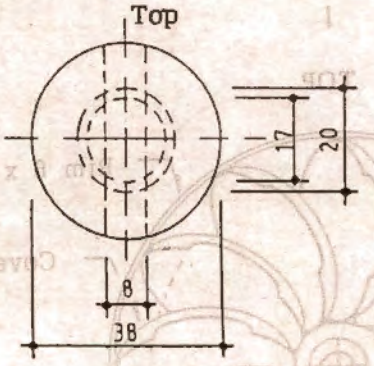
MASUREMENTS

in mm

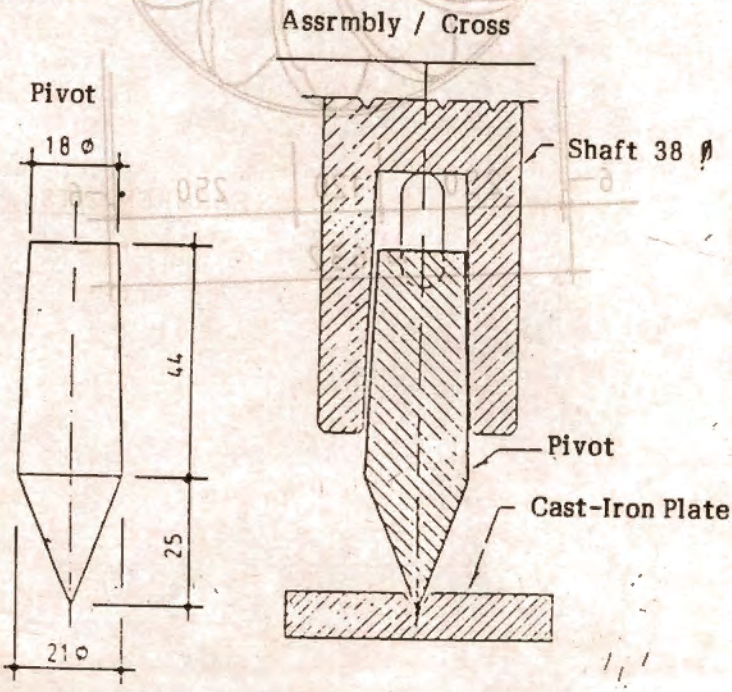
PILOT ASSEMBLY







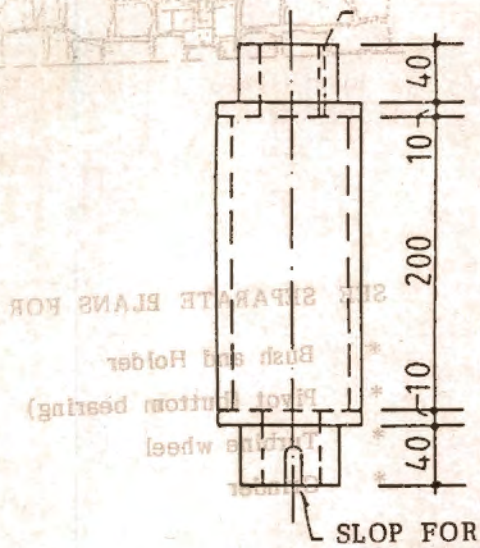
* RPM of stone approx 100-150
* Materials
U-Bar 75x40x5 mm
Angle-Iron 65x65x6 mm
Bush & Bottom Pivot - Sep. Sheet



MEASUREMENTS
in mm

HUB

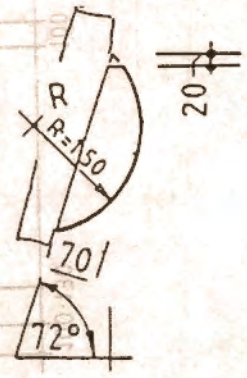
FRONT



SLOP FOR PIN TO
KEEP TURBINE AT LEVEL

FRONT

SIDE



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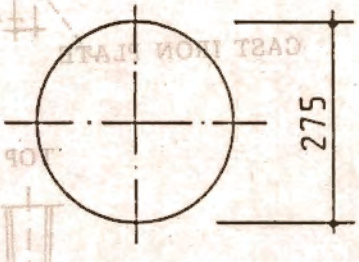

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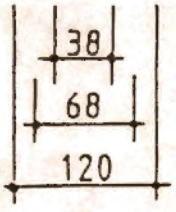
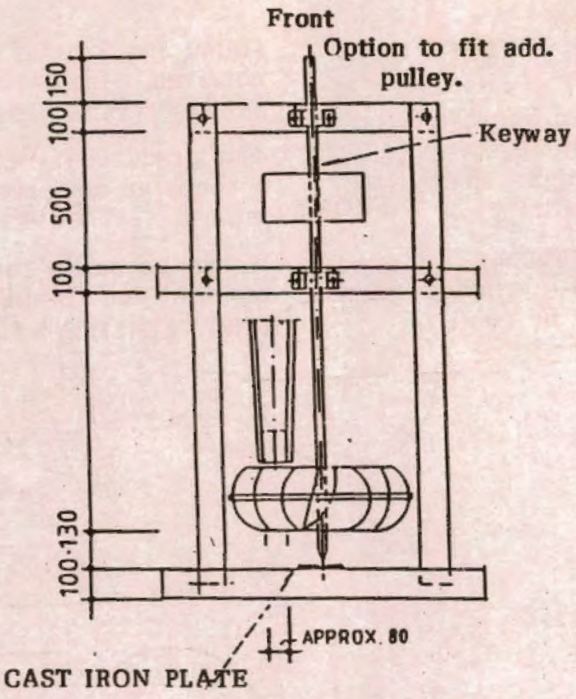


