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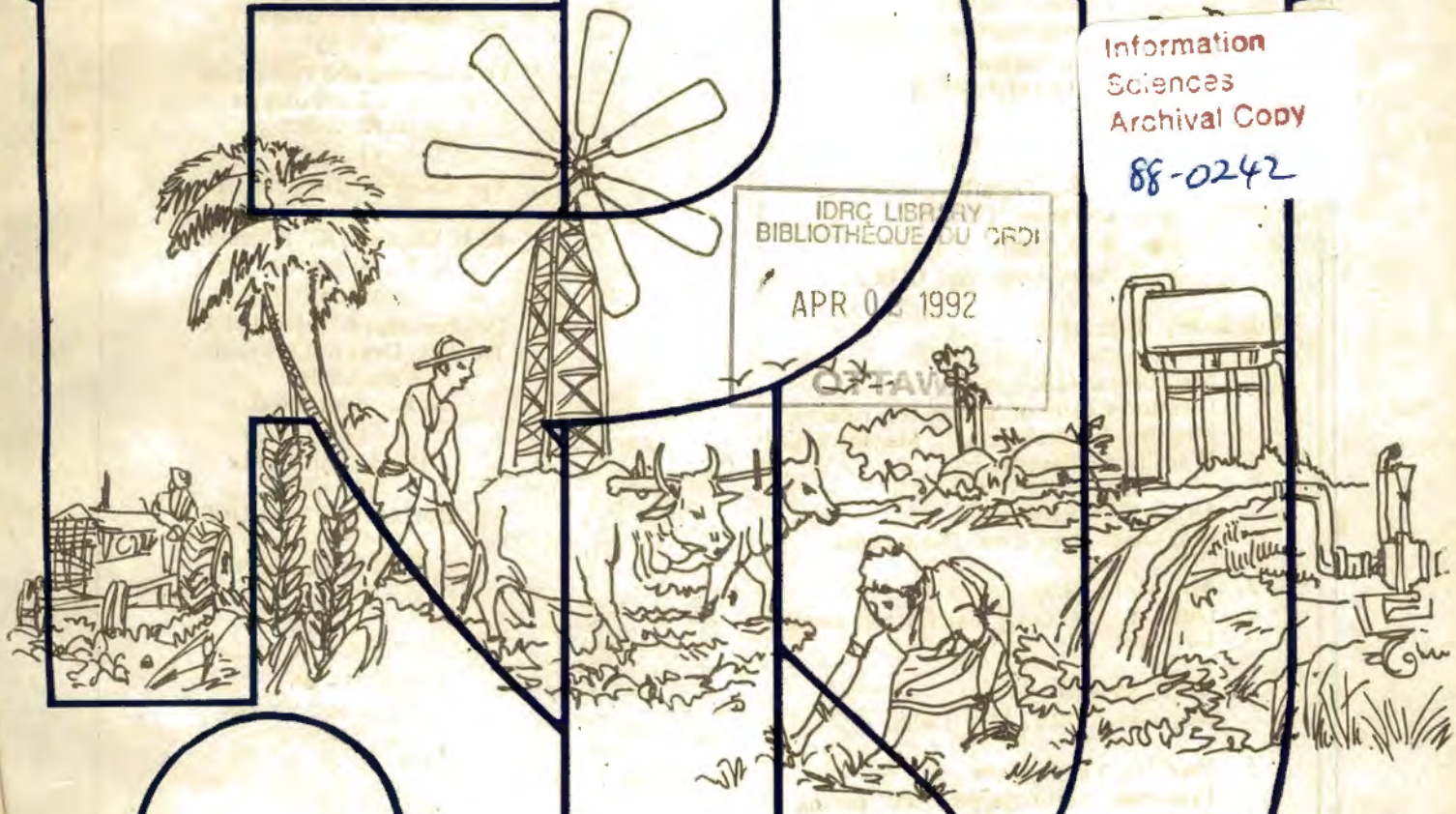

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Editorial

Much has been said and discussed regarding defects in the planning process and policy support for socio-economic development of the country. But invariably even those measures, which are supposed to be well designed, do not focus on the role of employment generating and labour intensive traditional technologies for production of mass-consumption goods. The areas of textile, leather and agro-processing are outstanding examples where proven tiny/rural industrial units can generate massive employment opportunities and at the same time save greatly on scarce capital. A local resource-skill-technology based development plan worked out at Block level, with Nyaya Panchayats as the basic settlement units, drawn and implemented as a micro-model, can, in a very reasonably time span, make a dent in the rural poverty and unemployment. The success of such a model can ensure replicability, with necessary local variations, and halt the process of flight of human, material and capital resources from rural to urban areas. The development of social amenities and other peripheral services would automatically take place once adequate economic surplus is generated in the villages. It will be even more prudent if such a micro-model also provides two basic infrastructural inputs viz. a minimum of road development plan to facilitate movement of men and material, within the area of service, and a rural marketing centre as a trading joint amidst a village cluster or a Nyaya Panchayat. The success of 'Focal Points' set up long back in the rural areas of the state of Punjab strengthen the above proposition of a minimum basic infrastructure.

Such a micromodel would also result into shifting large percentage of population from unremunerative engagement in agriculture to tiny/rural industries agro-based, forest-based or based on other predominant resources and skills. It would thus regenerate village economy. On an experimental basic voluntary organisations, with proven track record, active educational institutions, and Nyaya Panchayats should be involved in the development planning, implementation of the development plan and its regular monitoring. The country would not loose much, compared to the astronomical resources being lost in graft, mismanagement waste and environmental damages, even if such a model does not yield the expected results.

In order to introduce such a concept the first step should be that planning process and the implementation machinery, from top to bottom, should be compulsorily asked to identify innovative development models, catalyse their formulation from below, and support them intensively. The need to-day is that for innovation, together of course with the decentralization of authority. Let us watch whether the new government lives up to such aspirations of the masses or succumbs to elitist pressures and writes it's own epitaph.

Publication List 1990

1. Rural technology : Report of National Seminar, 1981, 20 papers on Rural/Appropriate Technology.
   English pp 288 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/-

3. Selection of Windmill and Agricultural Pumpsets : Course manual of Training Programme for Senior Officers of NABARD, 1984, 3 papers on Water Pumping Windmills, Special features : Paper on agronomic aspects of Windmill Irrigation.
   English pp 39 Rs. 30/-

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.
   English pp 165 Rs. 150/-

5. Paper and proceedings of National Workshop on Energy from Agricultural Residues, 1986 : Background paper, recommendations, keynote and valedictory address and 28 papers on the topic.
   English pp 208 Rs. 200/-

6. Paper and proceeding of National Workshop on Decentralised Energy Planning for Rural Development : recommendations, keynote and valedictory address and 12 papers on the topic.
   English pp 200 Rs. 200/-

7. Course synopsis of ISTE : Manual of Training Programme for Junior Engineers of Rajya Krishi Utpadan Mandi Parishad, U.P. 1987, 17 papers on biogas, Agricultural Implements. Wind mill, Agriculture marketing, Water lifting devices etc.
   English pp 235 Rs. 225/-

8. Course synopsis of ISTE : Manual of Training Programme on Renewable Sources of Energy for Project Officers of Non-Conventional Energy Development Agency, Government of Uttar Pradesh, 1987. 13 papers on Biogas, Biomass, Solar energy, Cookstove, Human and Draught Animal Power, Aero Generator etc.
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9. A case study on Smokeless Cookstove
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10. Report of Sample Survey and Evaluation of the Smokeless Chulha Extension Programme of the Non-Conventional Energy Development Agency U. P., in the District of Varanasi, Faizabad, Nainital and Bijnaur.
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Agri Portfolio

Article/Paper

GREEN HOUSE CULTIVATION : AN INDUSTRIAL APPROACH TO FOOD PRODUCTION

Pitam Chandra

Central Institute of Agricultural Engineering, Bhopal.

This paper narrates concept of green house in augmenting and diversifying horticultural practices. As a brief case study of outlines the success achieved in the Green House Project of the Central Institute of Agricultural Engg., Bhopal.

INTRODUCTION :

Like human beings, crops too require favourable environments for their maximum productivities. The crop environment consists of (i) light, (ii) temperature, (iii) air composition and (iv) nature of the roof medium. In addition, the environment should be free from insects, pests and pathogens. It is not possible to control the crop environment in open field cultivation. Therefore, unpredictable weather conditions cause a lot of variation in crop productivities. Crop environments can, however, be controlled to the desired levels in greenhouses with the result that greenhouse crop yields are higher (five to fifteen times) and assured as compared to open field cultivation.

WHAT IS A GREENHOUSE

A commercial greenhouse is usually a 2—5 m high plastic or glass enclosure covering 200—500 m^2 of floor area. Depending upon the climate of the specific location and the crops to be grown environmental control equipments are fitted in the greenhouse.

STATUS :

Greenhouse cultivation technology is more than two centuries old and it is being commercially practiced in more than fifty countries, China reportedly has more than 100,000 ha under plastic structures to grow fruits, vegetables and ornamental plants. Holland exports greenhouse produce to neighbouring countries. Abu Dhabi and Kuwait use greenhouses to grow food under desert conditions.

ATTRIBUTES :

Although greenhouse cultivation is capital, labour and energy intensive, it can be profitable under a variety of conditions. For example,

1. to grow food round the year in those cold and hot climatic conditions where open field cultivation is not practicable.
2. to grow food in wastelands and other problematic soils. Small greenhouses could be constructed even on roof tops to maintain household plants and to raise vegetables.
3. to grow off-season vegetables, flowers and fruits near big cities.
4. to grow exotic/medicinal plants and
5. to grow horticultural crops for export.

Besides, greenhouse cultivation has the following additional attributes.

1. More employment for skilled and educated agricultural workers per unit of cultivated land : greenhouse cultivation requires about ten persons per hectare.

2. Increased income from marginal land holdings: a greenhouse grower would earn about Rs. 15,000 net income from just 0.1 ha under greenhouse.
3. High utilisation efficiency of agricultural inputs.
4. Profitable cultivation in water deficit areas as water requirement of greenhouse crops is about one—third less as compared to that for open field cultivation.
5. No soil erosion.
6. Reduced drudgery for greenhouse workers
7. Factory—like approach to food production.

When an off-season crop (fruiting in December) of ladiesfinger was taken in the experimental greenhouse at CIAE, Bhopal, the yield of the greenhouse crop was 24 t/ha as compared to 4 t/ha for the open field crop grown simultaneously. Even higher yields are possible with better environmental control and management.

A LOW COST GREENHOUSE :

A pipe (G. I.) framed plastic greenhouse (Fig. 1) has been designed for moderate climatic conditions. The greenhouse needs to be covered with a layer of ultra-voilet resistant polyethylene film. The film needs replacement after one to two years depending upon local climate. The greenhouse design is such that except for the pile foundations to anchor the greenhouse frame, the entire frame could be prefabricated and made available as a kit. The whole structure could be assembled by two persons on site in one day.

AVAILABILITY :

At present, there is no commercial agency providing greenhouse kits for prospective growers. Interested individuals/parties may, however, write to Director, Central Institute of Agricultural Engineering, G. T. B. Complex, T. T. Nagar, Bhopal 462003 for full guidance in adopting this novel cultivation technology.

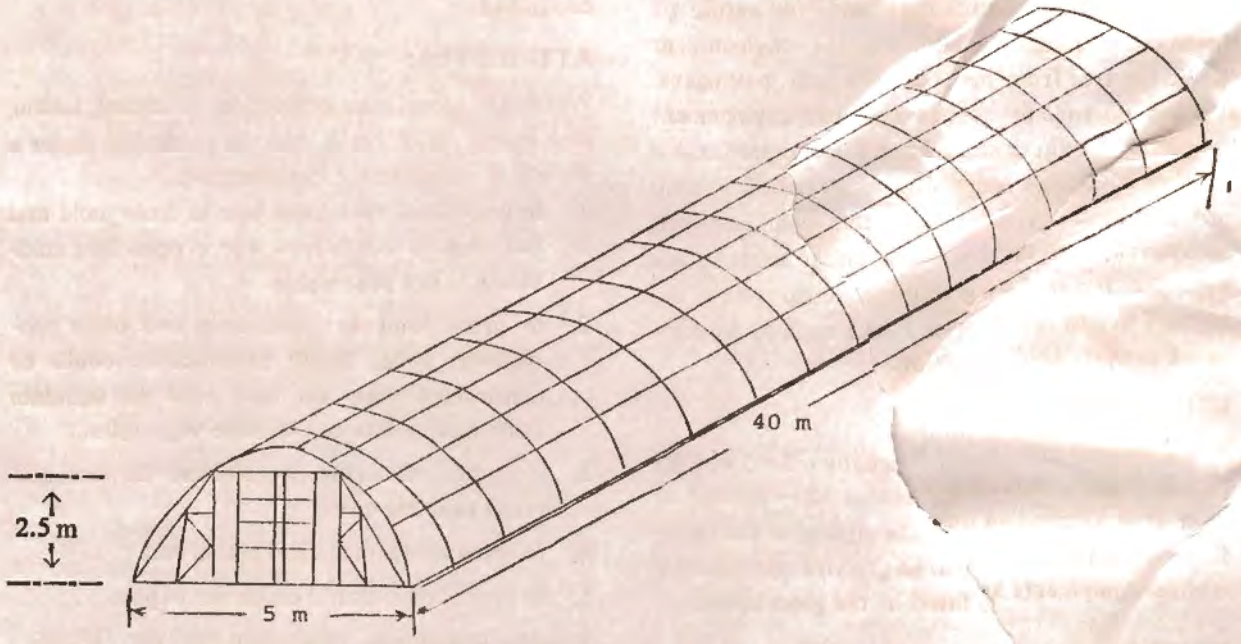

Fig. 1 Schematic Diagram of Pipe Framed Greenhouse

SCOPE OF DISSEMINATION & TRANSFER OF THE GROUNDNUT DECORTICATOR : AN EFFECTIVE APPROACH

Mohan Lal Gupta

Research Officer, Council for Advancement of People's Action and Rural Technology (CAPART), New Delhi.

The article gives a narrative of groundnut potential in different states of the country and describes the development of a groundnut decorticator at CIAE Bhopal. It explains in simple terms the working of such a device, the prospects of its use by rural women folk and the resultant gains to them by the way of drudgery-reduction, enhanced of earnings and related socio-economic benefits.

INTRODUCTION :

Over 70 percent of Indian population reside in the villages engaged mainly in farming and related jobs. About 47 percent of the workforce engaged in agriculture are women. Women are involved in most of the farming and related activities besides their exclusive involvement in domestic chores. The women do the extremely tedious, time and labour intensive works like sowing, transplanting, weeding and interculture, harvesting, threshing, transport and post-harvest operations like shelling, cleaning, grading, processing and storing etc. These all jobs involve considerable amount of drudgery because it is mostly done manually. Amongst all, today, the post harvest technology component has earned convincing importance and has thus, carved its own firm position in the total agricultural production scene both, at State and Central level of the country.

A number of improved equipment are available for post harvesting such as maize shelling, groundnut decortication, cleaning, grading, drying,, milling and storage of food grains of various kinds of crops, Amongst others, a relevant technique suitable for women is the groundnut decorticator. This presentation highlights the scope and potential of the equipment in most of the parts of the country, which may be adopted by the rural women as an income generating activity.

THRUST :

Separation of kernels from the groundnut pods for home as well as seed purposes is done by using hand and mouth. This operation is very slow and deficient and thus costly. Special care has to be taken in separating the kernels for seed from the pods. In order to reduce the drudgery from separating seeds, there is a great need for educating the rural women to adopt and use of improved device like 'Groundnut decorticator'.

SCOPE :

In most parts of India, groundnut in both the crops are cultivated. Table 1 shows the statewise area in hectares under cultivation of groundnut.

Table 1 : State-wise area under cultivation of Groundnut in India. (1986-87)

State	(Area in '000 hectares) Kharif	Rabi/ summer	Total
1. Gujarat	1,966	150	2,116
2. Andhra Pradesh	1,177	270	1,447
3. Tamil Nadu	697	257	954
4. Karnataka	742	95	837
5. Maharashtra	663	118	781
6. Madhya Pradesh	320	...	320
7. Uttar Pradesh	249	...	249
8. Rajasthan	207	...	207
9. Orissa	116	103	219
10. Punjab	80	...	80
11. Others	31	1	32
Totals	6,248	994	7,242

It can be judged from the above table that Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra among other states produces large amount of groundnut. Thus, the decorticator could be highly useful in seperating the kernels from the pods in these states.

TECHNOLOGICAL INTERVENTION :

Central Institute of Agricultural Engineering (CIAE), Bhopal developed a decorticator and proved that the device would be a boon for the rural women engaged in seperating the kernels. The decorticator (Fig. 1) consists of a steel frame which is filled with perforated screen. The peg type shoes are attached to the lower end of the operating handle. The groundnut pods are placed in the hopper and the handle is given the reciprocating motion. The groundnut pods get decorticated by rubbing action between the shoes and the screen. The kernels and husk pass through the screen and fall by gravity on ground surface. The device consists of concave and oscillating sectors. Three holders are provided to operate the oscillating sectors with the help of person. Feeding of pods in the hopper has to be done in batches of 1 kg each manually. The decorticator cost is between Rs. 250-300/. The machine has a capacity to decorticate 40-50 kg/hour. The decortication efficiency is about 97 to 98% and thus breakage percentage is 2 to 3%.

EFFORTS MADE FOR DISSEMINATION :

Accepting the real utility of the groundnut decorticator, Agro-corporations came forward to replicate the design and also for marketing, with having a nominal profit. Agro-corporations also tried to design it in number of fashions such as the size, the shape, double shift—arrangement of operation, keeping the principle of the device same. NAFED is actively involved in fabricating and marketing these. They have the manufacturing workshops at Alwar, Rewari and Jaipur districts of Rajasthan and also at New Delhi.

The ultimate approach for large scale adoption of such devices may be through voluntary sectors whose roots are of more strength and deepen, comparison to the block/district machinery. The voluntary sector may consider this device as a boon for rural women, who could work efficiently in less time with more income and devote 'her saved' time in some other developmental activities either for her children or for the community.

EXPECTED BENEFITS :

Alongwith the adoption of other appropriate devices, related to energy, reducing drudgery etc. one could expect the following benefits besides others.

(a) Women become economically emancipated as they take part in economic ventures.