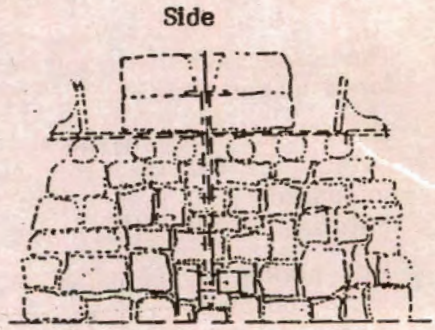
CUTTING OF M.S.
PLATES 5 MM FOR
SPOONS

MEASUREMENTS

in mm

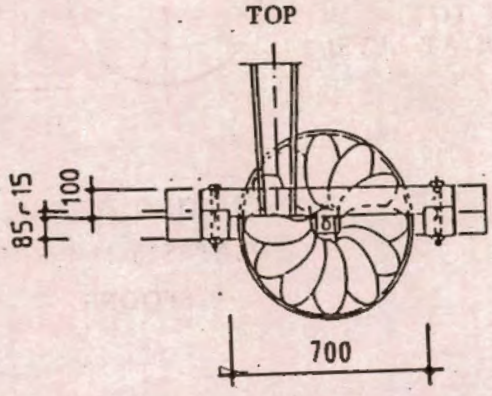
METAL RUNNER ASSEMBLY





SEE SEPARATE PLANS FOR

* Bush and Holder
* Pivot (buttom bearing)
* Turbine wheel
* Grinder



RPM Approx 220

MEASUREMENTS

in mm

* The processed materials can be stored for a longer time.
* The flour obtained from the improved water mill has a better nutrient status compared to that from high speed motorised or diesel powered mill.
* Rice hulling is an added advantage. The flour obtained from grain grinding improved water mill is same in quality as that from traditional water mill.
* It does not become heated and can be stored for long as compared to the flour obtained from motorised or diesel powered grain mills.
* The productivity can be increased about 3 times as compared to traditional water mill.
* It can be easily removed, dismantled and repaired due to simple design.

ANTICIPATED LIFE : 10 years.

COST : Rs. 10,000/- (including wooden frame, grinding stones rice huller, pulley, belt etc.

MATERIALS FOR IMPROVED WATER - MILL

A	TURBINE UNIT (METALLIC RUNNER TYPE)		
1.	M.S. Shaft 48 m.m. dia	1.8	Meter
2.	Pulley 300 m.m., 38m.m. bore	1	No.
3.	Pulley 600 m.m., 38 m.m. bore	1	No.
4.	M.S. Black sheet 12 gauge	1.2m x 1.2m	
5.	M.S. pipe 100 m.m. dia, 10 gauge thick	0.3	meter
6.	Red oxide paint	1/2	lit.
7.	Welding Rod 10 No. (3.15mm thick)	1	Packet
8.	M.S. Flate 25 m.m. x 6 m.m.	3	meter
9.	M.S. Flate 50 m.m. x 8 m.m.	0.5	meter
10.	M.S. Round bar 12 m.m.	1	meter
11.	Pin 20 m.m. dia, 50mm long	1	No.
12.	Double row bearing 40 m.m. bore	2	Nos.
13.	Bush Heavy duty for bearing house	2	Nos.
14.	Block C.I. for bearing	2	Nos.
15.	Nails different sizes	500	gms.
16.	Nuts bolts 75mm long 12mm dia. full threded	8	Nos
17.	Nut bolts with double washer 150 m.m. long, 12m.m. dia.	10	Nos.
18.	Nut bolts with double wahser 200m.m. long, 12m.m. dia.	4	Nos.
19.	Nut bolts 75 m.m. long, 8 m.m. dia.	4	Nos.