(b) The image of the women gets raised and they become visible and evince leadership and participation.

(c) The productivity of the women is enhanced as a result of relief from household drudgeries.

(d) Women's work output is improved through better health, nutrition and environmental sanitation.

(e) Women contribute effectively to decision making at household level and also become partners in the development process.

CONCLUSIONS AND RECOMMENDATIONS :

Being a high level of potential in providing an income generating device, one could perhaps work for his better future, at least try to increase some income.

Such a properly designed equipment needs support for its population through extension programmes. It involves the cost factor, its marketing and infrastructure for its production.

Besides this, research institutions should pay more attention to the needs of the women workers considering the scope and marketing aspects depending upon the wide-range of applicability of the device to be developed. Of course, it should be kept in view to reduce the drudgery to women, who ultimately be the beneficiary.

REFERENCES :

1. NAFED Leaflet.
2. Correspondence with Director, National Research Centre for Groundnut (NRCG), Junagarh, Gujarat.

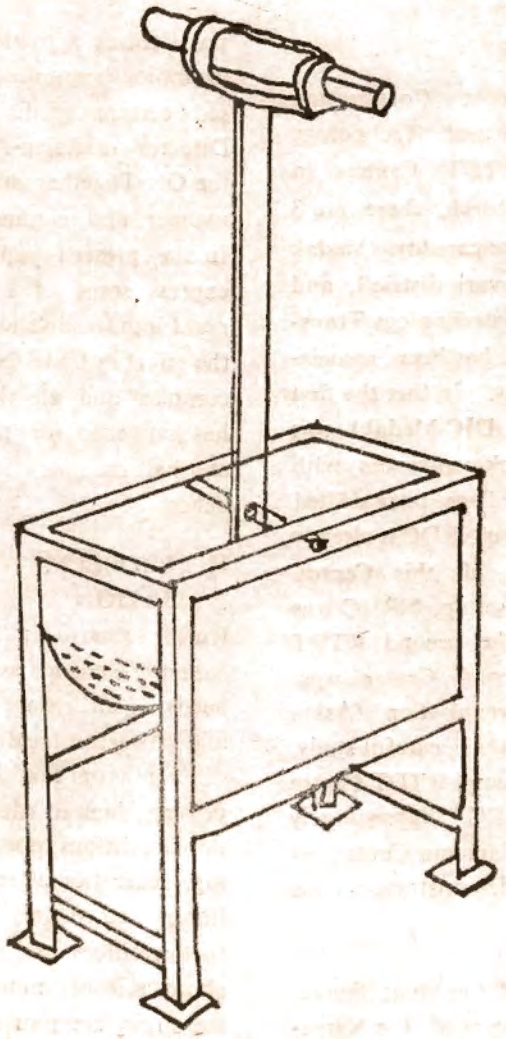

Fig. 1 : Ground Nut Decorticator.

DEVELOPMENT AND PROMOTION OF RURAL TECHNOLOGIES

Prof. B. R. Sant

Head, CSIR-Polytechnology Transfer Centre, Hyderabad

Development and promotion of rural technologies on a massive scale is needed more urgently than ever before. Apparently, the problem today is not that generation of technologies but of their transfer, acceptance and diffusion. This paper focuses the issues on income generating activities, technology transfer, its utilisation through rural industries.

I. NRDC's RIDT CENTRES :

National Research Development Corporation (NRDC) has set up several Rural Technology Demonstration-cum-Training (RTDT) Centres in different states. In Andhra Pradesh, there are 3 RTDT centres one each in Sangareddy (Medak district), Narsapur (West Godavari district), and Tirupati (Chittoor district). Polytechnology Transfer Centre (PTC), Hyderabad has been associated with the first 2 RTDT Centres. In fact the first centre at Sangareddy (under DIC-Medak) was established under very difficult ciscumstances with the original location in Isnapur village later shifted to DIC-Sangareddy premises. The NRDC is already aware about the functioning of this Centre. Because one Centre was already set up, NRDC was initially reluctant to permit the second RTDT Centre in the State. The second Centre was proposed by a voluntary organisation (Asian Acadamy) and PTC (Hyd) after a careful study, strongly felt the utility of this second RTDT Centre and recommended it to NRDC. Subsequently NRDC agreed and offered the Narsapur Centre but with less number of technology demonstration units than for the first Centre.

PTC (Hyd) has visited the RTDT Centre at Sangareddy a few times. We are aware of the Narsapur Centres activities; they have propogated rural technologies amongst the locals and have popularised certain spcific technologies. The Executive Director of Asian-Academy who is now attending the Get-Together can describe his Centre in a better manner and comment on his future requirements. In the present paper, the author would like to express some of his thoughts on bringing about rural industrialisation in the country with focus on the effort by CSIR/NRDC. The task is gigantic and complex and all the more challenging with what has happened (or not happened) in the last four and half decades after the country attained independence.

II. PROBLEMS OF RURAL INDUSTRIALISATION :

Rural scenario in India has some very strong common elements as also some very specific local needs which reflect at once the socio-cultural unity and powerful local traits of a group of people as different from that of another group. The general poverty, lack of education, poor health and sanitation conditions, poor infrastructure of roads, housing, recreational and sports facilities, inadequate library and reading room facilities, unsatisfactory fuel resources, and poor knowledge and awareness about science, nutrition, preventive medicine are the strong common features in villages barring aside

TECHNOLOGIES FOR INDIAN RURAL LEATHER SECTOR

K. B. Gupta, J. K. Khanna, K. S. Jayaraman

Central Leather Research Institute, Madras

The authors give an illustrative account of a very effective extension programme of the Central Leather Institute, Madras. It is an interesting example of how improved level technology can augment employment potential in villages, enhance the socio-economics of artisans engaged in leather trade. It also highlights the great potential of processing of hider and skins in the rural sector and thereby contribute to overall development of villages.

Indian economy is predominantly agricultural and accounts for 45% of the National gross product. Agro based industries are the largest generator of employment in the rural areas. For many years this core sector could not attract the attention of planners for various reasons. This resulted in the migration of rural folk to the semi urban and urban centres which weakened the agricultural base and activities connected with it. Vertical growth of the urban centres, congestion and space shortage in the cities, ever increasing pollution and many other socio-economic problems diverted the attention of planners back to the rural areas.

The rural leather area is the integral part of the agricultural sector. Belonging to an unorganised set up the leather units being tiny in size are scattered in remote villages. Once it was a hub of activity in the rural areas, encompassing collection and flaying of carcass, tanning of hides and skins, and production of variety of leather products meeting the needs of the local people, providing gainful full and partial self employment to many artisans in the rural areas. Leather working was part and parcel of the rural activity forging links with farming community, artisans of other disciplines and other sections of the society. From variety of country footwear intended for farming and field work, and special occassions like wedding, to leather items for driving bullock cart and drawing water from well and items for other uses, were made by the village cobbler from the locally produced vegetable tanned leathers.

In the past 25 years the rural leather industry has suffered serious set back loosing its foothold in the villages and thus the trend towards the decline. Of late the leather industry has shown a distinct shift towards the organised sector in urban or semi-urban areas due to many reasons such as mass production, increased mechanisation, impact of fashion trends etc. Leather Industry which used to support large section of rural population is towards sharp decline and number of direct beneficiaries are decreasing.

Social injustice, traditional technology, low productivity and minimum return, drudgery and unhygienic conditions in tanning, inadequate funds, old tools and equipments, lack of innovation in designs and product development, shortage of tanning materials and high cost of hides and skins, change in the marketing pattern and resistance towards modernisation are the main reasons towards the drift. Moreover the well educated youth

associated with leather profession from artisan families are not very keen to continue in their age old profession.

However situation is not so disappointing in the bigger villages or semiurban areas. Here a good number of people are engaged in their own modern footwear making units or employed by the traditional artisans having enhanced production. These are the areas where the intervention of leather science and technology has made its impact felt.

CLRI TECHNOLOGIES FOR CONVERTING WASTE INTO WEALTH AND IMPROVING RESOURCES OF RURAL LEATHER SECTOR :

The Central Leather Research Institute, Madras and its five Regional Centres for Extension and development located at Calcutta, Kanpur, Jullundhar, Rajkot and Bombay, from the inception have been trying seriously to develop suitable technologies in the field of curing and preservation of hides and skins, utilization of animal and tanning byproducts, improving tanning processes including reduction in the process duration, standardisation and quality control, training of craftsman in the leather goods fabrication and providing facility for leather products designing through computer aided programme. In collaboration with Khadi and Village Industries Commission and their respective State Board, State Leather Development Corporations, Small Industries Services Institutes, CSIR, Polytechnology Transfer Centres, D. S. T. different semi-Govt agencies and finally voluntary organisations the technologies given below have been transferred directly to the rural beneficiaries by way of practical demonstrations at the workspots and training at appropriate level mainly at Madras and at respective regional centres for Extension and Development. The Central Leather Research Institute since its inception and active functioning from 1954 has conducted more than 200 demonstrations of rural tanning techniques in various important rural centres all over the country which has benefitted over 25000 artisans. The speciality of these demonstrations have been the development of suitable adoptive techniques easily assimable by the rural tanners. While improving the processing techniques, the extension services of the Institute induced the enterprising rural tanners to venture into production of finished leathers. This has taken place in and around Rajkot, Ahmedabad, Gujarat, Kolhapur (Maharashtra) Jullundhar, Lucknow and Meerut in U. P., Ambala (Haryana), Burdwan in West Bengal, Mandi in Himachal Pradesh, Erode, (T. Kallupatti) in Tamil Nadu. Kavali in Andhra Pradesh, Anjad and Damoh in M. P. In these Programmes improved process of bag tanning of hides, vegetable tanning of skins, hairon tanning of goat and sheep and even wet blue chrome processing have been demonstrated. Simple finishing technique have been also demonstrated.

Recently CLRI has developed technologies for the processing of rural tanned hides and skins which could be converted into consumer leather products. The value addition by adopting these techniques to the sales is about 45% to 50% the original cost. These techniques were also demonstrated in 1989 at Ambala in a tannery set up with the help of KVIB, Haryana.

Rural leather centres set up near Mandi (Himachal Pradesh) and Dehradun (UP) with the assistance from Department of Science and Technology, Govt. of India and run by Voluntary Organisations (Centre for Technology and Development) have started yielding good results for the cluster of villages. For these centres constant technology was provided by the Central Leather Research Institute, Madras. These Centres produce vegetable tanned sole and lining leathers for local consumption and fabricate leather products (closed and open type shoes, sandals etc.) which have very good demand locally. More of such centres are likely to come up in future. Similarly, carcass utilisation centres are likely to be set up at many rural centres in the 8th Five Year Plan.

To improve the storing of raw hides and skins and to avoid any possible purification, curing and pre-

a few enlightened and developed villages. The varying climatic and agroclimatic conditions, exposure or otherwise to modern way of life, geographical location, and strong historical background and cultural ties with different type of natural resources available make each region characteristic of its own. In brief then, certain needs are common for the entire rural population of the country and certain other reeds are special to one particular region. To this scenario, one has to add the skills (or lack of them in some cases) of the local people. These necssarily vary from place to place. Within the rural scenario, the skill focus can be on women and youth for developmental activities.

III TECHNOLOGY TRANSFER PROBLEMS IN RURAL SCENARIO

Rural technology is not an appropriate term as it may mean different things to different people. The term 'appropriate' or 'intermediate' technology has undergone several debates and no satisfactory answer has emerged. A simple cost-effective technology is what is needed to bring in rural industrialisation. Any technology when it is developed at a place far away from the user's place has to be transferred and implanted. Even if it is developed at user's place, the technology has to be replicated and spread. There are always problems in transfer of technology. There are very few institutions where technology transfer problems are studied systematically. Even when such a study is carried out it is generally for conventional practices like small, medium, and large scale industries, imported technologies, horizontal transfers, etc. More often the transfer of technology problems remain the exclusive experiences of individual entrepreneurs or industries and seldom available to others to learn. Notwithstanding all this, very little information is available on problems of technology transfer in the rural scenario. Infact rural industrialisation and its problems have seldom been examined from the viewpoint of technology transfer problems and mechanisms. It is not the purpose of the present paper to discuss in detail the technology transfer problems except to touch upon them being a vital link in the development and promotion of rural technologies.

One of the most important aspects of rural industrialisation is whether the technology under consideration was developed for that purpose or whether it was accidental and casual. Rural technology development has to be objective-oriented with local parameters, local needs, socio-cultural level, and socio-political climate taken into consideration. The other important factor is the acceptability of the technology by the locals. In a product-oriented technology, marks and market-support are obviously of utmost importance without which any talk of rural industrialisation is meaningless.

IV. MECHANISM OF TECHNOLOGY TRANSFER :

Any exercise on rural-industry development and promotion then has to be assiduosly carried out with rural men, women and children as the target beneficiaries. A unit like 'Mandal' or 'Taluq' has to be chosen as the target for development and promotion of rual industries. The local resources and skills are taken into consideration and developmental plans drawn for a unit which can build up into a district and a state plan. In Andhra Pradesh, the Government selected 8 Mandals for planned development and assigned the task to Andhra Pradesh Council of Science and Technology (APCOST). The Council prepared resource survey of 2 Mandals and proposed developmental activities like health, education, agriculture etc. They later asked our Polytechnology Transfer Centre (PTC), Hyderabad to suggest S & T inputs mainly in the form of industrial activity in the Mandal. We have suggested activities suitable to the 2 Mandals (one in Ranga Reddy District and one in Ananthapur District). Such a movement has to take place all over the State and in all the States of our Country. We expect that voluntary agencies will play a very important role in the technology transfer and rural industry development at the grassroot level. Various agencies of the government like DRDA, Grameen Banks, Panchayat Raj departments, functional departments of the government etc. will have

necessarily to take part in the village development programme.

V. S & T INPUT IN RURAL INDUSTRIALISATION

It may be mentioned that rural-industry development cannot and should not function in isolation but has to be part of the total development activity. Technology transfer in the rural scenario has perhaps not taken place in a big way in the existing integrated rural development programmes. One of the reasons perhaps is that S & T inputs and involvement of S and T personnel have not b.en of the magnitude essential for an impact-making rural-industry development. It is not enough to transfer available technologies on to the rural scenario. A deliberate activity is needed so that users can 'demand' or ask for a relevant technology to be developed, transferred, and transplanted and it should be the responsibility of the S & T agencies to respond to such 'demand'.

VI. PLANNING OF RURAL — INDUSTRY ACTIVITY

Thus it is necessary to plan rural industry activity at a unit level (Mandal or Taluq or other) and in this task it is desirable to involve a CSIR/NRDC representative (eg. PTC wherever it exists) and a voluntary agency in addition to State level agencies like Councils of Science and Technology. At the time of implementation, the technology generators (say one or more National Laboratories) will come into the picture from where the technology will be transferred with the help of the voluntary agency and the PTC. The actual transfer mechanism will be decided on the nature of the technology and related matters like the scale of operation, any demonstration unit needed, etc. The author will be happy to discuss and share his experiences in technology transfer mechanism in detail with those interested and concerned. It is understood that aspects of infra-facilities, marketing and distribution etc. have been examined before or during the transfer of technology operation. It should also be understood that rural-industry project implementation is a part and parcel of the Unit (Mandal/ Toluq other) development.

VII. BROADENING THE SCOPE OF SELF-EMPLOYMENT SCHEMES CONCEPT

Technology transfer in the rural scenario can be for social benefits or as income-generating efforts through self-employment. The former are societal mission activities like providing drinking water, immunisation, health care, literacy etc. The present article focusses the issues on income-generating activities through rural-industry projects. The sub-focus is on rural women and rural youth. The conventional IRDP emphasises self-employment which perhaps covers an individual or a single family. In a recent Workshop on Rural Industrialisation held at National Institute of Rural Development (NIRD), Hyderabad where the author had the opportunity to participate as a representative of CSIR, there was a comprehensive debate on broadening the scope of self-employment schemes to cover larger investments and more than one beneficiary. The author was the Group Chairman for developing this concept. It was felt that in the context of the past experiences of IRDPs and with the growing concept of common facilities centres, the so-called self-employment schemes should be enlarged in their scope thereby providing the benefits of modern S & T to rural masses. It may once again be emphasised that rural industry development cannot take place in isolation and any such activity should form an integral part of the total rural development programme of a unit.

VIII. SUGGESTION

Development and promotion of rural technologies is a vast subject. The main theme of the present paper is total development of a unit with appropriate S and T inputs and effective technology transfer. Any number of examples can be given towards achieving these objectives. It is, however, felt that a few specific examples which could be relevant to almost the entire Indian rural scenario may illustrate the theme. The S and T inputs could come from NRDC, CSIR and the National Laboratories. The actual mechanism of S and T transfer will have to be worked out with the help of State Councils of S and T, CSIR—Polytechnology Transfer Centres and the Voluntary agencies.

1. S and T Awareness Programme :

Here the theme should be 'catch them young'. A practical awareness about basic science in day-to-day life has to be designed in the form of video-tapes in all the major languages of India. They will be targetted to rural school children but will cover the general rural population. also. The programme could be designed on the lines of UGC's, TV programmes. The task will necessary have to be assigned to professionals with certain help perhaps coming from Overseas.

2. Production of Leaf Cups/Leaf Plates :

A cup or plate is essential in day-to-day life especially in public places. Besides the huge requirement, the product should be cheap, disposable, hygienic, and based on renewable raw material. Leaf cup/plate making is a rural industry based on plant resource which will employ a good number of people both directly and indirectly and has the advantage of doing away with the current highly unsatisfactory modes of unhygienic cleaning of ceramic/metal plates and will in the long run save water and prevent secondary infections. One could think of 1-3 units in every district. It is believed that the leaf is available in plenty and once the idea is acceptable its cultivation and/or renewal practices in forest areas can be taken up in future.

An improved version of CFTRI's original leaf cup-plate making machine (4-16 inch dia) is available in Hyderabad which along with stitching machines and moulds/dies can constitute a very low investment production unit. The machine manufacturer is providing training facilities, raw material, and buy-back guarantee. The typically used 'Adda' leaf is available at many places (in Tamil Nadu and Gujrat the trading is on a substantial scale). Short term development work can be taken up to study other types of leaves. The present machines are in a position to add paper and polythene layers to the leaf plate. Integrated machines at a somewhat higher cost are available for dual purpose of leaf plate and paper making. Efforts are on to make the machines semi-automatic.

3. Simple and Economical Block Ma[illegible] Civil Construction :

Simple block making machines are ideal [illegible] manufacturing CBRI stone masonry, stabilised soil cement, sand lime and cement concrete blocks. Blocks of any size can be made with 1-HP motor simple operation and using local materials. A low investment machine employing 6-8 persons (including women) can produce 800-1000 blocks in a 8-hour shift. The machine is portable and can be shifted from place to place. Such a machine is available in Hyderabad and may also be available elsewhere. Simple and economical construction blocks are needed everywhere and their demand will only increase with time all over the country. If machines can be made available at centres of activity to individuals on outright purchase basis or hire-purchase basis it will increase the rural-industry activity, reduce drudgery, and create employment generation. The exercise of using local clay/soil material has to be carried out initially and some skill has to be imparted for the operation of the machine.

4. Ceramic Centre for Rural Development :

This scheme envisages providing common facilities of low thermal mass (LTM) kiln for producing low cost ceramic products like building blocks, roof planks, tiles, sanitary ware etc. for rural housing, as also water filter candles for providing bacteria-free drinking water using local raw materials (plastic and semi-plastic clays) and local artisans. CGCRI, Calcutta has recently provided such a ceramic centre in Bankura district of West Bengal under sponsorship of CAPART. Such an activity can be replicated at various rural places all over the country with the help of CGCRI. It will need a preliminary study of local raw materials, available skills, and local needs. On par, a pottery centre can also be considered at certain locations.

5. Cultivation and Processing of Aromatic, Medicinal, and Economic Plants :

The above plants as their names suggest can be a source of important constituents required in industry

e. g. essential oils, perfumery chemicals, steroid drugs, hydrocarbons etc. Although a number of CSIR laboratories (like CIMAP, NBRI, RRLs at Jammu, Jorhat, and Bhubaneswar etc.) and other ICAR and agriculture/horticulture institutions have popularised aromatic, medicinal and economic plants, the author feels that there is still enormous scope to undertake intensive cultivation in rural areas of the country especially on wastelands, in coastal areas, and in droughtprone locations. It is not the knowledge that is lacking but what is needed is extension work with market linkages. Also needed is the integrated work on processing and extraction of active constituents especially at the field level. The proposed area of activity needs careful planning, systematic lab to land technology transfer, and monitoring of field results. It is an extremely potential area with prospects of modern biotechnology of propogation (plant tissue culture) coming into the picture in not too distance a future.

6. **Literacy Aids :**

Paper Slates and Plastic Slates can be popularised on a massive scale, saving thereby the scrace and expensive writing paper.

7. **Briquetting of Biomass/Agro-waste for Fuel :**

Some more development work is needed to perfect such compaction machines for use in the rural set-up and they have to be popularised. This is a top priority area of activity.

8. **Common Facilities for Post-Harvest Technology at Rural Level :**

Ex : Mini—rice Mill
Mini—grain Mill
Mini—wheat Mill

IX CONCLUSIONS :

Developement and promotion of rural industry units on a massive scale are needed more urgently in India today than ever before. With the dynamic international events taking place. India's rural masses-men, women and youth are impatiently waiting to forge ahead and we must provide them with opportunities to fulfil their aspirations. Action is called for on a war-footing. Scientists, technologists, and engineers wherever they may be in the country have to rise as 'one-man' to improve the economic lot of the rural people. Institutions too may have to reorient their work programmes to respond to the needs of villages by involving themselves in the task of rural development by the application of S and T. The CSIR-Polytechnology Transfer Centre, Hyderabad will be very happy to participate in the national task and share their knowledge and experiences with others, so that the pace of rural industry development can be speeded up.

servation of hides and skins with the addition of chemicals like zinc chloride, sodium trichlorophenate and sodium bisulphite to common salt have been demonstrated at many rural centres. This has helped in improving the quality of hides and skins free from foul smell and getting higher market value by rural flayers and small hides and skins collectors. These improvements have been reflected in the upgradation of hides and skins quality for producing quality leathers for domestic consumption and export as well. In the animal bye products sector frequent courses have been conducted at CLRI, Madras to train the trainees from Voluntary organisation, KVIC, SISI, Veterinary Departments, sister CSIR Labs for recovering leather from wasting—resources like Intestine, stomach, flesh, bones and ruminal contents etc. Various simple techniques have been developed and demonstrated using new model of solar dryer developed by the CLRI for preparing animal feeds, pet foods fertilisers, keratinous rich products, including ensilaging from available fallen carcass. These when further propagated by the trainers would substantially generate wealth and give rise to new rural industries for the ultimate benefit of the rural India.

Similarly in the leather product sector, a beginning has been made towards the training of rural artisans in the various aspects of leather products making, providing them with better tools for working and simple finishing techniques to enhance the get up and aesthetic value of and increasing sale value of such finished products. Other organisations like Prototype Development Centre, Madras has developed special toolkits for flaying and footwear activities for rural areas to help the rural artisans.

In future, such services will be given a greater thrust by the Institute. The CLRI in all its rural development programmes have been aiming at from the beginning to develop clean and simple technologies with emphasis towards constant development for modernisation, thus, bridging the gap between the under-developed, developing and developed. This is, in short to proceed towards harmonious and balanced growth for the benefit of the Indian Society as a whole.

DEVELOPMENT AND TESTING OF A DONKEY-DRAWN CULTIVATOR-CUM-SEEDER

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There is enormous potential for using the donkey as a draught animal for field operations in West African semi-arid tropics where soils are light and sandy. The existing donkey-drawn implements, made of iron, are considered too expensive. A low-cost cultivator-cum-seeder to be pulled by a donkey was designed, developed and tested in the Republic of Mali The cultivator is made partly of wood and partly of iron. It can be used for inter-row weeding and presowing shallow tillage. It covers approximately 0.1 ha in one hour and its performance is as good as the commercially available Hoe Asine. The seeder can be used for sowing pearl millet and sorghum in hills about 50 cm apart and in rows spaced up to 90 cm. It covers approximately 0.2 ha/h while sowing in rows spaced 50 cm. apart.

INTRODUCTION :

Draught animal power can be an appropriate and sustainable technology for intensifying agriculture and raising living standards of small farmers in Africa. Draught animals are being actively promoted and there are now 8 to 10 million working animals in sub-Saharan Africa (Starkey, 1986). Donkey is the most numerous equine in West African semi-arid tropics and plays an important role in rural life for carting and as a pack transporter. It has enormous potential for use in field operations where soils are light and sandy (Fielding, 1987).

In many parts of the West-African semi arid tropics land is abundant and majority of farmers still use hand cultivation techniques. The primary obstacles to increase the cropped area are scarcity of labour and low work rate of manual seeding and weeding operations. Many farmers determine the size of their cropped area by their capacity for weeding (Newman et. al., 1980). Animal drawn implements can perform weeding six to seven times faster than

manual weeding. However adoption of animal drawn weeders is very low due to infrequent practice of line sowing (Sargent et al. 1981). Animal drawn seeders could play an important role in adoption of line sowing, but these seeders are considered too expensive in most of the semi-arid Africa. These facts clearly establish need for low-cost implements for line sowing and inter-row weeding.

Sowing in hills is a common method of seeding pearl millet and sorghum in the semi-arid West Africa. Attempts were made to develop a low-cost implement for sowing in hills and inter-row cultivation. This paper reports on development of a donkey-drawn cultivator-cum-seeder, tested in Mali during rainy seasons of 1987-89.

MATERIAL AND METHODS

Development of a Donkey-Drawn Cultivator

A low-cost cultivator to be pulled by a donkey was designed and fabricated in Mali. It consists of a frame made of a wooden plank with two rigid beams. Three duckfoot tines or a blade can be attached to the frame with the help of simple clamps designed for the purpose. Two small wheels can be attached on the frame to control the depth of penetration of the implement during operation and to facilitate its transportation. The cultivator can be hitched to a donkey with the existing harness, used on donkey carts. In a preliminary field trial the cultivator worked well for inter-row weeding on flat land. To reduce the cost it was modified to work with a single wheel instead of two. Design of the clamps was modified to improve ease of fabrication and adjustment of tines and the wheel was replaced by one, readily available in the market. Three units of the cultivator were fabricated at the workshops of Division de la Machinisme Agricole (DMA) and SMECMA (the largest manufacturer of farm implements in Mali), located at Bamko.

Development of a Donkey - Drawn Two-Row Hill Seeder

A two-row donkey-drawn seeder for sowing in hills was assembled in Mali. Some of its components such as furrow openers and seed metering device were developed and fabricated at ICRISAT Center India, whereas other components such as soil covering device, gauge wheel and seed release mechanism were developed and fabricated at Cinzana in Mali. It consists of a wooden main frame (same as for cultivator), on which a gauge wheel, seed metering bowl and two furrow openers with seed trap and release mechanism are fitted with the help of clamps. Seed is metered by hand, which gets divided in two parts at the seed bowl and passes through seed-tubes to reach the furrow openers where it is held on the seed trap. Actuation of the seed release mechanism allows the seeds to fall in hills, about 50 cm apart. Initially, the seed release mechanism was actuated by a string pulled manually but later it was modified so that it could be actuated by a lever attached to the gauge wheel.

During the preliminary field trials it was observed that the manual metering of seed through wooden bowl posed difficulty to the operator and it could be a potential impediment for adoption of the seeder. Therefore, the seed divider wooden bowl was replaced by a simple seed-container with fixed opening type seed metering mechanism, in which size of the opening could be selected depending on the seed-size. It has provisions to vary the rate at which seeds are dropped and to stop dropping of seeds when desired. A manually operated agitator was provided in the seed box to maintain continuous supply of seeds through the metering device. The old wheel of the seeder was also replaced by the one being used on the cultivator.

Testing

The donkey-drawn cultivator was tested for weeding in a pearl millet crop, sown in rows at a spacing of 75 cm. The cultivator fitted with telescopic beams and a spring type dynometer was used

in another field to asses its work rate and draft requirement for shallow tillage (depth 5 cm). A field trial was conducted to compare performance of the donkey-drawn cultivator with Hoe Asine, a commercially available cultivator, made of iron. The trial was conducted in a randomised block design with three replications. Both the implements were fitted with duck-foot sweeps for inter-row weeding in Maize crop sown in rows spaced at 100 cm. The pull force required, actual width of cut, depth of cut and travel speed were recorded for each implement. The trial was repeated at two other research stations located at Cinzana and Kaporo.

RESULTS AND DISCUSSION

It was observed that the weeding efficiency of the donkey-drawn cultivator was about 80% of manual weeding and it covered approximately 0.1 ha in an hour. The draft requirement of this implement on a sandy soil, while covering a 45 cm wide strip, was about 32 kg. and its field capacity was about 0.1 ha/h.

Results of the field tests from the three different locations (Table-1), indicate that there is no significant difference in draft requirement, work capacity and weeding efficiency of the donkey-drawn cultivator and the Hoe Asine. The pull requirement of both the implements (about 32 kg) was within the pulling capacity of the donkeys and no undue exertion to the animals took place. Some of the problems such as, trash getting entangled with tines and larger pull required due to deeper penetration of tines or wider coverage were the same for both the implements. In general, both the implements are equally good for inter-row cultivation. However the new cultivator is simple in construction, it can be fabricated with locally available material and it is cheaper than the Hoe Asine.

Results obtained from field testing of the donkey-drawn two-row seeder indicate that it can be successfully used for sowing pearl millet and sorghum in hills (Table 2). The average spacing between two consecutive hills in each row was 42 cm and the number of seeds per hill were 15 and 5 for pearlmillet and sorghum respectively. Spacing between rows is adjustabte up to 90 cm. Optimum size of opening for seed metering for pearl millet (Boboni) was 5 mm and for sorghum (CSM 219) it was 5.5 mm. Number of seeds per hill can be varied by setting different sizes of openings for the seed metering according to the size and quality of seeds.

In the final prototypes, the main frame, clamps and the wheel have become common for both the seeder and cultivator. Therefore the cultivator can be converted into a two-row seeder simply by removing the tines and fitting the components for seeder (i.e. furrow openers, seed container etc). Thus the donkey-drawn implement, can be used as a cultivator and as a two-row seeder also. It is proposed to name this implement as the "Donkey Drawn Cultivator-cum-Seeder" (DDCS),

CONCLUSION

The donkey-drawn cultivator-cum-seeder is an appropriate implement for small farmers in West African semi-arid tropics. It is simple in construction and can be fabricated with locally available material. It is cheaper than the existing donkey-drawn seeders and cultivators. Farmers can perform seeding and weeding operations at a faster rate with this implement and expand the area under cultivation.

Table 1. Performance[1] of the donkey-drawn cultivator and Hoe Asine for inter-row cultivation, Mali, rainy season 1989.

Implement	Draft (kg)	Width of cut (cm)	Work capacity (ha/h)	Depth of cut (cm)	Weeding efficiency[2] (%)
DDCI	32.5	51.33	0.11	6.78	86.2
Hoe Asine	31.1	51.00	0.11	6.38	83.0
SE (±)	1.18	0.012	0.014	0.567	2.00

1. Results are based on data from 3 locations in Mali. Differences in values of the performance parameters are stastically nonsignificant.

2. Weeding efficiency = $\frac{\text{No. of weeds before operations} - \text{No. of weeds after operation}}{\text{No. of weeds before operation}}$

Table 2. Performance of the two-row hill seeder, Mali, rainy season, 1989.

Crop	Spacing between hills (cm)	No. of seeds per hill	Depth of sowing (cm)	Work capacity (ha/h)
Pearl millet (Boboni)	43.4	14.7	2.8	0.22
	(3.55)[1]	(5.73)	(0.81)	(0.011)
Sorghum (CMS 219)	42.2	4.9	3.2	0.21
	(4.17)	(1.76)	(0.65)	(0.012)

1. Values of SE (±) are given in parantheses.

REFERENCES

Fielding, D. (1987). Donkey power in African rural transport. World Animal Review, 63 : 23-30.

Newman, M., Ouedraogo, I. and Norman, D W. (1980). Farm-level studies in the semi-arid tropics of West Africa. Pages 241-263 in Proceeding of the International Workshop on Socioeconomic Constraints to Development of Semi-Arid Tropical Agriculture, 19-23 Feb. 1979, ICRISAT, Hyderabad, India.

Sargent, M. W., Lichte, J. A., Matlon, P. J. and Bloom, R. (1981). An assessment of animal traction in francophone West Africa. Working Paper 34. Department of Agricultural Economics, Michigan State University, East Lancing, USA.

Starkey, P. (1986). Draught animal power in Africa, Priorities for development, research and liaison. Farming systems support project. Networking Paper No. 14. University of Florida, Florida, USA

HAND CHAFF CUTTER

USES

1. FODDER CHAFFING :

In India farmers use crop residue very intelligently. They have selected such crops that grains are utilized for human food and the remaining straw and leaves are fodder for the cattle. Thus two main energy sources of agriculture—human and animals survive at a time.

The straw of sorghum and other low millets are fed to agricultural cattles. In paddy growing areas paddy straws are first softened by crushing under bullock feet and then fed to cattles. In wheat growing areas wheat straws are first cut into pieces and used as fodder. Thus fodder for animals varies from region to region according to main crops of that area.

In most cases straws of various crops are fed as they are. This is not convenient to cattles to eat straws in long pieces. Some of the thick and long straws are thrown away in manure pits. If straws are cut into small pieces and mixed with common salt and molasses cattles would eat it willingly and there would be no waste.

Agricultural Tools Research Centre since 1964, has developed a Hand Chaff Cutter for small farmers who need to chaff different straws manually. The Hand Chaff Cutter can work very well for 4—5 cattle's fodder.

2. PREPROCESSING COMPOSTING :

Thick and hard straws, which are dumped in farmyard manure pit as they are, do not produce uniform and quality compost as hard straws do not digest easily. Also big straw pieces make it inconvenient to turn and mix compost manure up and down. If the hard straws are cut into small pieces with Hand Chaff Cutter and fed to farm yard manure pit, the straw pieces digest faster to produce compost manure. Mixing also becomes easier.

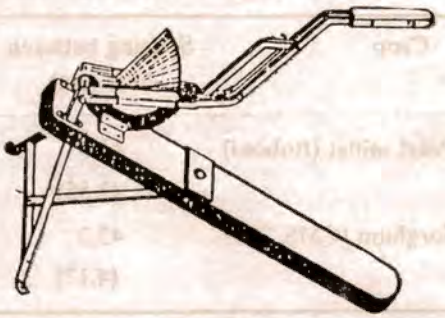


Figure : 1 Hand Chaff Cutter

Green vegetative growth which is not useful as fodder can also be chopped into pieces with the Hand Chaff Cutter and put to compost pits Composting becomes faster and easier. Therefore the Hand Chaff Cutter is a very useful tool for preprocessing for composting. In the country like India where there are many clear sunny months, any organic matter can compost by aerobic digestion but it takes different periods. For uniform and faster composting raw materials are to be prepared in uniform small pieces to bring their carbon to nitrogen ratio (C : N) down faster.

Many farmers believe that manure making process is a function of the nature, man has nothing to do with it. This is very wrong notion. In country like Japan where there are no animals in agriculture, every piece of organic waste is collected

and put in farmyard manure pits. In his spare time the farmers turns the manure up and down and rearranges it layer by layer with addition of ashes, water, some soil and chemical fertilizers in necessary proportion. Thus he gets uniform and rich organic compost manure.

3. CHAFFING MATERIALS FOR BIOGAS MANURE PLANT :

It has been established that not only cattle dung and night soil can be fed to anaerobic diagesters popularly known as Biogas plants, but other organic kitchen, street or farm wastes can also be put into biogas manure plant. It produces fully digested organic manure and also clean, smokeless and efficieint fuel gas for cooking and other purposes. Unhygienic organic wastes can also be very well disposed through anaerobic digesters. Here Hand Chaff Cutter is very useful to chop straws, weeds and other green vegetation into pieces to be fed into the biogas manure plant.

Thus the Hand Chaff Cutter is a very versatile equipment for small farmers. As described above it helps in chaffing fodder for cattles, preprocessing for composting and chaffing kitchen, street and farm wastes suitable to biogas manure plants.

HOW TO USE

If few bunches of straws are to be chaffed, only one man can operate the Hand Chaff Cutter. He can feed the bunches with one hand and press the handle with the other hand. But for large quantity of fodder two persons are necessary to operate the chaff cutter. One will feed the bunch of fodder or straws and the other will operate the handle.