20.	**Saal Wood**		
i)	100 m.m. x 100 m.m. x 1.8m	2	Nos.
ii)	100m.m. x 100 m.m. x 1.05.	2	Nos.
iii)	100 m.m.x 100 m.m.x 1.5m.	1	No.
B.	**HULLING UNIT**		
1.	Baby Rice Huller with accessories	1	No.
2.	Bricks Ist class for foundation	150	Nos.
3.	Foundation bolts 300mm long x 12mm dia.	4	Nos.
4.	Cement (50 kg. bags)	1	Bag
5.	Sand (Medium)	4	Bags
6.	Belt 50 m.m.	7.5	meter
7.	Belt lock	2	Nos.
C.	**GRINDING UNIT**		
1.	M.S. shaft 38m.m. dia	0.75	meter
2.	Pin 20 m.m. dia, 50 m.m. long	1	No.
3.	Pulley 250 m.m. 38 m.m. bore	1	No.
4.	M.S. Flate 50mm x 8 m.m.	0.3	meter
5.	M.S. Pipe. 75 m.m., 10 gauge.	0.1	meter
6.	Grindng stone	1	No.
	i) 600mm x 200 mm	1	No.
	ii) 600 mm x 225m.m.	1	No.
7.	G.I. Sheet for Hopper.	1	No.
	(1 metre x 2 meter)		
8.	Belt 50 m.m.	7	meter
9.	Belt lock	2	Nos.
10.	Seal wood 100 m.m. x 100 m.m. x 1.5 m.	2	Nos.
11.	M.S. Round Bas. 12 m.m. dia	0.6	meter
12.	Brick Ist class for foundation	150	Nos.
13.	Cement (50 kg bags)	1	Bag
14.	Sand (Medium)	4	Bags
15.	Wooden Bearing 75 mm x 100 mm x 40 mm bore	1	No.

WICK IRRIGATION FOR POTTED PLANTS

POT culture, though popular, demands a lot of care and attention. Water is required in abundance since most of it is lost by evaporation and through drainage holes. This aggravates in summer forcing people to give up gardening.

overcome by a new method-wick irrigation. This system is based on the capiliary movement of water through micropores in a wick dipped in a basin of irrigation water below the pot.

Plastic pots (ordinary plastic buckets) about

Wick irrigation system

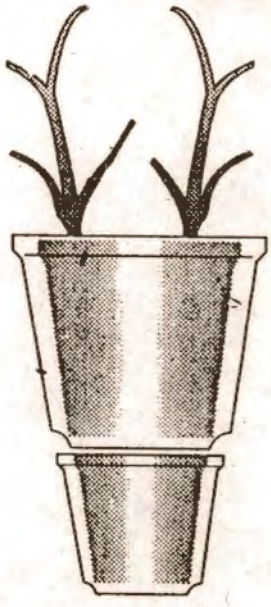


Fig.1

Fig.2

Trials were conducted at the Kelappaji College of Agricultural Engineering and Technology Tavanur under the Kerala Agricultural University to find a remedy to these problems. It was inferred that the drawbacks in potted plansts could be

20cm high were used to grow the plants with 15cm tall basins holding the irrigation water. A coirope of one cm diameter was cut into 20 cm long pieces to prepare the wicks which come out through the holes at the base of the upper pots. They were dipped in

the lower basins containing water. Two wicks per pot could provide the required water supply for normal growth of the plants. The system was fabricated as illustrated in figures 1 and 2.

The growth of the plants and the water consumed in these pots was compared to potted plants grown in similar conditions but with conventional irrigation-direct application on the soil surface in the pots. There was no marked difference in growth and yields, but results on water consumption were alarming.

While plants grown with ordinary irrigation used on an average a litre of water per pot daily those grown with the wick system just needed 1/8th of this. Moreover, the frequency of irrigation reduced to once in three weeks. The system thus, not only conserved considerable irrigation water but also reduced the time spent in gardening.

For further information contact :

P. Rajndran and C. P. Muhammed
K C A E T
Tavanur
Kerala

*****

SPOT LIGHT

March '90 / 43

News and Views

INSTANT HOUSES FOR DISASTER RELIEF

Scientists at Roorkee are offering an instant relief and rehabilitation measure to poor people whose unstable houses are invariably the first casuality in natural disasters.

The technology for instant houses, developed at the Central Building Research Institute, Roorkee, may prove to be a boon to people whose traditionally-built houses that make use of locally available, weak and perishable materials and unscientific construction techniques are damaged in earthquakes, fires, floods, tsunamis, Cyclones and storms.

CBRI has developed two alternative systems based on the same principle. One system uses portable rectangular and triangular frames that provide a complete support structure. The second system is based on four triangular frames that are joined together to form one component. This can be folded to give a triangular bundle.

Four such components having 16 triangles provide an octagonal room of size 4.41x4.41 square metres. Different sizes of rooms, varying from 2x2 square metres to 3.16x3.16 square metres can be made using two and three components respectively. The cladding may be of any suitable material like cloth, sheets and insulated covering depending on the climatic conditions and resources.

The sizes of the components are determined according to limitations of transport facilities and the required number of components can be stored at the district or local administration centres for transportation to the disaster sites.

Prototypes have been built at the Institute using only the triagular components. Which can be assembled in 15-20 minutes. CBRI scientists hope that once the components are commerically manufactured and the jointing techniques perfected. Assembling and dismantling of these houses will take only about 15 minutes.

WOMEN AND NEW AND RENEWABLE SOURCES OF ENERGY TRAINING MODULES

INSTRAW stands for the International Research and Training Institute for the Advancement of Women, a UN Institute based in Santo Domingo, the Dominican Republic. In the field of new and renewable sources of energy (NRSE) and women UN-INSTRAW experience has indicated that there is a lack of adequate training materials and that wherever they exist, women, who are the primary users of energy at the household level, have been systematically excluded.