One end of the tool, where blade is mounted, is raised above ground on two legs of the stand [1] so that the operator does not have to bend much to operate the handle. The tool rests on three points—two iron legs [1 C] of the stand and one end of Wooden Base [2]. The three point contact of the tool keeps the tool stable on uneven floor also. Weight of the tool itself keeps it steady during operation. Therefore the chaff cutter does not need any base or foundation. Still two legs of the stand are provided with holes through which big nails or bolts can be passed and fixed with the ground.

WORKING PRINCIPLE

Generally chaff cutting is done by scissor action. Of the two blades of such chaff cutter one is stationary and the other is rotating. Fodder or straws fed in between the blades are scissored into pieces. For grasses or soft straws like paddy this method is convenient. But for hard and thick straws or stems three point cutting, as used in the Hand Chaff Cutter, is more convenient. Two forks [5A] in the handle forms two blunt, vertical edges. In-between the two vertical edges comes a semicircular sickle shaped Blade [4] fixed on a wooden Base [2]. When straws are put on cutting edge of the blade and the handle is passed down they break. If the straws do not break immediately, they slide along the sharp edge of the blade and eventually are cut by guillotine action.

After one cut, the handle is lifted up, the bunch is moved forward and again the handle is pressed down for the next cut. Long handle gives mechanical advantage of lever and makes the working easy. After each cut the bunch should be pushed forward over the blade by the length of pieces required.

The hinge on which the handle moves is 5" long. Therefore to and fro motion of the handle over the blade is precisely maintained and the handle can not swing on either side. Wear and tear are also evenly distributed. As a result life of the Hand Chaff Cutter is fairly long with minimum maintenance. The blade is made of medium carbon steel and does not require frequent resharpening. A curved mild steel Blade Cover [7] is welded to the handle. When the tool is not in use the blade cover covers the sharp blade for safety purpose.

The design of Hand Chaff Cutter is simple but robust and needs very less maintenance. The tool,

originally designed by "Krishi Sudhar Kendra", Deglur (Maharashtra) is a very useful to small farmers for various purposes.

MANUFACTURING PROCESS

(Design Plate : 1, 2 & 3)

Components of the Hand Chaff Cutter are :

[1] Stand

[2] Wooden Base

[3] Blade Support

[4] Blade

[5] Handle

[6] Pedestal—for hinge

[7] Blade Cover

1. STAND

For convenient working, the blade end of the Wooden base is kept high with the stand. The stand is 16" high made of mild steel flat iron strips of size 1" × ¼". For strength tie bar [1B] is fixed to the stand with bolt and nuts as shown in Design Plate : 1. The other end of the tie bar is bolted to the Wooden Base [2] as shown in the assembly in Design Plate : 3.

To Prevent legs thrust into ground small flat iron pieces [1C] are welded to both the legs of the stand. Two legs of the stand and the lower end of the wooden base touches the ground, to make a tripod base of the chaff cutter.

2. WOODEN BASE

Wooden base is made from a close grain, hard wood like Babul of the size 4" × 2" × 48" long. The wooden base provides support as well as adds to the stability of the tool. At the middle of the base 4" × 4" × 1½" high wooden piece is fixed as a rest for the handle.

As shown in the assembly of the tool, two pieces of pedestal [6] are fixed to the wooden base with four bolts. Out of these four bolts two holds the stand also. One end of the tie bar [1B] is fixed to the base by the bolt passing through the middle wooden piece on the base. Blade support [3] also is fixed to the wooden base with two bolts and nuts.

3. BLADE SUPPORT

Blade support is made from 2" × ¼" angle iron piece of 5" length. The vertical side of the piece, on which the blade is to be fixed, is cross cut. Vertical side has two holes to fix the blade with two bolts and nuts. The horizontal side of the blade support has also two holes to fix them with wooden base [2] with bolts and nuts.

4. BLADE

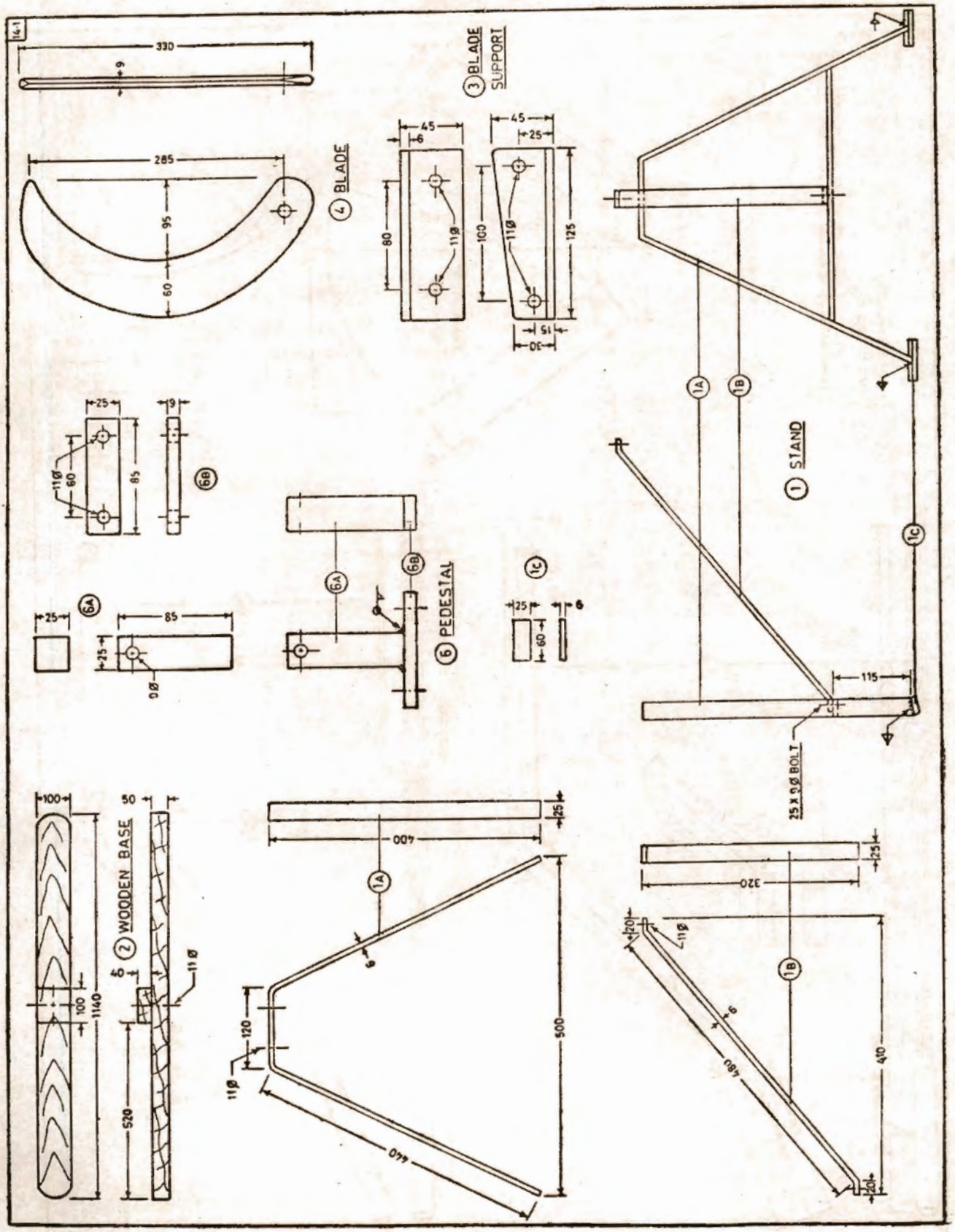
The blade is made from 2" × 3/8" thick and 14" long medium carbon steel or spring steel flat piece. The blade is formed into sickle shape by hot forging. The inner edge is sharpened to work as the cutting edge. The broad end of the blade is fixed to the fork end of the handle and two pedestals with a 5" × 5/16" carriage bolt. From the middle the blade is fixed to the wooden base [2] with the blade support [3].

5. HANDLE

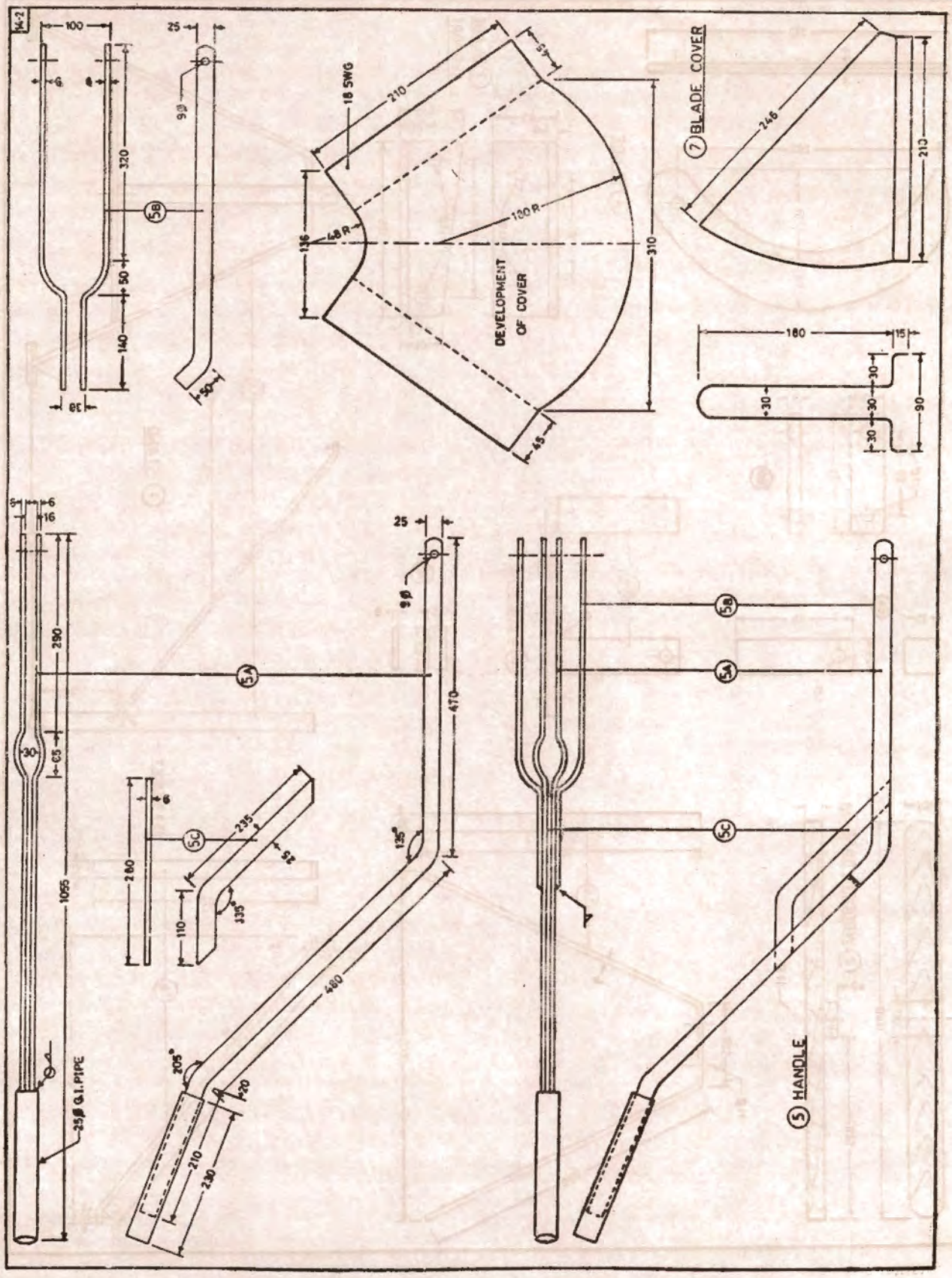
From 1" × ¼" mild steel flat, components of the handle [5A], [5B] and [5C] are made and welded as shown in Design Plate : 2. The piece [5C] acts as a tie bar to provide strength to the handle. Fork shaped piece [5B] is to make the hinge stronger and stable; and also to support the blade cover [7] which is welded on it.

Fork [5A] has a special bulged shape at a distance of 11½" from the hinge end. The purpose is that even if there is slight play in the hinge the pointed end of the blade does not strike with the fork [5A]. 9" long and 1" diameter galvanized iron pipe is welded to the other end of the fork [5A] as shown in Design Plate : 2. The G. I. pipe forms grip of the handle.

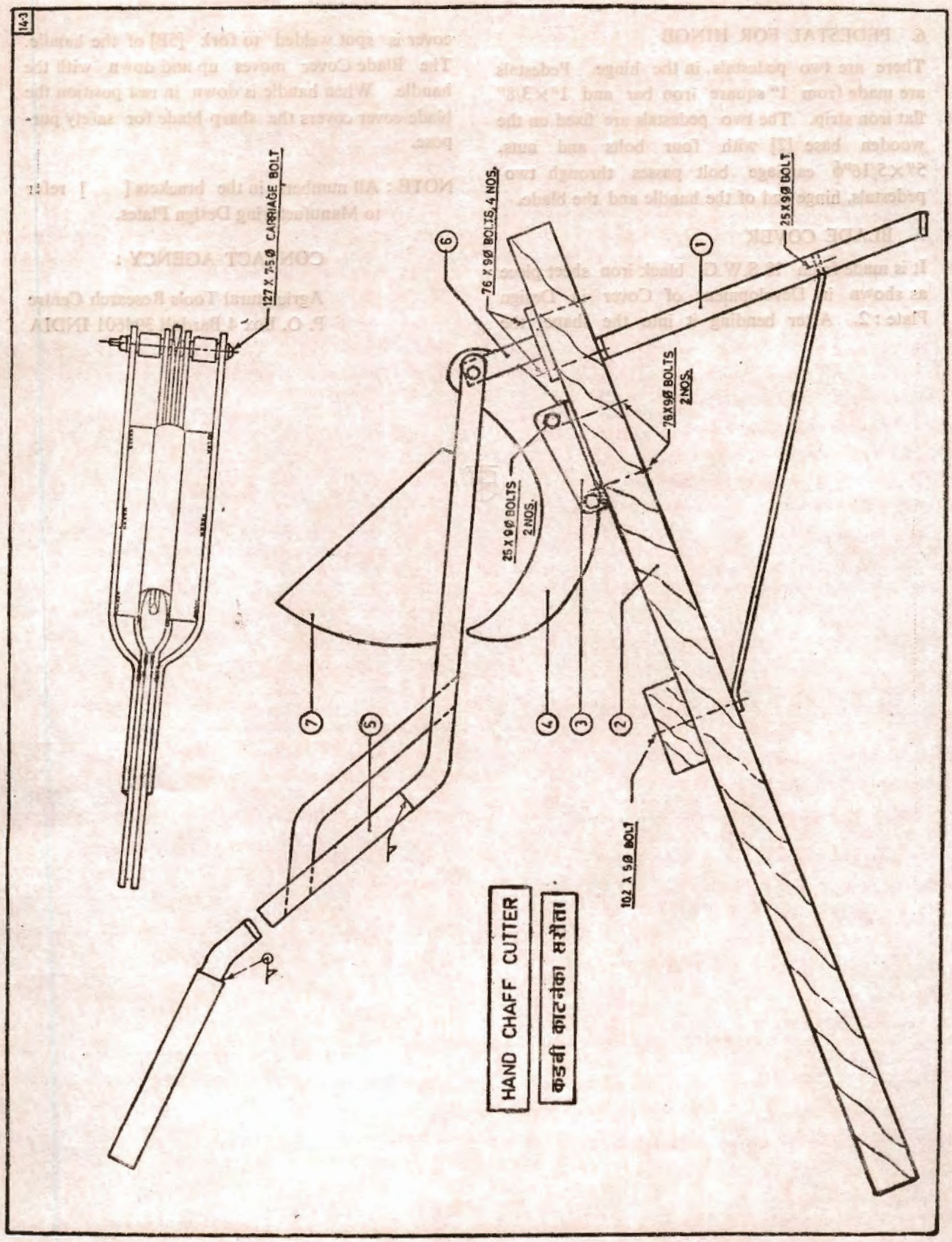
Design Plate : 1



Design Plate : 2



Design Plate : 3



6. PEDESTAL FOR HINGE

There are two pedestals in the hinge. Pedestals are made from 1" square iron bar and 1"×3/8" flat iron strip. The two pedestals are fixed on the wooden base [2] with four bolts and nuts. 5"×5/16"ϕ carriage bolt passes through two pedestals, hinge end of the handle and the blade.

7. BLADE COVER

It is made from 18 S.W.G. black iron sheet piece as shown in Development of Cover in Design Plate : 2. After bending it into the shape, the cover is spot welded to fork [5B] of the handle. The Blade Cover moves up and down with the handle. When handle is down in rest position the blade cover covers the sharp blade for safety purpose.

NOTE : All numbers in the brackets [ ] refer to Manufacturing Design Plates.

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DOUBLE ROW SEED DRILL

As Single Row Seed Drill was found suitable and useful manually operated tool to small farmers, Double Row Seed Drill was designed at Agricultural Tools Research Centre for performing various agricultural operations more precisely and conveniently. Two persons pull the tool from the front and one person drills the seeds. Thus Double Row Seed Drill needs three persons for operating it.

USES

1. Sowing operation can be performed at a distance of 9" to 18" between two rows.
2. After removing two shares [4], blade harrow of 9", 12", 15" or 18" can be connected to the tool bar [1] for loosening the top soil.
3. By connecting two or three small tines to the tool bar operation of light cultivation can also be performed. After this operation deep cultivation becomes quite easy.
4. In Banana crop, orchards or in community forests where there is irrigation farming or where bullock drawn implements may not be used, hand operated Double Row Seed Drill can be very well used for interculturing, light cultivation or for fertilizer application.
5. When the crop plants are small the seed drill can be moved over the plants row or in high crop the tool can be moved in between the two rows for applying fertilizer.

In addition to these Double Row Seed Drill has all the advantages and uses as that of Single Row Seed Drill.

MANUFACTURING PROCESS
(Design Plates : 2, 3 and 4).

Double Row Seed Drill has following 18 Components :

(1) Tool Bar
(2) & (3) Angle Iron for connecting (1) & (15)
(4) Share
(5) Conduit Pipe
(6) Flat Strip for connecting (5) to the Tool Bar
(7) Handle Angle
(8) Hand Grip
(9) Bolting Piece to be bolted on (7)
(10) Support for (9)
(11) & (12) Angle Iron for making seat of (13)
(13) Seed Bowl
(14) Two Conduit Pipes
(15) Bamboo Beam
(16) Clamp
(17) Bamboo Pulling Bar
(18) Flat Strips for fitting (17) to (16)

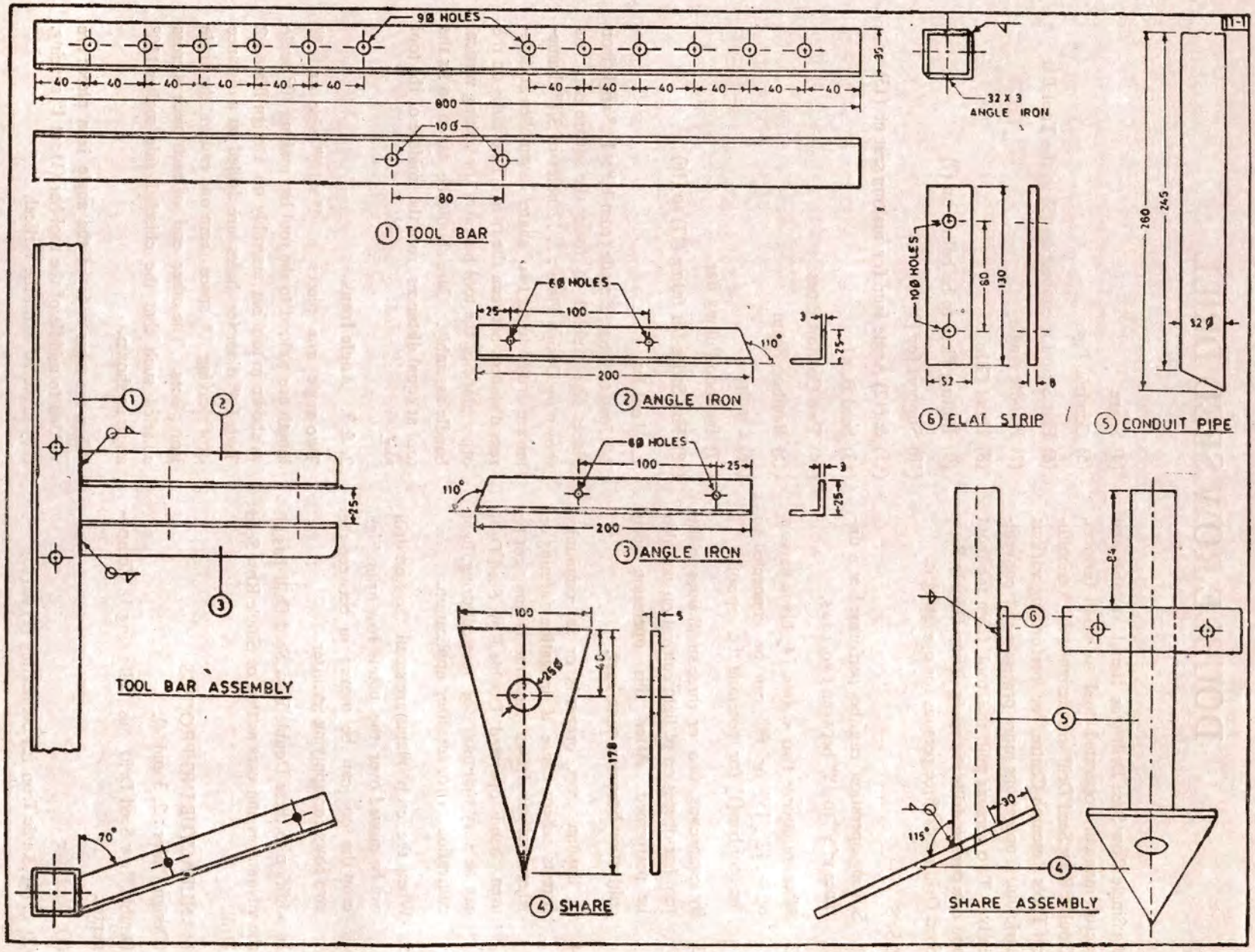
1. Tool Bar

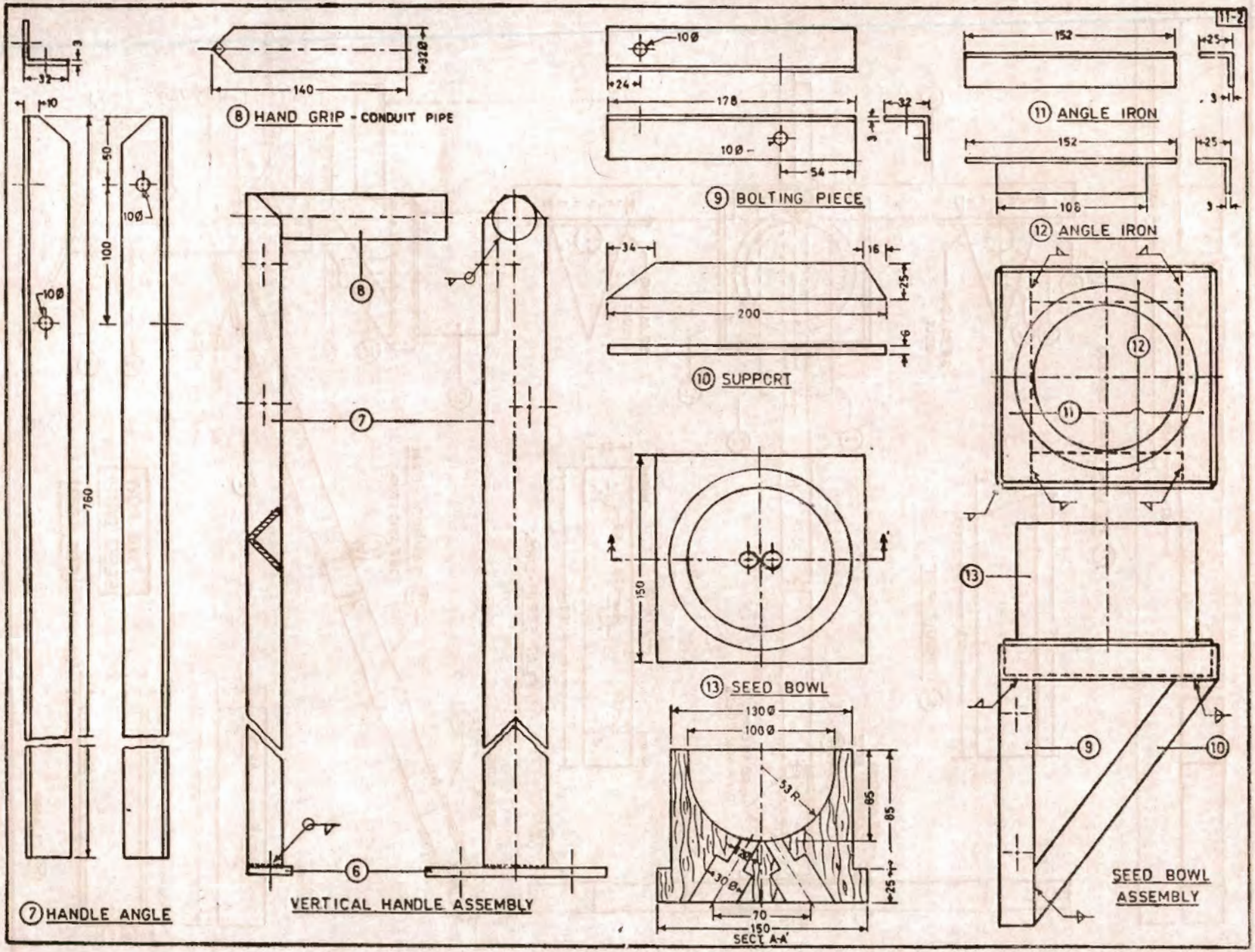
24" long tool bar is made from $1\frac{1}{4}" \times 1/8"$ angle iron pieces line welded to form the square bar. As shown on Design Plate : 2, 12 holes of 3/8" diameter are drilled to fix two share assemblies at different distances between the two. Two holes on the other plane of the tool bar are for bolting vertical handle assembly. Care should be taken to fix the tool at equal distances from the middle of the tool bar.

2. & 3. Angle Irons

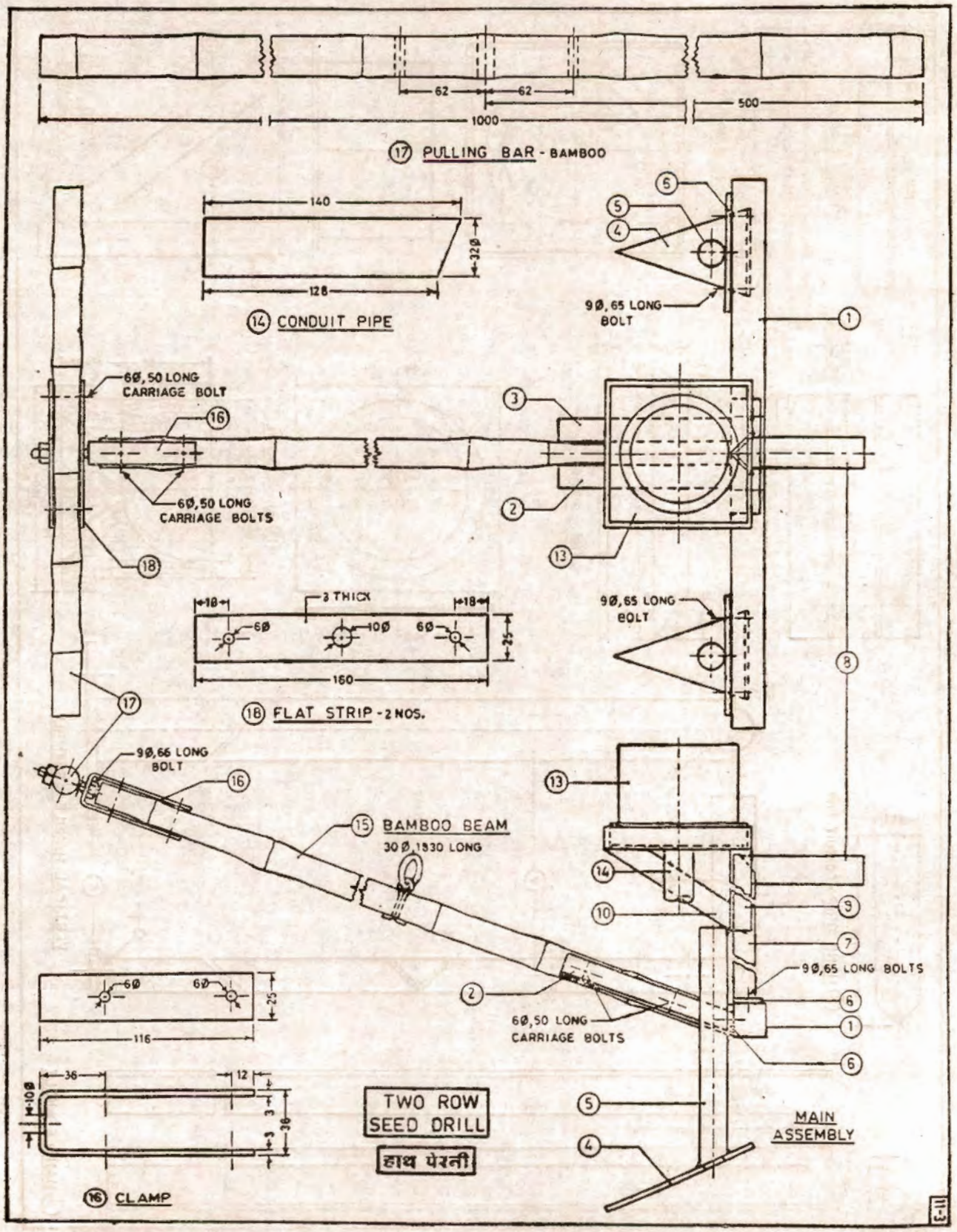
Two angle iron pieces of $1" \times 1/8"$ size and 8" length are welded to the tool bar making 70° angle as shown in tool bar assembly on Design Plate : 2 Two 1/4" diameter holes are drilled at a distance of 4" leaving 1" space from one end of the angle iron pieces. The other end of each piece is cross chiseled such that the chiseled side makes 110° angle as shown.

When the taper ends of the angle iron pieces are welded to middle of the tool bar (1) at 1" spacing. they make 70° with the vertical.


9Ø HOLES
40 40 40 40 40 40 40 40 40 40 40 40
800
10Ø
80
① TOOL BAR
6Ø HOLES
25 100
110°
200
② ANGLE IRON
6Ø HOLES
100 25
110°
200
③ ANGLE IRON
TOOL BAR ASSEMBLY
70°
100
25Ø
40
178
5
④ SHARE
32 X 3
ANGLE IRON
10Ø HOLES
52
80
130
8
⑥ FLAT STRIP
780
52Ø
⑤ CONDUIT PIPE
115°
30
SHARE ASSEMBLY


11-2
⑧ HAND GRIP - CONDUIT PIPE
⑨ BOLTING PIECE
⑩ SUPPORT
⑪ ANGLE IRON
⑫ ANGLE IRON
⑦ HANDLE ANGLE
VERTICAL HANDLE ASSEMBLY
⑬ SEED BOWL
SECT A-A'
SEED BOWL ASSEMBLY

Design Plate : 4



4. Share

Triangular share is made from 1/4" thick mild steel plate. Base of the triangle is 4" and altitude is 7". At a centre distance of 2" from the base a hole of 1" diameter is drilled.

5. Conduit Pipe

It is 10" long conduit pipe of $1\frac{1}{4}$" diameter. It is cross cut at one end as shown. This taper end is welded to the share just over the hole in the share (4). The share makes an angle of 115° with the pipe.

A flexible PVC pipe to carry seeds fits over the conduit pipe. The other end of the PVC pipe fits to the seed bowl assembly.

6. Flat Strip

It is a mild steel flat of $1\frac{1}{4}" \times \frac{1}{4}"$ size and 5" length. Two 3/8" diameter holes are drilled at a centre distance of 3" leaving equal distance from the ends. The flat strip is welded to the conduit pipe (5) such that its centre line is 4" away from top of the pipe as shown in the share assembly. Then the flat strip is bolted to the tool bar while assembling the tool.

The similar flat strip is welded to the bottom of the vertical handle (7) also for bolting the handle to the tool bar.

7. Handle Angle

It is an angle iron of $1\frac{1}{4}" \times 1/8"$ size and 30" long. As shown in the Design Plate : 3 two holes of 3/8" diameter are drilled on the two sides of the angle iron. Hand grip (8) is welded to the top end and the flat strip (6) is welded to the bottom end of the handle.

8. Hand Grip

It is a conduit pipe of $1\frac{1}{4}$" diameter and $5\frac{1}{2}$" length. One end of the hand grip is cut to form a right angle shape. This end is placed into 'V' of the handle angle (7) top end and welded.

9. Bolting Piece

It is an angle iron piece of $1\frac{1}{4}" \times 18"$ size and 7" length. Two 38" diameter holes are drilled as shown. The bolting piece connects the handle angle (7) and seed bowl (13).

10. Support

It is a $1' \times \frac{1}{4}"$ mild steel of 8" length. Both ends are cut, as shown, and welded to the bolting piece (9) and angle iron (11).

11. & 12. Angle iron

These four angle iron pieces form a square seat for the seed bowl (13). Each angle iron is of $1" \times 1/8"$ size and 6" length. From two pieces slots are cut out from both ends. Then the four pieces are positioned to form a square and welded. To this square the bolting piece (9) and the support (10) are welded as shown in the seed bowl assembly.

13. Seed Bowl

It is prepare from a hard wood block of size $6" \times 6"$ and $4\frac{1}{2}$" height. Across the direction of the fibers, a 4" diameter hole is cut out upto depth of $2\frac{1}{2}$". At the same time the block's outer face is also turned round leaving 1" portion at the bottom. At a centre distance of $2\frac{3}{4}$", at the bottom of the block, two holes are drilled as shown in the Design Plate : 2. First $\frac{1}{2}$" diameter through holes are drilled. They open, touching each other, in the half round seed bowl as shown. These two holes should be precisely drilled such that there remains only a thin edge of wood between the two holes when they open in the half round hole. If precisely done the seed or fertilizer fed to the bowl distribute evenly into the two holes. Then the holes are enlarged into $1\frac{1}{4}$" diameter upto half of its length.

14. Conduit Pipe

These two pieces of the conduit pipe are meant for separating two channels from the seed bowl. They penetrate into the two holes at the bottom of the seed bowl and at the other ends of the pipes flexi-

ble PVC pipes are slipped over. The other end of the PVC pipes slips over the conduit pipe (5) of the share assembly.

The conduit pipes are $1\frac{1}{4}$" in diameter and $5\frac{1}{2}$" long. One end of each pipe is cross cut such that when end is inserted in the seed bowl, the cross cut end remains parallel to the ground. Purpose of the cross cutting is to facilitate easy fitting of the PVC pipes.

15. Bamboo Beam

It is $1\frac{1}{4}$" diameter solid bamboo of 72" length. Its one end is chiseled to fit between two angle iron pieces (2) and (3) welded to the tool bar (1). At the other end of the beam a clamp (16) is fixed as shown. At the middle of the beam one metal ring is fixed with a cotter pin. The ring is provided to tie strings, as a tie bar, between the ring and the support strip (10).

16. Clamp

This clamp is prepared from 1" × 1/8" mild steel flat strip of 11" length. From the middle it is bent in 'U' shape keeping $1\frac{1}{4}$" gap between the two sides. Four holes of $\frac{1}{4}$" diameter are provided for bolting the clamp with the bamboo beam end.

Purpose of the clamp is to connect the beam (15) and pulling bar (17). Before bolting the clamp to the beam one 3/8" diameter bolt is passed through a hole at the middle of the 'U' bend of the clamp. Head of the bolt rests in the clamp and later, pulling bar is fixed on the bolt with a washer and a nut.