In response to this need, INSTRAW designed a multimedia prototype training package which serves as basic goal to be integrated into existing training courses. The work plan and outline of the modules have been prepared in cooperation with ILO/Turin Centre with funding from the Government of Italy.
This prototype training package is the joint production of seven years of INSTRAW research in this field,and the scientific, technical and training activities of Energy Programmes in the ILO/Turin Centre.

The package consists of five modular units: Module I: An overview of UN Activities on NRSE, Module II: Position of Women in the Energy Sector, Module III : NRSE Projects and Programmes: Design and implementation, Module IV: Relevant NRSE Systems: Characteristics and Technology, Module V : Education and Training Activities in NRSE Projects.

The training package on "Women and new Renewable Sources of Energy (NRSE)" is aimed at two different target groups : development planners, and managers of energy programmes and senior officials of women's organization and institutions at national, regional and international levels. Training of both women and men,

particularly leaders or those who hold executive position is a part of the process to change attitudes towards women and their full participation in development which involves parallel activities.

The prototype training package is produced in response to :

incorporating women in projects based on the exploitation of NRSE, in all stages from identification to evaluation :

promoting women's participation in the choice and adaptation of technologies appropriate to socio-economic conditions;

involving women in training programmes which involve women in the technical stages of project implementation :

The major aims of the training modules are :

to contribute to a new approach in the organization and management of NRSE systems through the integration of women's needs, as well as their participation in planning, technical operations and maintenance, assessment and implementation of NRSE programmes and projects;

to increase the awareness and capacity of planners, officials and experts in charge of the management of energy programmes and women's organizations and institutions, of the need to involve women in energy planning and the development and implementation of projects.

The five modules encompass 600 pages including curriculum plan, lesson plan, pedagogical scheme, time-table, full text of lecture. Each modular unit is supplemented with audiovisual aids, such as transparencies and 2 sound-slide packages, additional reading materials, key issued checklist for group work, evaluation form for participants (trainees), and a trainer's guide. An annotated bibliography is provided for further reference on "Women and NRSE".

The substantive information that could be included in this package is limited to selected elements of women and NRSE. Its aim is not to examine all energy sources, or each detail on the involvement of women in energy programmes and NRSE projects. An effort has been made to keep this package to the essentials making it brief and simple, while providing a general overview. The present package is meant to be merely the starting point for training different target groups to create awareness on "Women and NRSE", and could be adapted to specific national and community needs.

For more information on the training package on "Women and NRSE" please contact: INSTRAW, Desk Officer for NRSE, P.O. Box 21747, Santo Domingo, Dominican Republic.

INTERCROPPING SUGAR CANE WITH MAIZE

Noel Govinden, a Mauritian supported by IDRC to pursue a doctorate in biology at the University of Ottawa in Canada, designed an experiment in Mauritius to measure the yields of sugar cane and maize when they are intercropped.

Sugar cane is Mauritius dominant crop, accounting for 90 percent of the country's farm production and having guaranteed sales at stable prices through an agreement with the United Kingdom. Maize is an important animal feed which is far underproduced: in 1983 Mauritian farmers produced 1500 tonnes of maize while the country's needs stretched to over 14,000 tonnes.

Dr. Govinden first discovered, during 15 field experiments in three climatic zones, that intercropped maize and sugar cane compete for light necessary for healthy growth. Still, planted at the right times and with carefully calculated spacing, they could be grown together because of sugar cane's resilient up ability. When first planted, maize compets for light with the sugar cane. But maize soon overtakes the cane in growth and wins in the competition for sunlight. As soon as it reaches this height however it is harvested, and the sugar cane is left alone in the field to catch up in growth lost because of low

sunlight.

Ordinarily, the Mauritian farmer plants one sugar cane crop per year. But Dr. Govinden found that by intercroping with maize at two-thirds of its normal density, the farmer can not only produce an additional crop, but sugar production remains very near its normal level.

Dr. Govinden is now doing research on how to make intercropping of sugar cane with potato, bean and groundnut, more productive. Mauritius is now self-sufficient in potato, 75 percent of which is intercropped with sugar cane, and in groundnut, 60 percent of which is intercropped with cane. Only 10 of the 21 major sugar cane growers intercrop with maize. Still, this has pushed the country's maize production to 8,000 tonnes, fulfilling 40 percent of its maize needs.

FORCED TO FLEE

Environmental refugees are the largest class of refugees in the world today. But most governments don't recognize environmental decline as a legitimate cause for refugee movements.

In the recent Worldwatch Paper Environmental Refugees : A yard stick of Habitability, Jodi L. Jacobson writes that "throughout the world, vast areas are becoming unfit for human habitation," She estimates there are 10 million environmental refugees in the wold today.

Land degradation is the single most important reason for the existance of environmental refugees. A survey by the United Nations Environment Programme (UNEP) estimated 35 percent of the earth's land surface is in various stages of desertification. These areas are home to more than 850 million people.

Although agriculture is the backbone of many developing economies, population and financial pressures have forced many farmers in the Third World to use short-cut methods that lead to long-term land degradation. Eroded unproductive soils have spawned mass migrations in Africa.

Natural disasters such as floods, avalanches, and earthquakes are also responsible for a large number of refugees. But there is an increasing number of "unnatural disasters"- caused by human-induced changes in the environment such as deforestation and soil erosion. These can turn normal events such as flooding into catastrophes, as recently happend in Bangladesh.

More and more companies in the industralized countries are paying to dump chemical waste in developing countries. But it is the citizens of those developing countries who pay the highest price. Many are forced to leave their homes, which have been contaminated, and others face the danger of toxic poisoning and chemical illness.

Some researchers predict a massive increase in the number of environmental refugees. The expected rise of worldwide sea levels caused by global warming threatens the homes of millions, who will have to move farther inland and compete with others for scarce food, water and land.

For a copy of this Worldwatch Paper, write to :

Worldwatch Institute
1776Massachusetts Avenue, N.W. Washington, D.C. 20036
USA.

SPEECH SYNTHESIS SYSTEM FOR SPEECH IMPAIRED

People with impaired speech might soon be able to voice their thoughts through a microcomputer controlled speech synthesis system developed by an undergraduate student at the Birla Institute of Technology and Science (BITS) in Pilani.

The portable speech synthesizer developed by

M. Viswanathan, a student of electrical engineering at BITS works around an INTEL 80C31 microprocessor chip and can convert typed text in to speech sounds.

To devlop speech data, several words in a language are first spoken out through a personal computer, digitized, and the specific phonemes, required for the recognition of words, are stored onto an EPROM which becomes part of the system.

When a user types in text, the 80C31 chip scans the memory and recalls the corresponding phonemes which are fed into a digital to analog converter (DAC). The DAC output goes to an amplifier which through filters and speakers converts voltage waveforms into sound.

Viswanathan claims the small size and compactness of the unit make it unique. The specially designed phonetic keyboard is much smaller than normal keyboards. A user could type in text using just one hand and keep the other hand free. However, one limitation of the phonetic keyboard is that users will have to key in phonemes instead of words. This could take some time to get used to. Viswanathan said.

But the phonetic keyboard is specially advantageous for Indian Languages such as Hindi in which words are almost always pronounced the way they are written down. So the user need not think about converting the world to its phoneme equivalent, he said. An average speller in Hindi will be able to use the phonetic keyboard with much greater ease than a person using the English language version.

The voices of several people, both male and female have been used for digitization and an EPROM programmed from each. A user could install and use a copy of the voice which pleases him or her the most. The unit is powered by four rechargeable batteries which provide 4.8 volts. It can be periodically recharged by connecting a recharger to the socket provided.

LOW-COST TRAY DRYER FOR FOOD PROCESSING INDUSTRIES

A low cost tray dryer using agricultural waste as fuel, which can be utilised in small-scale food processing industries for drying products at controlled temperature has been fabricated at the Central Institute of Agricultural Engineering (CIAE), Bhopal. The tray dryer basically consists of a drying chamber and plenum chamber which is covered with an asbestos sheet on the sides and wire mesh at the top, according to a report by CIAE scientists RT Patil and BD Shukla in the journal "Invention Intelligence". A burning-cum-heat exchanging unit is housed in the centre of the plenum chamber.

The burning chamber is a galvanised iron sheet cylinder fitted with six pins for transfer. One end of the cylinder is open to take in the fuel which is burnt in the centre. While the other end is connected to a chimney having a butterfly valve for manual control of the temperature of the drying air.

The drying chamber is provided with an exhaust vent with an adjustable opening at the top.

The fuel, mostly agricultural waste and wood chips, is burnt in a welded wire mesh tray in the centre of the burning chamber. The high temperature of the flue gases heats the drums and the fins, and the heat is transferred to the surrounding air by radiation and convection.

The hot air comes in contact with the wet material as it moves upward. The moisture laden air then escapes from the exhaust vent. The process creates a cycle of natural convection of air through the drying trays. The material is stirred frequently and the position of the trays interchanged to achieve

uniform drying.

The dryer can take a load of 100kg of wet material per batch. The dryer is estimated to cost Rs 5700, with the cost of drying working out to be a mere 25 paise per kilogram which compares well with sun drying. It also offers the additional advantages of improved material quality and drastic reduction in processing time. Besides, there is no need to expose the material to the open air for secondary drying which is required in the case of sun drying.

HITTING THE ENEMY FROM ALL SIDES

Integrated Pest Management (IPM) is fast becoming a popular alternative to the widespread and often indiscriminate use of chemical pesticides in agriculture.

IPM controls pests using a combination of technique - biological cotrol (using the natural enemies of a pest as weapons against it), special cropping patterns, and the planting of pest-resistant varieties. Chemical pesticides also have a role in IPM, but they are used miniimally.

The hit-from all sides approach of IPM has proven effective in lowering the risks to human health and the environment that pesticides pose. It has also led to higher yields and profits for farmers.