17. Pulling Bar

It is a solid bamboo bar of $1\frac{1}{4}$" to $1\frac{1}{2}$" diameter are 40" length. It has one 3/8" diameter hole at the middle and two $\frac{1}{4}$" diameter hole at $2\frac{1}{2}$" distance on both side of the middle hole, Two flat strips are first bolted through the two $\frac{1}{4}$" diameter holes and then the bar is fixed over the bolt through the clamp with a washer and nut, such that the pulling bar is free to rotate around the axis of the bamboo beam.

18. Flat Strips

These two flat strips are bolted to the middle of the pulling bar as described before. They are 1" × 1/8" mild steel flat strips of 6" length. Three holes of the same size as in the pulling bar (17) are drilled on the flat strips at same centre distances as in the bar.

By assembling all the components described above Double Row Seed Drill is ready. Two conduit pipes of the seed bowl assembly and the share assembly are connected with transparent, flexible PVC pipes of about 36" length to complete the path of the seed or fertilizer.

The beam and the pulling bar of both the seed drills can be of conduit pipes instead of solid bamboo, according to coveniency and availability.

All the numbers in the brackets ( ) refer to Manufacturing Design Plates.

CONTACT AGENCY
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PLANT STALK PULLER

USAGE :

In crops like cotton, pigeon pea and similar others in which the plant stem or stalk is hard and woody, it is not easy to pull out the stems after harvesting the crop. If the stalk is not removed with roots next year's ploughing becomes difficult. The left over roots in the ground obstructs the ploughing and needs higher pulling power. Cotton crop is sometimes attacked with spotted ball-worms. So if the roots are left over with the worms they become nuisance in the next crop. In termite prone fields the roots are added attraction to the termite. Also left over roots absorb soil nutrients. Therefore it is essential to remove plant stalks with as much roots as possible.

For the purpose of removing plant stalks with roots Agricultural Tools Research Centre has redesigned and developed Plant Stalk Puller of Agricultural Department of Gujarat. In crops like cotton, pigeon pea the roots penetrate upto two feet of soil depth. It is not possible to pull out such stems with hands. While they can be very well pulled out by the Plant Stalk Puller by advantage of lever. The tool can also be used in maize and sorghum with hard stems.

METHOD OF USE :

Figure : 1 shows method of using the Plant Stalk Puller. The stem of plant is gripped between two jaws of tool. Then by tilting the handle as shown, the stem is uprooted. In the process the soil, upto the depth of the roots, also gets loose. This facilitates better airation and quality of the soil improves. First ploughing of the following year also becomes easier. The operator goes on removing stems by moving in back direction. With cotton crop, one person can cover one to two acres in one day, according to plant population.

MANUFACTURING PROCESS

There are four components of the Plant Stalk Puller :

[1] Tongue
[2] Stay
[3] Handle
[4] Support

1. Tongue

It is forged from $1\frac{1}{2}'' \times \frac{1}{2}''$ mild steel flat of 19" length. After leaving 3" length at one end, as a jaw, the flat is bent in a semicircular shape as shown in the Design Plate. The rest portion of the flat is twisted at right angles. It acts as a footrest while

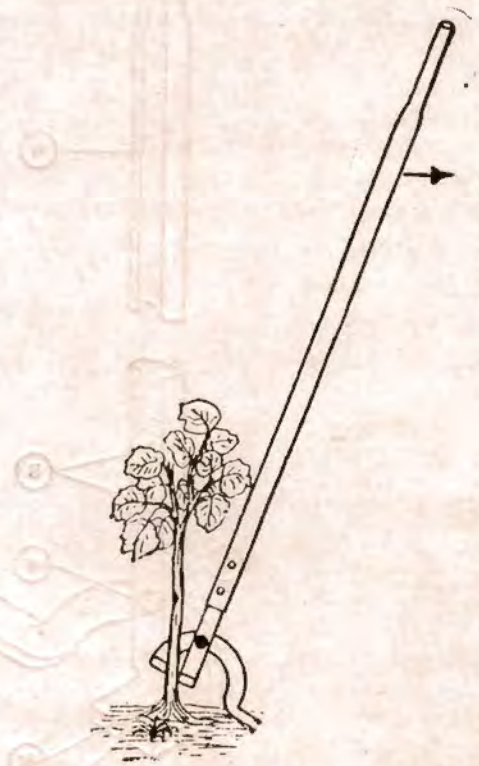


Figure : 1 Method of using the Plant Stalk Puller

tilting the tool for pulling a stem. A flat mild steel bracket is welded to the footrest and the semi-circular portion for strength purpose. The edge of the jaw is knurled for firm grip of stem.

2. Stay

It is shaped from $1\frac{1}{2}'' \times \frac{1}{2}''$ mild steel flat piece of 12" length. One end of the flat, for 3" length is bent into 'L' shape. This end acts as another jaw to hold the stem. Its edge is also knurled for firm grip of the stem. The other end of the flat is hot forged for 3" length to fit into the handle of galvanized iron pipe. Two holes are drilled on the flat $-\frac{1}{4}''$ diameter hole for rivet and $\frac{1}{2}''$ diameter hole for pivot bolt.

3. Handle

For few years the handle was made from mild steel sheet, bent in channel shape as shown in Fig. 2. Later, after introduction of hybrid varieties of cotton and other crops, stronger handle was necessary. So now thick walled galvanized iron pip of 1" diameter and about 46" length is used as a handle. G. I. pipe is strong enough but light in weight.

One end of the G. I. pipe is made little oblong to fit over the end of the stay [2]. About 3" length of the stay end is inserted into the handle end, welded at the edge and rivetted also, as shown.

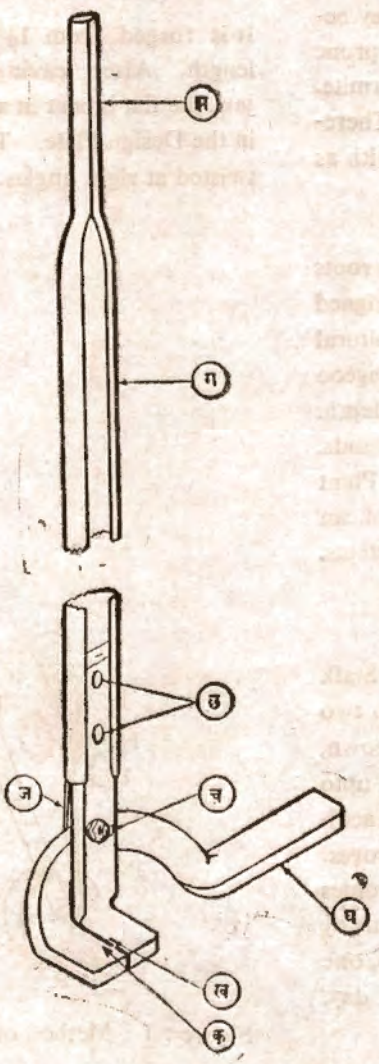
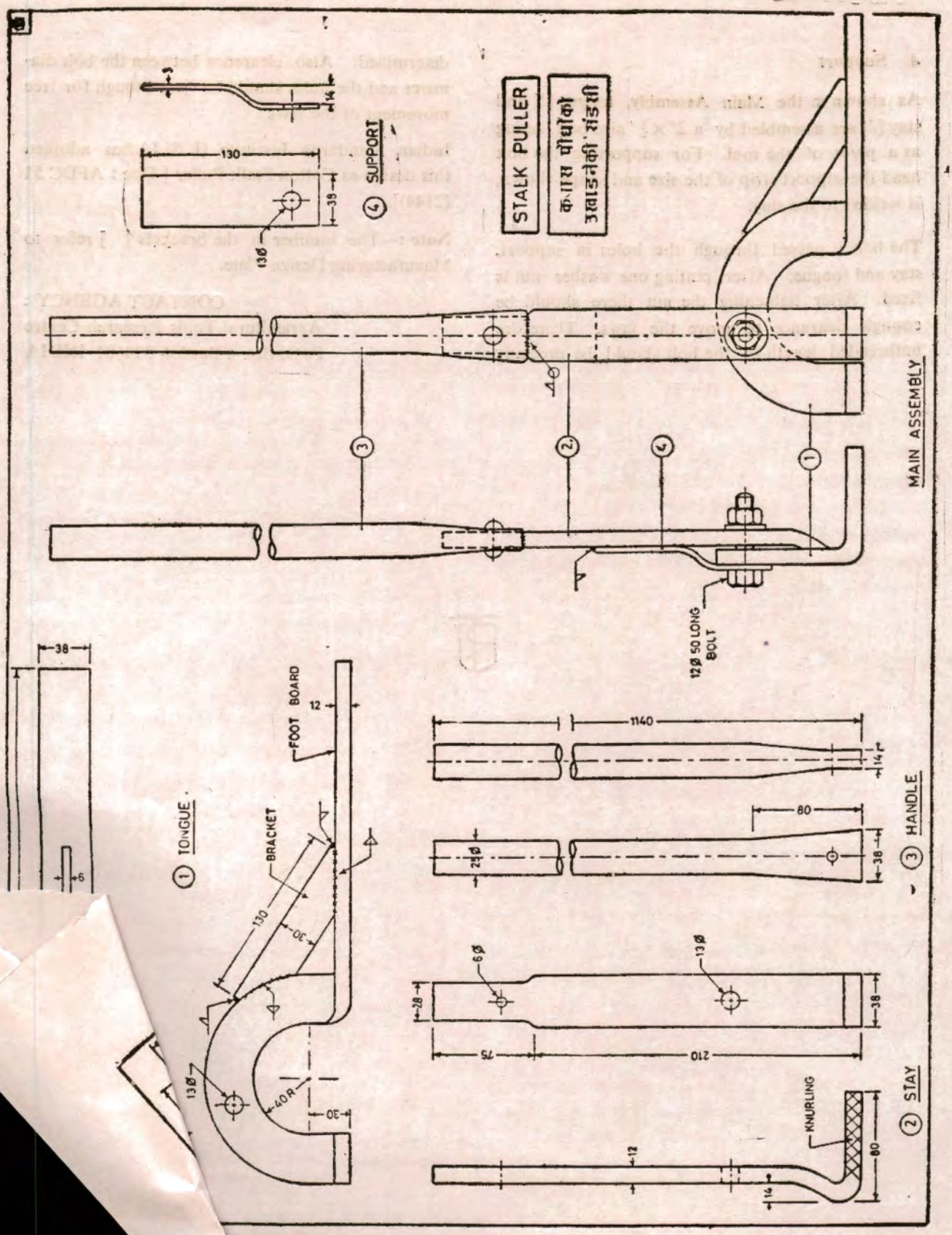


Figure : 2 First Design of the Plant Stalk Puller.

Design Plate



4. Support

As shown in the Main Assembly, tongue [1] and stay [2] are assembled by a 2″×½′ size bolt, acting as a pivot of the tool. For supporting the bolt head the support strip of the size and shape shown, is welded to the stay.

The bolt is passed through the holes in support, stay and tongue. After putting one washer nut is fixed. After tightening the nut there should be enough clearance to move the jaws. Therefore unthreaded length of the bolt should be precisely determined. Also clearence between the bolt diameter and the holes should be just enough for free movement of the jaws.

Indian Standards Institute (I. S. I.) has adopted this design as Cotton Stalk Puller [Doc : AFDC 51 (2144)].

Note :—The number in the brackets [ ] refer to Manufacturing Design Plate.

CONTACT AGENCY :
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SPOT LIGHT

N. R. D. C. PROMOTES DEVELOPMENT OF RURAL TECHNOLOGIES

The N. R. D. C. provides interest free loan/grant for converting ideas into products/process for the benefit of rural masses.

N. R. D. C. has set up several Rural Technologies Development-Cum-Training Centres in various parts of the country for transfer of appropriate technologies in rural areas.

N. R. D. C. is now offering funding of rural technology projects, upto a maximum of Rs. 5.0 lacs, based upon useful and concrete ideas, which lead to income/employment generation, filling technology gap and capable of quick replication.

Registered societies, voluntary, organisations, and technical institutions etc. with good track-record can apply to N. R. D. C.

The end result of such projects will be made available to N. R. D. C. for commercialization and transfer etc.

For further details please write to
Mr. S. Burman,
Development Engineer,
National Research Development Corporation,
20-22 Zamroodpur Community Centre,
NEW DELHI-110048,

FROM BARREN LAND TO OASIS

Three years ago it was a barren and desolate stretch of land scarred by ravines and gullies. But thanks to a National Dairy Development Board (NDDB) project. Sarnal today has been transferred into an oasis. Situated on the banks of the Mahi, a short distance from the Ahmedabad Godhra highway. Sarnal was a near-wasteland when a team of the Tree Growers Cooperative Project (TGCP) of NDDB visited the area in 1987. The team confronted by 60 to 70-feet deep gullies and large gashes criss-crossing the steep slopes of ravines. Indiscriminate felling of trees and overgrazing had led waste to the land.

Not disheartened by the sight, TGCP took up the challenge to turn the area into what is today an oasis of green trees, thick bushes and thriving animal life. The tree Growers Cooperative Society was registered in May '1987 and about 35 hectares of land leased to the cooperative.

It was the third year of drought in Gujarat, with the mercury touching 46 degrees Celsius, the TGCP team organised contourline marking, gully plugging, bunding and pitting.

But there were misgivings about the survival of the trees because of the drought. During the first year (1987) the rains were scanty. One or two light showers resulted in slight retention of water and soil in the gully beds : Trees were first planted in August that year. Led by TGCP team leaders Mr. Theophilis and Mr. J. R. Panwar, the people of Sarnal worked hard to plant trees in soil which had little moisture.

According to statistics available at NDDB about 11,000 trees of acacias prosopis and other species were planted in 1987 of which about 5,000 survived. A thin cover of grass and legumes developed in the area by the end of August. But for lack of rains the trees started wilting. The TGCP team then decided to instal a handpump in the gullies, which in a way heralded Sarnal's long battle against drought. In the summer of 1988, trees were watered by hand. Water was fetched from the Mahi river as well. But while all this was going on, the people of Sarnal had to face another problem-illegal grazing. Nomads let their animals into the plantation area twice resulting in the loss of a number of trees. With the onset of the monsoon in July, 1988, the

ravines came alive as trees and grass grew rapidly. The gullies were filled with water and soil erosion was minimised. By September, 1988, Sarnal's barren and desolate ravines had blossomed into an oasis.

PLASTIC COATING FOR LOW COST MUD HOUSES :

Scientists working at the Indian Petrochemicals Corporation Limited (IPCL). Baroda, have developed and successfully field tested a technique that promises to revolutionise traditional low cost mud houses in India.

Traditional mud houses are constructed out of lumps of mud, sun-dried mud blocks or sundried bricks. The walls of these mud houses are covered with layers of earth followed by layers of animal dung soaked in water. These walls become damp in monsoon, develop cracks with time and erode due to the deterioration of materials used in plastering and the chemical nature of clay. The humid substances present in soil absorb moisture, cause non-uniform expansion and contraction resulting finally in cracks and erosion in monsoon.

The clay contains aluminium silicates arranged in layers. In the inter-layer spacing, alkali and alkaline metals on earth form hydration layers. These moist surfaces do not keep the clay surface smooth and long lasting.

It has been found that dung-clay-husk plaster surface has a suitable structure on which a plastic film can be bonded. But the walls of the mud houses have to be specially prepared for treatment with Poly Vinyl Chloride (PVC), to make them water proof and durable.

They are first made uniform before application of dung plaster. Irregular, undulating and loose material if any is scrapped with a trowel to make smoothen the surface. If there are appreciable cracks on the surface these are filled with ordinary mud slurry and then allowed to dry thoroughly. After sprinkling the walls with a little water to improve bonding, dung plaster–a mixture of dung-husk-water-is applied up to a thickness of 25 mm by a wooden or metal trowel and allowed to dry to make the surface uniform and smooth once again. If some cracks appear during the drying process they are filled with the plaster. Filling and drying may have to be repeated to obtain a well dried, hard, smooth and crack-free surface before application of PVC.

PVC is dissolved in cyclohexane and diluted with iomax, Any desired colour shade can be added to the solution. The prepared is applied with a painter's brush carefully so that it spreads on the entire surface uniformly. With two hours of coating, all the solvants evaporate leaving a thin film/layer of PVC on the mud walls. The cost of such PVC coating is only Rs. 14 per square metre.

Three mud houses in a village in Orissa were coated with the newly developed PVC solution in July 1985. While all other mud houses constructed at the same time needed replastering at intervals of 5-6 months and some of them which were not replastered in time displayed wearing out of plaster, the houses coated with PVC appeared smooth, glossy and the PVC layer was found intact even after three years, when they were inspected by a team of scientists from IPCL in February 1988 and subsequently in July 1989.

The new solvant system is safe, less toxic and the PVC layer can be directly applied on cow-dung-plaster. A model PVC coated mud house showed extremely good performance during monsoon.

The low-cost, durable and easily applicable indigenous technology based on petrochemical products made in India provides an acceptable choice for cheap rural housing projects to make the "Shelter for Homeless" projeet a success.

BAMBOO PLYWOOD

A Kerala-based company has come out with Bambooply—plywood made out of woven bamboo mats, wood veneer and an organic resin as adhesive, which is water and heat resistant, termite proof and safe from attacks by white ants.

Bambooply is available in different sizes and thicknesses ranging from 4 mm to 12 mm. It is the best natural material for false ceilings, panelling, partition walls and works as a substitute for quality plywood made out of costly timber. Bamboo is a naturally renewable product and does not consume non-renewable petroleum product used in the plastic industry.

The new natural panelling material from bamboos is claimed by manufacturers to be the first such product in the world and is also suitable for furniture, doors, windows, table/teapoy tops and meets all the requirements of a structural material. It is a novel product where bamboo mats–a hand woven cottage industry product–has been blended with modern day plywood.

THE COCKROACH : A REASON FOR LIVING

TWO MICRO-ORGANISMS which live in productive harmony in the hind-gut of cockroaches are exciting microbiologists at the University of Dar es Salaam in Tanzania. Commenting on the creatures, Dr. Huub Gijzen of the microbiology unit says they are "a complete machine for the conversion of plant matter (biomass) into fuel".

The organisms *Nyctotherus ovalis*, a type of ciliate or protozoan—a minute acellular organism—and the methane producing bacteria which live within it, are being cultivated in fermentors to convert organic matter into fuel. Thousands of bacteria are found within a single ciliate cell.