"A beautiful ecological balance between prey and predators in rice ecosystems has evolved over centuries,"."Pesticide misuse upset that balance in many areas. But researches hope to restore it through integrated pest management".

In Asia, four countries have adopted IPM as official policy on crop protection: the Philippines, Indonesia, India, and Malaysia. "Wide scale IPM adoption should reduce pesticide use on rice by 50 percent".

C D R T NEWS

Prof. H. C. Srivastava, Dean R&D and Head Centre for Development of Rural Technology, I.E.R.T., Allahabad was conferred with the Uttar Pradesh Government National Award by the Indian Society for Technical Education for outstanding contribution in application of Science & Technology for Welfare of the masses. This is in recognition of his over decade's work with unremitting committment and brings honour and inspiraton to fellow workers and to the Institution. We wish him continued success in his endeavours in times to come.

Council of Science & Technology, U.P., has sanctioned a project for Rural Technology Survey in 100 villages (spread in nine districts) of the State, to C.D.R.T., I.E.R.T., Allahabad. The main objectives of this project are :

To collect informations regarding the current status of technologies and techniques of production in villages.

To identify technologies which need modification and minor improvements for higher productivity etc.

To identify areas in which further research and development work is needed.

To identify major local resources, material & human both, for further development/technology transfer.

This project will be implemented by CDRT, in collaboration with several voluntary organisations/government departments/institutions of the state.

two day workshop on Rural Technology Survey Project was conducted by the CDRT

in Institute of Engineering & Rural Technology on 26th & 27th March'90. Twenty seven participants belonging to voluntary organisation and government/semi-government departments/institutions atended the workshop.

The basic objectives of this workshop were stategy formulation, finalisation of draft questioniare providing science and technological know how to the participants and training of data collection techniques etc. In addition, some lecture sessions were also arranged to discuss about Medicinal Plants and Herbs.

Information Services Division of CDRT, IERT, Allahabad is going to constitute a National Expert Panel for there Technical Enquiry Service under the I.D.R.C. Canada sponsored Rural Technology Information Service Project. The Technical Enquiry Services is expected to be initiated from the second week of June'90. T.E. Service in specially designed for the CDRTs, Community Polytechnics and Voluntary organisations, Government/Semi-Government agencies or the country. All interested CDCs are requested to contact:

Incharge, Informaton Service Division

C.D.R.T., I.E.R.T.

26, Chatham Lines,

Allahabad.

CDRT, has organised too In-House Awarenss Generation Seminars on public sector undertaking : Bharat Pumps & Compressors Ltd., on 9th and 12th February'90. Looking to the success of this programme the B.P.C.L. has requested CDRT to further organise four seminars.

Rural Technology Library and Information Centre at CDRT, IERT will be computerised in the near future to enable us to disseminate rural technology informations in a systematic manner and in a short span of time.

UNCOMMON ACTION

"Mother Earth is now suffering from AIDS-her immune system is being devastated by poisons in our waters and air, by the savage destruction of the tropical forests, by damage to the ozone layer.... If we want a common future, or any future at all, we have to begin uncommon action now.

Anwar Fazal, Director

Forthcoming Events

A CLEAN ENERGY FUTURE

The Folkcentre for Renewable Energy, Denmark will organize twelve weeks training programme on Energy, Environment and Sustainable Development from 2nd April to 24th June '90 at Denmark. The trainig programme is for planners, decision- makers and engineers from 3rd world countries who are offered an opportunity to share the experiences of the Folkcenter and of its international contacts in the field of environment and energy.

The programme will provide the participants with the basic knowledge of Wind, Solar, Hydro and Biomass energy, Energy efficiency and conservation in agriculture, industry and households and Energy planning and policies will be also covered as course contents.

For further information contact :

Folkcenter for Renewable Energy

P.O. Box 208,
DK-7760 Hurup Thy
DENMARK

MUNICIPAL SOLID WASTE MANAGEMENT

The first U.S. Conference on Municipal Solid Waste Management is planned for June 13-16 in Washington, D.C. It is being sponsored by the U.S. Environmental Protection Agency. Topics to be covered include integrated solid waste planning, sources reduction and reuse, and special wastes.

For further information contact :

US MSWM
C/O GRCDA
P.O. Box 6126,
Silver Spring,
Mary land 20906, U.S.A.

KITCHEN GARDENING, HOME LEVEL PROCESSING OF FOOD AND ALLIED ACTIVITIES

Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP) in collaboration with Bangaladesh Academy for Rural Development (BARD) will organise a "Workshop on Kitchen Gardening". Home level processing of food and Allied Activities For Rural Women" in June at Comilla, Bangladesh.

For further information contact :

Director
CIRDAP
Chameli House
17 Topkhana Road,
GPO box 2883
Dhaka - 1000
BANGLADESH

APPRENTICESHIP IN ECOLOGICAL HORTICULTURE

The Agroecology Programme/U. C. Extension is offering a six month Apprenticeship in Ecological Horticulture, from April' 1st to September 30th 1990 at the farm and Garden, Santa Cruz.