Researchers were alerted to the potential of the bacteria inhabiting cockroaches because it had been observed that these omnivorous creatures could eat and digest almost any organic material, including cellulose, which makes up most of the mass of plant material and is in abundant supply. Research results are 30 to 100 100 times those reported for conventional methane digesters.

GARBAGE RAKES IN PROFIT AS FERTILISER

A bio-chemical process developed by a Bombay industrial group to convert city garbage into highly useful organic fertiliser has won laurels from the Asian Institute of Technology at Bangkok, the continent's most prestigious of its kind.

At a recent seminar in Bangkok, eminent technologists and experts showed a keen interest in the process developed by Mr. K. C. Shroff, managing director, Excel Industries Ltd., and his team of scientists. Mr. Shroff carried out successful experiments at Bombay, Vadodara and Mandvi (Kutch).

The Bombay municipal corporation has already started unloading ten trucks of daily garbage at the Excel Estate at Amboli, a Bombay suburb, for conversion into fertilizer. Also, Mr. S. S. Tinaikar, Bombay's municipal commissioner, has asked the company to devise a working plan to improve the efficiency of the civic body's gaint compost plan at Mankhurd.

Mr. P. L Punia. managing director of PICUP, the government enterprise, who saw the working process of the plant has offered to adopt it in major cities of Uttar Pradesh starting with Kanpur.

The Excel Industries has plants at Bombay (Amboli and Jogeswari). Bhavanagar, Vadodara and Roha (Lord Parsuram, near Chiplun) in Maharasthtra. It has collaborations with the Punjab, Gujarat and U. P. Governments.

SPOT LIGHT

The Shroff family's experiment in waste started in a small way at Kalani, a small town near Vadodara and was soon extended to Mandvi in Kutch, Bombay, with it's record amount of daily waste was naturally the third step.

The process involves pneumatically separating the garbage into organic and inorganic waste and spreading the organic garbage into the pits. It is then fermented by adding benign microbes and phosphates. The fermentation takes about a month or 35 days, by which time the waste throbes with life and becomes a fibrous powder.

The proportion in which microbes and phosphates are added has been kept a closely guarded secret by the Shroffs. The credit for the innovation goes to Mr. K. C. Shroff, Mr. G. C. Shroff, Mr Dipesh Shroff, Mr. Hasmukh Patel and Mr. Tulsibhai Gajra.

Mr. G. Narayana corporate adviser of Excel, who attended the international seminar on "Bio-technology of Agro-industrial Waste" at Bangkok, described the company's success. We are unaware of such a useful conversion into organic fertilizer anywhere in the world.

Disposal of daily refuse has been a nagging and knotty problem the world over, more so with the developed countries. The most popular method has been to dump the waste in the open spaces for land reclamation. In some countries part of the waste is burnt down in giant incinerators. This is followed in many Asian countries, particularly Thailand. But it is not possible to burn down inorganic waste such as glass, metal and plastic.

In Thailand, the civic authorities have adopted the practice of placing twin refuse bins on streets, exhorting people to dump organic garbage in green bins and glass, metal, plastic etc. in red ones.

Among the metropolitan cities in India, Bombay leads the rest in everyday accumulation of garbage, closely followed by Calcutta.

Explaining the advantage of using organic fertilizers, Mr. K. C. Shroff said it enriched the soil and enabled the land to hold water for a longer period thereby increasing the productivity of the soil. Also vegetables and other commodities grown by the use of organic fertilizers kept their original taste.

The chemical fertilizers in contrast has several disadvantages. Their repeated use harms the land and brings down productivity The soil becames hard and its capacity to hold water comes down. The produces are also less tasty.

Organic fertilizer is cheaper to make through this method. The garbage is almost free and the cost involved is in preparing the pits, breeding microbes and using phosphates is not much. A truckload of organic fertilizer is estimated to have a manufacturing cost of Rs. 500/- while the marketing team can easily sell this at Rs. 900 per truckload.

But everything is not hunky-dory with the organic fertilizer. The use of chemical fertilizer per acre is estimated at 150 kg., while organic fertilizer needed for the same acreage is 6,000 kg. But this is more than compensated by two factors; the price difference and increase in yields.

The price of urea is stated to be Rs. 2,450 a ton and on DAP Rs. 3,760 a ton, while the organic fertilizer costs only Rs. 140/- a ton. Secondly, chemical fertilizer is needed before every crop whereas with the single use of organic fertilizer at, least three crops can be taken in a year.

Excel is planning to introduce the organic fertilizer in the market soon. Emboldened by their experience at Mandvi where they collected five trucks of garbage in a day and converted it into organic fertilizer worth a tidy sum of Rs. 9.5 lakhs, their next move will be exports. With the high cost of transportation to distant countries, franchises could be in the offing.

The sky is the limit for innovators as theysay.

AGRICULTURAL WASTES : NEW SOLAR INSULATORS

Scientists in Jodhpur have devised a new cost-effective system of storing solar-heated water upto 24 hours for domestic use.

The new system, developed by the Central Arid Zone Research Institute (CAZRI) uses agricultural wastes like saw dust, pearl millet husk and wood scrap as insulating agents to prolong the storage period of hot water. The system is reported to be efficient in decreasing heat loss from the container to the atmosphere outside.

The system involves three identical storage systems, each having two concentric cylinders. The insulating material is filled in between the cylinders.

The inner cylinder, which houses the water tank, is made of galvanised iron and has a capacity of 196 litres. The outer cylinder is made of PVC-coating iron sheet. The quantity of insulating material varies with its density.

A 1.6 × 1.6 metres square flat plate collects the solar radiation which heats up the water. Normally, a storage system with about 180 litres capacity requires two such solar collectors which are provided with glazed plane glass on the surface for absorbing heat.

The plane glass allows the solar radiation to reach the collector and prevents the accumulated solar heat from escaping out. The collectors transfer the heat to the stored water.

Special gate valves connect or disconnect the storage systems to their respective colletors. A suitable overflow provided at the top of each storage tank helps to remove excess water.

The use of agricultural wastes as insulators reduces the total cost of the device. CAZRI, scientists say. The system is also efficient and easy to fabricate.

Studies show that with glasswool, the new system recovers 74.9 percent of the solar heat, and 59.4 percent with pearl millet husk. Saw dust is reported to give even better results than glasswool when water is stored overnight.

SERICULTURE TURNING INTO A MAJOR CASH CROP

Introduced as a subsidiary occupation by Capt. Hutton in Jharipani in Mussoorie in 1856 to be followed by the establishment of a 3471 acre farm in Resham Majra about six kilometres from here in 1881 by M/s Liston and Company, a reputed textile manufacturing firm in England, sericulture is enroute to becoming a major vocation in Uttar Pradesh.

Although only 2,647 families are now practising sericulture on 252.13 acres spread over Dehra Dun district and in small pockets over a dozen more districts, the Regional Sericultural Research Station (RSRS). Resham Majra, is confident of developing sericulture into a major cash crop in 37 districts of the State in the next 15 years.

The sericultural development plan has its roots in the fact that the silk industry of Uttar Pradesh consumes 2.5 thousand metric tonnes of silk fibre annually while the domestic production was only 30 metric tonnes. Rest of the silk fibre demand is met by Tamil Nadu and Karnataka. Uttar Pradesh consumes 50 per cent of the country's silk fibre produce.

Statistics evolved over the last couple of years, reveal that in Uttar Pradesh, sericulture yields an annual income of Rs. 30,000 per acre to the farmer. This is higher than the income from sugar cane which is presently the major cash crop of Western Uttar Pradesh districts. Of late, sugarcane has become a less profitable cash crop as although land under it increased manyfold over the past decade, the number of sugar mills has not increased in proportion. The often leads to distress sale by cane farmers.

Further sericulture farming does not involve usage of heavy machinery like tractors or large number of labourers and irrigational facilities. A family of five can easily employ themselves to rear silkworms and grow mulberry bushes on an acre with very little training imparted by the RSRS and the State Sericulture Department personnel. The Rs. 30000 per acre income includes Rs. 18,000 of labour charges, which the family can avoid by employing themselves.

UPGRADED

Established in 1973 as Univoltine Research Station in Resham Majra, it was upgraded to a Regional Sericultural Research Station in 1986. It caters to the Research and extension needs of Uttar Pradesh, Madhya Pradesh and Haryana.

The Central Silk Board (CSB) has granted an aid of Rs. 5.5 crores to the RSRS for bringing 3,000 hectares in Dehra Dun and 1,000 hectares in Saharanpur under sericultural farming over the next five years. The aid is from the Rs. 55.5 crore National Sericulture Development Project founded by the World Bank. The Board has also asked Mr. Gupta to expeditiously draw up a plan to promote bivoltine silk races in the eight hill and seven tarai districts of Uttar Pradesh.

The hill and tarai districts provide the best climate for bivoltine races and since the mulberry plants are hardy and can grow on almost any terrain, the scheme when introduced on a big scale in this region is bound to make Uttar Pradesh the leader of silk industry, says Mr. Gupta. He has developed after converting 60 released dacoits into good sericul urists in the Nadia district of West Bengal a few years ago. These hardworking sericulturists working out of the one acre wasteland plots given to each of them are now back in the social mainstream and recently persuaded the West Bengal Government to open a primary school and primary health centre there. They are now earning an annual profit of Rs. 23,000 and with time they will earn more and demand more civic amenities.

DIVERSE GENEPOOLS

The RSRS maintains 19 bivoltine and 12 multivoltine silkworm races of diverse genepools. It is studying about 50 lines under various breeding trials out of which four high yielding races Sh6, JD6, SF 19 and YS3 have been selected for field trials in Dehra Dun, Saharanpur, Muzzafarnagar and Meerut districts.

Special emphasis is laid on developing and promoting bivoltine races and their hybrids as the silk produced by them was of international quality standards and fetched a better price. Bivoltine hybrid crops can be taken twice a year while the inferior but hardy multivoltine races yield four crops a year.

The JD6 × NB4D2 and SH6 × NB4D2 Bivoltine hybrids released by the RSRS have been found very suitable to the climatic conditions of spring and autumn seasons of Jammu and Kashmir. The RSRS has been supplying the entire silkworm layings demand of that State for the past three years. This has affected a foreign exchange saving of Rs 18.00 lakhs per year.

The RSRS will be soon releasing two promising Bivoltine hybrids Sh6 KA and SF19 × C122 which have been found performing well during both the autumn and spring seasons. These hybrids have produced about 110 kg of cocoon per 100 disease free layings (DFL) during spring and about 80 kg of cocoon per 100 DFL during autumn.

Leaf yield of mulberry is generally more during summer and monsoon seasons but these seasons are not suitable for rearing bivoltine silkworm races. To tap the mulberry bush potential during these seasons the RSRS has ev.lved suitable multivoltine × bivoltine hybrid races as the multivoltine races are more resistant towards adverse climatic conditions of high temperature are humidity. Of these the performances of MY1 × NB4D2 and MY1 × YS3 have been found most satisfactory both in late

spring and late autumn. These hybrids have produced 51 kg of cocoon per 100 DFL during late spring and about 63 kg of cocoon per 100 DFL during late autumn.

These hybrids would be put to selective demonstration trials in various districts to make them popular amongst the farmers.

As many farmers wish to supplement their earnings through an additional crop during monsoons the RSRS has evolved N×MY1 race as a multi×multi hybrid for rearing in monsoon season. This hybrid gives about 35 kg of cocoon per 100 DFL.

The RSRS staff has evolved a simple and cheap method for rendering the mulberry leaf disease free by dipping the leaves in a 0.001 percent solution of potassium permanganate before feeding them to the silkworms. What has made the researchers more happy is that sikworms tend to eat more and grow faster when leaves dipped in the solution are used for feeding them.

A similar experiment is the Tent Rearing System introduced recently by the RSRS. Under the system, silkworm rearing trays provided by the RSRS or State sericulture department are placed on improvised racks made of bamboo or any other material. The rack is covered by a tent or any material that would keep out excessive heat, wind and rain. A 13.5 ft by 6 ft five tiered economic rearing house yields an income of about Rs. 3,000 during the spring and autumn seasons in places like Dehra Dun. This system is most suited for landless labourers. This concept has been appreciated by Japanese scientists who visited the station recently.

The RSRS has made an equally good contribution in improving the yield and quality of mulberry leaves. The high yieding S 146 and Kanava-2 released by the station earlier have become quite popular.

According to Mr. Gupta, the RSRS is helping farmers establish Kisan nurseries to meet the sapling demands of sericulturists. An acre of mulberry nursery can yield Rs. 30,000 as income with not much labour. This income was equal to the per acre income of the silkworm growers. The RS provides cuttings of mulberry to the Kisan nurseries from its own farm.

To protect growers from distress sale the RSRS purchases all the cocoons produced at a support price.

POISONING FROM PESTICIDES INCREASES

While the importance of integrated pest management to crop yields, and of the place of pesticides in successful IPM, is undeniable, so too is the fact that accidental poisoning by pesticides is increasing.

The World Health Organisation has estimated that more than a million people are affected each year, though the number of deaths caused by poisoning is thankfully few.

Natural Resources Institute is working on ways of improving the safety of pesticide application. Lucy Ambridge, of the Pesticide Management Section, told RESOURCE : 'We must make farmers aware of potential risks.

'Penetration through the skin is the most common route by which pesticides enter the bodies of workers."

'Protective clothing is available, but is not always suitable for use in hot climates, where the wearer could risk heat exhaustion.'

'But our advice is that everyone applying pesticides in the tropics should at least wear light and durable cotton overalls and that these should be washed frequently to remove contamination.'

'If overalls aren't available, long trousers without turn-ups and long-sleeved shirts are acceptable alternatives, but they too must be washed after use and kept away from everyday clothing.'

Lucy Ambridge emphasised : 'Every worker in the fields should wash with soap and water after spraying and before doing anything else'.

SOLAR-POWER GENERATOR

Researchers at Sandia National Laboratories in the U. S. have produced a solar power generator called a photovoltaic concentrator which is more efficient than all others of its type.

The device has 12 plastic lenses that concentrate sunlight to 100 times its normal level onto 12 silicon solar cells. Its peak efficiency is 20.3 percent. "Industry should be able to duplicate most of the design features very quickly", says Eldon Boes, supervisor of Sandia's Photovoltaic Technology Division.

The key economic innovation is the relatively inexpensive lenses that multiply the intensity of light from the Sun by several hundred times, focusing it on a cell. Without these lenses, many more expensive cells would be necessary to obtain the same power.

Another important feature of the generator is the prismatic cell cover that bends sunlight away from the thin metal gridlines carrying the current. This increases the amount of light that strikes the silicon surface, and allows wider, more efficient gridlines to be used.

The researchers also found a way to solder the silicon cells directly to the underlying copper contacts, which help to remove heat. This eliminates the need for the usual ceramic insulator which other photovoltaic concentrators have between the two layers, because copper expands thermally five times as much as silicon.

An anti-reflective layer of magnesium fluoride solution was applied to both surfaces of the Fresnel lenses to increase the amount of light they transmit. The researchers measured an increase in transmission of about two percent.

ACTION PLAN FOR BIO-FERTILISER

The government has launched an action plan to take blue green algae, a bio-fertiliser, to the fields, Four to six regional centres, to multiply the BGA will be set up all over the country under the plan this year ; later efforts will be directed towards taking up this work in the fields itself.

Government's effort is to provide at least 20 to 50 kg of biofertiliser per hectare in about 80 million hectares of the country's rice-growing fields (rice is grown in approximately twice this area).

The average fertiliser consumption per hectare currenlty is less than 15 kg.

Inaugurating the symposium, the minister of state for science and technology, Prof. M. G. K. Menon, stressed the need to increase the country's food production through low-cost energy consumption methods, especially by using biofertilisers.

He pointed out that a single percent growth in agricultural sector results in a 2.5 per cent growth in energy needs. Energy is a high-cost input. Can we afford it, he asked.

A few figures, quoted by him, illustrate the point. The population grew by about 60 per cent in the last few years and the food production growth rate was 67 per cent. But, to achieve this, the consumption rate of fertiliser increased by over 1000 per cent.

FOOD OUTPUT :

The annual food production now stands at 170 million tonnes, with an average yearly rate being around 3.5 million tonnes. But when the country's population is estimated to become 1000 million from the present 800 million by 2000 AD. the food production should increase to about 240 million tonnes.

This means that the annual food production rate should be doubled during this decade. This is the challenge facing the agricultural sector.

NEW MOISTURE METER FOR COPRA

For many food commodities moisture content is a critical factor during storage and processing for ensuring acceptable quality standards.

One important commodity, produced from coconut is copra (dried coconut kernel), a source of oil and animal feed. In 1989 world production was estimated at 4.8 million tonnes.

Recent work undertaken in Britain and overseas by Stafford. Head of the Oilseeds and Edible Nuts Section shows that instruments currently available for measuring the moisture content of copra sometimes give inaccurate results.

He and Derek Cox, Head of Mechanical Engineering Section, are assisting a British manufacturer to develop a purpose-built meter. Proto-types will be field-tested in the Philippines, Sri Lanka and the Caribbean.

The meter provides a direct digital reading of moisture content of copra samples and will be simple to operate. It switches itself on and off, there is no need to correct for temperature changes, and readings at 6 percent and 20 percent moisture content are verified at the push of a button.

There will be further collaboration with the manufacturer to develop a system to monitor the moisture content of grain in bulk storage, which should help reduce post-harvest losses in developing countries.

FUELWOOD CRISIS NEED FOR A CHANGE IN APPROACH

Traditionally, people in India depend on government-owned forests and woodlots for their fuelwood requirements. Unlike agriculture, production of fuelwood to meet people's demands was considered as one of the functions of the forest department. With the gradual increase in the demand, reduction in the forest area, and excessive biotic pressure, the government owned natural forests, spread over 75 million hectares and comprising only 22.8 per cent of the total land area, could not meet the fuelwood demand. Owing to the high cost and difficulty in procuring fuelwood, illicit felling of trees increased to such an extent that in 1970-71 only 10 per cent of the total consumption of fuelwood was recorded by the forest departments, while more than 90% was accounted for illicit felling.

In the late 1950s, emphasis was laid on commercial tree plantations on private farms. These schemes attracted many large farmers because of the growing demand for commercial wood and profitability of fast growing commercial tree species like Eucalyptus, Casurina, etc. with short gestation period. As a result of this response, the government had already provided 9% of the forest development budget, under the head of social forests in the Fourth Plan. Towards the end of the Plan, the National Commission on Agriculture insisted on the need to strengthen the social forestry programme with the active participation of the local community.

By 1980, most of the state governments had established a separate social forestry wing in their forest departments to promote people's participation in producing fodder, fuel, small timber and other minor forest produce, to meet the local needs.

Even after ten years of the introduction of the social forestry programme, after pumping billions of rupees, it is difficult to find even a few cases where landless labourers have found year-round employment or the small farmers have found sustainable livelihood, through the establishment of fuelwood plantations. What could have gone wrong? First the objective of the social forestry department to restrict the scope to fuel, fodder and small timber production to meet the local needs, probably did not attract many farmers. It has been estimated that about 64% of the fuelwood utilised in the rural areas is collected free of cost, mostly by the small farmers. These villagers are interested neither

in fuelwood production nor in the purchase, until the free resources are exhausted completely. Same is the case with the production of fodder, particularly for the unproductive non-descript cattle living on the fodder resources of common properties. Therefore, most of the small farmers are not interested in concentrating their efforts on mere production of fodder and fuel. Second fuelwood fetches the least while the wood used for timber and commercial purposes would fetch 200-300% more. Schemes for establishing commercial species might attract small farmers but the Social Forestry department has no such programme.

The government feels that the small farmers should be developed into entrepreneurs by establishing fuelwood and other forestry plantations on the marginal and wastelands owned by them and these should be on lease. Theoretically it seems very sound and the objective is noble. But the small farmers probably consider it to be risky, as it is difficult for them to predict the returns till the produce is actually harvested.

It is estimated that by the turn of the century, we will need about 65 million tonnes of commercial wood every year. As the ratio of the commercial wood to fuel from a plantation is roughly 1:1, sincere efforts to boost the commercial wood production itself should be able to generate about 30-40% of the fuelwood required in the country. Promotion of horticultural crops, particularly, irrigated orchards would further ease the situation, without any expectation in the price rise.

PUTTING THE WEED TO WORK

The water hyacinth with its dark green fleshy leaves and pretty blue flowers has become an uncontrollable weed in most waterways in India. Its prolific growth rate and short life cycle ensures that it is almost impossible to eliminate, once established in a body of water. This fresh-water weed was introduced accidentally into Africa and Asia and has succeeded in causing major blockages in rivers and canals. The water hyacinth which contains 93 percent water as its total body weight, grows like a thick green blanket on the water surface and causes several problems. Apart from mechanically obstructing the flow of water, it presents a huge transpiring surface leading to tremendous water loss. Water which could be used for irrigation, generating electricity, washing and drinking. In addition, it blocks off sunlight, adversely affecting the biosphere in the water and upsetting the balance of aquatic life. Despite the evils attributted to it, there is a hidden bonanza of benefits in this vigorous, watery weed, allowing ample scope to turn adversity into good fortune.

By virtue of of its phenomenal growth rate and its near indestructability, the water hyacinth yields a vast and continuous supply of biomass which can be used to generate energy. Under experimental conditions, water hyacinth has been known to yield a harvest of 20 wet tons per hectare per day. Even allowing for the drained-off weight being half the wet-harvest weight and assuming seven percent of this to be actual plant material (93 percent is water), the daily growth rate works out to an extraordinary 0.7 dry tons per hectare per day or 250 tons per year. Experimental conditions cannot be extrapolated to the field but even a fifth of this output should yield 50 tons of dry biomass per hectare annually, under field conditions. In southern United States, the water hyacinth has shown annual growth rates of upto 45 dry tons per hectare. In India, with a higher year round insolation, it is not unrealistic to expect yields in the range of 50 tons from the field.

The ideal and perhaps the only practicable way of obtaining usable energy from fresh water aquatic biomass is to be produce biogas by anaerobic digestion, where the high water content of the biomass is not a disadvantage. India has already optimised digester technology for use in gobar gas plants. The same units can be used for wet biomass either alone or together with animal waste and farm

residues. In fact, studies have shown that the water hyacinth yields 16 percent more biogas than cowdung. It has been calculated that one ton of dry hyacinth can yield 424 cubic metres of biogas with a methane content of 65 percent. This is equivalent to the fuel value of 223 litres of kerosene oil. Even assuming an extremely low recovery of 10 to 12 tons of hyacinth per hectare annually, it is possible to generate 2,000 cubic metres of biogas per day from the hyacinth harvest of a 100 hectare water reservoir. This would meet the cooking fuel requirement of 5,500 people each day or run 100 five horse-power engines for nine hours a day. The optimal distribution of such biogas plants would be to set them up at source to service local village communities, much as has been envisaged for gobar gas. Biogas generated from water hyacinth or other vegetational biomass has one added advantage over gobar gas or biogas generated from human excreta : greater acceptance as cooking fuel in conservative rural communities.

The high cellulose content of water hyacinth makes it a potential raw material for the production of paper. The concept of using cellulose from aquatic biomass present as water weed or growing on non-cultivable land like marshes and swamps, is being tried out in development projects. Romania and Iraq are already using plant material derived from water reeds to supply their paper mills and are developing reed swamps to feed the paper industry. With a cellulose content of almost 60 percent, a 100 hectare reservoir of hyacinth would yield about 3,000 tons of cellulose per year, assuming an annual harvest of 50 tons per hectare. In addition to relieving the pressure on fast disappearing trees, hyacinth-derived cellulose is "cleaner" than that obtained from wood. It is free of gums and resins and has a low lignin content. This automatically means having to use less wash water in paper processing, thus conserving another valuable resource.

The least known and perhaps most attractive quality of the water hyacinth is its potential for reclaiming nutrients from municipal, industrial and agricultural wastes and for "polishing" water for re-use. So promising is this aspect that the National Aeronautical and Space Administration (NASA) is evaluating the weed for eventual use in hydro-organic recycling of wastes that would be generated in space stations. Trials are also underway in the United States to use the hyacinth to soak up toxic elements from industrial effluents, based on the plant's ability to absorb heavy metals. Weed ponds associated with waste treatment plants are the subject of a longitudinal study since 1975 and have shown promising results with regard to filtering out heavy metals from contaminated water. In Narbonne, France, the French National Agricultural Institute has an ongoing research project working on developing special lagoons to deal with waste waters arising from the wine and other agricultural industries. Here the approach has been to grow a variety of fully aquatic species like hyacinth, reeds algae in the waste disposal and treatment ponds of the industry, in order to clean the water before release.

The prospect of attaching hyacinth reservoirs to industrial units is both cost effective and practical in cleaning up process water before discharge. This has special relevance in developing countries which has limited funds for high-tech effluent treatment and where aquatic plants grow profusely as weeds, without any investment. Toxic elements concentrated in solid form are easier to deal with and their removal from liquid wastes would make a significant difference to the quality of water in rivers and streams that receive industrial discharge. In addition such hyacinth reservoirs could be attached with great benefit to places such as dairies and pig farms where substantial animal wastes are generated. The dual benefit is water cleaning and nutrient recovery. Organic animal waste contains valuable nitrogen and minerals which are worth recovering via the plant body. Hyacinth which grows in such nutrient-enriched water can be used to supplement animal feed.

Putting the hyacinth to work in contributing to the energy pool is in itself a commendable target. Its add-on benefits such as a cellulose source, a green manure and animal feed, alongwith its potential for cleaning water and recovering nutrients, cumulatively manage to show the bad weed in a fairly good light.

DEPLETION OF OZONE LAYER MAY REDUCE CROP YIELDS

Holes in the ozone layer are likely to have a detrimental effect on crop yields, according to researchers at the Weizmann Institute of Science, Israel.

The findings show that the sun's ultraviolet B (UV-B) rays, most of which are normally blocked by the ozone layer, destroy the protein essential to plants for photosynthesis. "This means that thinning of the ozone layer could result in damaged plants and lower crop yields", says Prof. Marvin Edelman of the Institute.

Prof. Edelman and his team found that UV-B light triggers the breakdown of a plant protein called 32kDa-D1 which plays a crucial role in the conversion of sunlight into chemical energy. Under ordinary levels of U-V exposure the plant's D1 protein is periodically broken down, but quickly replaced in what is part of a process of natural turnover. However, the researchers found that when plants are exposed to higher levels of UV-B radiation, such as those resulting from a thinning ozone layer, they lose their D1 protein at an unusually rapid rate. The plants would be taxed to restore the protein fast enough to redress the imbalance, say the researchers.

It was found that it took 30 minutes for the plants' D1 protein to be reduced by half when exposed to a Middle Eastern summer sun at noon. Areas in which the ozone layer has thinned out can have this noon-time level of UV-B exposure for extended periods of time.

"The plants could survive under these conditions, but in the long run they would be diverting more energy into restoring this protein and less energy into producing food," explains Prof. Edelman.

AQUATECH : 90

The International trade fair and conference on water technology, "Aquatech '90", is to be held from 10 to 14 September 1990 in Amsterdam. Aquatech covers the entire water production cycle : abstraction, transport, storage and treatment. It deals with domestic water supplies as well as waste water.

During Aquatech '90 national and international symposia on water management will once again be held in cooperation with organisation from the water industry. Aquatech conference aims to help find solutions to today's problems. The object of the trade fair and the conference is to deal with practical applications while not over looking the scientific aspects.

The environmental trade fair 'Enviro' will be held in Amsterdam at same time as Aquatech. It will feature the latest developments in environmental technology, waste management and municipal and industrial cleaning.

For further information contact :
RAI
Europaplein
1078 GZ Amsterdam
The Netherlands.

ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

The Centre for Environmental and planning of Aberdeen University Research and Industrial Services Ltd., is going to organize its fifth three-month training course on "Environmental Impact Assessment and Management" at the University of Aberdeen, from 1st July to 21st September '90, and also an Advanced Study course on "Ground Water" will be held in Northern Tuscany, Italy, in September '90.

For further information contact :
CEMP
23 St. Machar Drive
Old Aberdeen AB2 IRY
SCOTLAND.

PROJECT PREPARATION FOR ENVIRONMENTAL ENGINEERING

Water, Engineering and Development Centre (WEDC), is offering a 12-weeks, postgraduate diploma course on "Project Preparation for Environmental Engineering" from Sept. 24—Dec. 14, 1990.

For further information cantact :
The Course Tutor
Project Preparation for Environmental Engineering
Water, Engineering and Development Centre (WEDC)
Loughborough University of Technology
Leices Lershire
LE 11 3 TU, U. K.

APPROPRIATE TECHNOLOGY AND COMMUNITY DEVELOPMENT

Servant in Faith and Technology (SIFAT), USA, is offering an eight weak training course "Practicum in Appropriate Technology and Community Development" from September 4—October 26, 90. The course is offering a more indepth, hands-on course for technically oriented people. The four components are water management, sustainable agricul-

ture, alternate energy, health and sanitation. Special hands-on projects are arranged depending on the particular interests of the student.

For further information contact :

Christie, Flanders
Servants in Faith and Technology
(SIFAT)
Rt 1, Box D-14,
Lineville
AL 36266 USA

NATIONAL AMARANTH SYMPOSIUM

The University of Minnesota is hosting the "Fourth National Amaranth Symposium" in Minneapolis MN from August 23 to 25,'90. This conference is for growers, researchers, processors, extension agents, business etc. who are interested in this newly commercialized crop. Topics to be discussed are production and biology of amaranth production and processing technology, marketing and need for research.

For further information contact :

Extension Special Programmes
Minnesota Extension Service
University of Minnesota
405 Coffey Hall
1420 Eckles AVC
St. Paul, MN 55108-1030
U. S. A.

MANAGEMENT SKILLS FOR RURAL DEVELOPMENT

University of Reading is going to organize a practical skills based, team building course on "Management skills for Rural Development" at the university from 2nd to 29th September '90.

The course is designed for managers in departments in the public sector and private sector organisations who work with : health services, education services, welfare services, agricultural services (including extension), agro forestry. The content of the course will be : personal development skills, team building skills, information technology, marketing, financial and human resource development skills.

For further information contact :

Dr. Richard Thomas
University of Reading
Whiteknights
Reading
Berkshire
ENGLAND.

WEDC CONFERENCE

The 16th annual conference of WEDC is co-organized by the Regional Centre for Urban and Environmental Studies and WEDC itself, is going to be held from 27th to 31st August at Hyderabad, India, taking as its theme this year "Infrastructure for Low-Income Communities".

For further information contact :

Professor John Pickford
WEDC, Loughborough
University of Technology
Leicestershire
LE 11 3 TU
U. K.

CONVENTION OF THE TROPICAL ZONE

Federation Internationale des Tropiques. France is going to organize an "International Convention of the Tropical Zone" from 2-4 October, 1990 at Bordeaux, France.

This forum aims at promoting links between decision-makers from the sector of : agriculture, food processing, urbanisation, transport, energy, wood, health and communications. To coincide with this

there will be an exhibition of equipment and technology adapted to tropical markets and stands are available for hire.

For further information contact :

Federation Internationale des
Tropiques
12 Place de la Bourse
33076 Bordeaux Cedex
FRANCE

WORLD RENEWABLE ENERGY CONGRESS

University of Reading will organize a "World Renewable Energy Congress" from September 23-28, 1990.

For further information contact :

A. A. M. Sayigh
Dept. of Engineering
University of Reading
Whitknights, P. O. Box 225
Reading Berkshire
RG 62 AY
U. K.

SOLAR ENERGY CONVENTION

School of Energy Studies, Jadavpur University, Calcutta will organize a National Solar Energy Convention-90 of the Solar Energy Society of India, with the theme "Integrated Renewable Energy for Rural Development", from December 19th to 21st '90 at Calcutta.

The broad topics will be covered in the convention are :

1. Solar Photovoltaic energy technology and systems.
2. Solar thermal energy technology and systems.
3. Solar chemical conversion.
4. Meteorological aspects of solar energy.
5. Wind Energy technology and systems.
6. Bio-mass energy technology and systems.
7. Energy education and planning.
8. Socio-economic aspect of solar energy.

For further information contact :

Prof. M. K. Mukherjee
Organising Secretary
National Solar Energy Conventino-90
School of Energy Studies
Jadavpur University
CALCUTTA—700 032.

UTILIZATION OF AGRICULTURAL IMPLEMENTS AND MACHINERY

Trainer's Training Centre of Central Institute of Agricultural Engineering, Bhopal will conduct two weeks training courses on "Utilization of agricultural implements and machinery for increasing production and productivity" from Sept. 4th to 17th, 90 and November 14th to 27th, 90 at CIAE. Bhopal.

For further information contact :

Sri P. Dutt
Chief Training Organizer
Trainers Training Centre
Central Intitute of Agricultural
Engineering
Nabi Bagh
Berasia Road
BHOPAL-462018

ABSTRACTING AND INDEXING

Small Enterprises National Decumentation Centre (SENDOC), NISIET is going to organize a highly specialised training programme on "Abstracting and Indexing" from 16th to 27th July '90 at NISIET, Hyderabad.

The programme is envisaged as an intensive post-experience and practice oriented training course for Librarians, documentation information scientist, and other seconded to information work in academic and R & D institutions, industrial development organisations, public and private sectors, organisations etc. The objectives of the programme are :

1. To cover principles of abstracting, indexing, searching and information retrieval.
2. To provide practice and impart skills to the participants in information processing and retrieval.
3. To prepare participants to plan and organise abstracting and indexing services.

The course will cover Abstracting, Indexing, computer applications in abstracting and indexing and the saurus construction.

For further information contact :

The Registrar
NISIET
Yosufguda
HYDERABAD-500045

AT—SOURCE

AT-Source is a quarterly magazine on appropriate technology, which aims to create a more effective communication concerning small-scale technology transfer and development.

In AT-Source articles are published in the field of agriculture, energy, engineering, services and health. Information is given on small-scale technologies itself and on the social and economic impacts of technology-introduction. AT-Source is published by four organizations in the Netherlands and Belgium in both an English and a French version. At the moment, AT-Source has 2,000 subscribers.

AT-Source is quarterly magazine on small-scale technology for the Third World.

In the latest issue (March 1990) special attention is given to apiculture in the Third World. Different methods and levels of beekeeping, including their (dis-) advantages, are discussed. Attention is paid to the medical potential of propolis and the quality of the honey. A description of a project from Vietnam is followed by a discussion on the killer-bee in Central-America. The beekeeping 'mini-special' is completed by a list of references and literature.

Besides apiculture, this issue of AT-Source contains articles on fishfarming, watertanks and threshing of cereals and pulses.

Information and a free issue can be obtained from

The Editors :

P, O. Box 41

6700 AA Wageningen

The Netherlands.

AGRODOK 8 : THE PREPARATION AND USE OF COMPOST

This new version starts with a brief description of the processes which play an important part in composting. It gives practical requirements for making a good compost heap.

The general aspects of composting are followed by a description of some, worldwide used, composting methods such as the Indore, Bangalore and heating-process method.

The advantages and disadvantages of composting are dealt with extensively. This can be used as a guideline when considering to start composting. The booklet also discusses the practical use of compost in small-scale farming. A number of selected items are described in detail, for example the composting of vegetable garden waste, water-plants, household refuse or seaweed, and the use of compost as fishfeed in intensive breeding-ponds. Especially the latter items may contain some new information for more advanced composting.

This AGRODOK is available in English and French :

The preparation and use of compost by M. Inckel, P. de Smet, et al, price Dfl. 7.50 excluding postage. It can be ordered from :

AGROMISA, P. O. Box 41, 6700 AA Wageningen, The Netherlands.

AGRODOK 17 : HOW TO GROW TOMATO AND PEPPERS

AGRODOK is a series of low-priced, simple manuals on agricultural practices in the tropics.

AGRODOK 17 is a complete description of how to grow tomato, pepper and paprika. This new booklet replaces the previous AGRODOKS 13 and 17. "Capsicum Growing" and "Tomato Growing".

BOOK BAG

This manual is meant for those who want to start growing or already grow these crops on a small scale in the tropics. The text is easy to understand for those without an agricultural background but is also a useful guide for agricultural experts.

All aspects of growing are discussed : where to grow tomato and pepper, cultivation practices, sowing, transplanting, pruning, combatting weeds, diseases and plagues, harvesting, and the production of sowing seed. Special attention has been given to biological alternatives for using chemical fertilisers and pesticides. The booklet contains many illustrations and includes two tables of plant breeds, a list of seed producers and a bibliography with 34 references.

This AGRODOK is available in English and French :

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