The emphasis will be on hands-on learning, with instruction in horticultural methods (sowing, cultivation, composting, propogation, irrigation): cultivor requirements (vegetables, herbs, flowers, fruits) and pest and disease identification and control.

For further information contact :

Apprenticeship
Box A
Agroecology Programme
University of California
Santa Cruz, CA 95064
U.S.A.

ELETROMATION 90

National foundation of Indian Engineers (NAFEN) in collaboration with a number of academic societies and organisations, is hosting the 4th International Congress & Exhibition " Electromation 90 " at New Delhi on November 23-24, 1990. The main theme of the congress is "Electronic Automation for New Visions".

Special emphasis will be given on role of electronics and Electronic Automation in :

i) Agriculture, food, food processing, preservation etc.
ii) Health care
iii) Energy conservation
iv) Process Industries like Power, sugar, paper, oil, gas, steel etc.
v) Office Automation
vi) Telecommunication
vii) Space
viii) Ocean development
ix) Computerisation and
x) Artificial intelligence & robotics.

For further information contact :

Congress Convenor
35/2, East Patel Nagar,
NEW DELHI - 110008

EARTH CONSTRUCTION

Development Alternatives in collaboration with CAPART is going to organise a training programme on "Earth construction". The training comprises of two kinds of programmes : 1. BASIC : for mason, builders and supervisors. 2. ADVANCED : for Engineers and architects. The second one will be held on April 3-12, 1990. The course emphasis will be on the technical & economic aspect of earth construction, Indian standard specifications for soil blocks and improved earth construction techniques, principles of design and BALRAAM' operation, Maintenance & Assembly.

For further information contact :

Programme Co-ordinator,
Development Alternatives,
B-32, Institutional Area
New Mehrauli Road,
Hauz Khas,
NEW DELHI - 110016.

DURABILITY OF CONCRETE AND CEMENT PRODUCTS

The Institution of Engineers (India) Nagpur Local Centre, is going to organise a seminar on "Durability of Concrete and Cement Products" on September 22-23, 1990 at Nagpur.

The seminar is aimed at understanding the factors influencing durability methods and actions required to achieve reliability to decide goals in the areas of research, development and training.

The main topics to be cover in seminar are : Cement quality, Variation and standards. Role of aggregates, water and environment and their chemistry. Durability parameters (such as cement content, water cement ratio, strength of concrete, type of cement etc.). Corrosion in reinforced and prestressed concrete. Ouality assurance performance, and standards. Condition monitoring and availability reliability analysis. Preventive and service maintenance.

For further information contact :

Sri P.T.Mase
Convener
The Institution of Engineers(India)
North Ambazari Road
NAGPUR - 440 010.

POLLUTION PREVENTION

United States Environmental protection Agency and International Association for

Clean Technology are jointly organizing an International Conference on "Pollution Prevention: Clean Technologies and Clean products", at Washington DC on June 10-13, 1990.

Topics to be covered are: National and international policy. Research and development and applications: clean products, clean technologies, source reduction, recycle and reuse, product modification and materials substitutions, incentives of pollution prevention. Education and information exchange, Role of National and international organization. Global pollution prevention issues. Reduction of radioactive wastes and radioactive/hazardious mixed wastes. Technology application and case histories.

For further information contact :

Mary Bourassa
SAIC
8400 Westpark Drive
Mclean,
VA 22101, U.S.A.

DON'T MOURN ORGANIZE !

"One of the problems that we have-it's a stumbling-block but keeps our juices flowing-is that the continuning calamities in the world tend to draw our attention and too much of our energies to them, and away from needed systemic changes."

George "Mickey" Leland

RATTAN

Rattan is a 18 minutes, 16mm video film from International Development Research Centre, Canada. Rattan is a vine that clings to the branches in Asian forests. Rattan is primarily used to produce furnitures which are very popular in western markets. Rattan supplements the income of the labourers and supports a varied processing industry that employs thousands South-east Asian craft workers, provides job in export firms.

Due to the popularity of furnitures made of Rattan clear cutting of this vine is preventing the natural regeneration or Rattan which no longer has a suitable environment for growth. Researchers tell that rattan has always been part of their environment. This film outlines methods of using and processing Rattan and describes the research undertaken to protect this useful and valuable resource. This english film shows Ratan from forest to the laboratory then back to the plantation.

This is a useful film for forestry workers, development officers and ecologists. French version of this film is also available.

For purchase or borrowing details write to :

International Development Research Centre
Communication Division
P.O. Box 8500
Ottawa, Ontario
CANADA K1 G3H9.

NEW IMPLEMENTS FOR CROP PRODUCTION IN THE SEMI ARID TROPICS

ICRISAT (International Crop Research Centre for the Semi Arid Tropics) has developed farm machinery that can increase crop yields in the semi arid tropics by making better use of human resource and animal traction. A range of simple bullock drawn implements are available to enable the farmers to form a broad bed and furrow system and to carry out subsequent field operations. The information bulletin no. 27 gives details about such useful equipments. Agribar II, an improved version of the Agribar fitted with a four row planter, can sow various crops and perform village creations. Simple implements based on a T-bar have been developed for making broad beds, fertilizer application sowing and interrow cultivation. This booklet gives information about Crust breaker which enhances seedling emergence through the surface crust, a spinning-disc knapsac sprayer and a ground nut digger.

For a free copy of this bulletin please write to :
Dr. N.K. Awadhwal
Resource Management Programme
ICRISAT
Patancheru 502 324
A.P.

VOICES FROM WOLLASTON LAKE

Voices from Wollaston Lake is a story of resistance against uranium mining and genocide in Northern Saskatchewan. Wollaston lake is not merely a story. Its a harsh reality being faced by mankind every where in the world. In the summer of 1985 the Wollaston Lake small Indian communities hosted an unprecedented protest.

The book consists of four chapters. First chapter "the people" is a short description of community and the people. It also reflects light over the statements of Mayors on colonialism and neo-colonialism come from direct experience as they live in communities close to key Lake, the largest uranium mine of the world. Second chapter discusses mining activity and the waste problem. Some brief comments are given on the mines and their status as well as an explaination of connections between uranium and nuclear weapons. The waste problem is looked in detail. The topics, nature of problem, effects on plants and animals, contamination, possible remedies are discussed.

Third chapter is made up of testimonies by residents and other people about uranium mining. It gives daily chronology, the outcome and a critique which discusses non-violence at blocades as compared to Gandhiji's principles. The last chapter summarizes international solidarity.

The book is nicely mingled with poetic expressions. The people who are strugling hard to check the growing horror of nuclear powers will be pleased to see this publication.

For more information and copy, contact :
Miles Goldstick
Earth Embassy
Box 3183
Vancouver, B.C.
CANADA V6B 3x6.

EPI ESSENTIALS : AGUIDE FOR PROGRAMME OFFICERS

There has been remarkable progress in the global effort to stop the needless waste of lives of infants and children. This publication is one of these effects in the form of a powerful guide to the starting and managing of a childhood immunization programme. The body of this guide, is divided in four parts. The first chapter deals with administration and organisation and describes the attributes of a good Immunisation Programme. Second chapter provides key epidemiologic facts and their effect on strategies and discusses how goals and targets should be based on realistic data. A programme design checklist is provided as a tool to prepare child survival strategy papers, project identification documents and devèlopmennt of immunisation project.

The third chapter explains the essential components viz planning of vaccination strategies, delivery of vaccines, training of health workers and education to families. Fourth chapter clearly shows that immunisation programme evaluation needs to be a continuous process carried out at all programme levels. It also describes evaluation techniques in use at different levels of immunisation programmes. Very useful information about sources and equipments is given under appendix.

The book is well illustrated and it will benefit all those professionals who have concern with Immunisation from the point of view of technical assistance organisation. The REACH project deserves special thanks for this publication.

For a copy of the publication please write to :
Resources for Child Health Project
John Snow, Inc.
1100 Wilson Blvd., 9th Floor
Arlington, Virginia 22209
USA.

SCIENCE LITERATURE AID PROJECT

SLAP is a newly-formed group set up under the auspices of the Third World Science Technology and Development Forum. Science Literature Aid Project aims to collect unwanted technical journals for shipment to libraries in the Third World. In many developing countries universities and research institutes are chronically short of up-to-date literature and this severely hampers their work. Possible sources of journals and research-level text books include:

- individuals who are members of technical of professional bodies and receive their journals;
- University libraries;
- libraries in industrial research centres.

Details of requirements are being established at present. If you have a need for a particular journal or journals please contact SLAP.

If you have journals which you could donate we would also be please to hear from you.

Further information from:
Science Literature Aid Project,
9, Daleview Avenue,
Glasgow,
G12 OHE,
Scotland.

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Aims & Scope :

Rural Technology Journal is published by Information Services Division, Centre for Development of Rural Technology, Institute of Engineering & Rural Technology, Allahabad (India). The purpose of the Journal is to provide a forum for exchange of views, information and create awareness in the field of Rural Technology, its, development and transfer to the rural areas, technological products and processes, methodologies and approaches etc. Effort is being made to ensure that this Journal become relevant not only for this country but to all those nations, groups and individuals, in any part of the Globe who have concern to contribute towards the welfare of the under privileged rural communites. The Journal is divided into following main sections :

1.	Portfolio	—	(Articles/Papers)
2.	Tool Box	—	(Information on Rural Technology/Processes)
3.	Spot Light	—	(News and Views)
4.	Futurama	—	(Forthcoming Events : Training Programmes, Seminars, Symposium, Workshop etc.)
5.	Book Bag	—	(News on Books and Publications).

Note for the guidance of authors :

Papers/articles information packages, technical queries and related materials are cordially solicited. Manuscripts should be sent to :

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There is no limit to the length of contribution but it is suggested that a maximum of 6000 words or equivalent be used as a guide (approximately 6 to 7 pages).

1. The complete manuscript should be written in English and the desired order contents of Title, Abstract, List of symbols, Main Text, Acknowledgement, Reference and Appendices. The Standard Inter-national System of Units (SI) should be used.
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