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Editorial

For nearly half century we have been hearing about India's poor and poverty, notwithstanding 'Garibi Hatao' and 'Anti Poverty' programmes. Govt. admits that inspite of astronomical plan-investments nearly 40% or over 300 million of our country's population is below poverty line (an arbitrary threshold on which much can be said and questioned). Such a candid confession has to be appreciated but one fails to understand how India as a nation is poor endowed with abundant natural resources, TRILLIONS of rupees regularly going down the drain due to monumental loss generating public sector units, huge unrecoverable loans and taxes from big industrial houses/sharks of the capital world, graft of olympian standards due to lust of dazzling white cap/khadi and variously attired denizens of the murky world of politics with ever consenting 'committed' bureaucracy in tandem. Not to mention of annual programme of SCAMS of various kinds which besides the modernised version of grafts is also quite profitable to the media-industry. In the back-drop of such herculean wonders one is apt to skip noticing equally insidous but slow-poison effects of implementing the so called development technology and administering the technology policy. Just a glimpse in the myriad-world of technology should be enough to drive home the message (if it can really be driven-as we are all so ignorant, indifferent and insensitized to such trival things like-impact of technology and technology policy on our environment, economy and the total well-being of the nation). A case in point is that of chemical fertilizer industry about which some years back also we had written and had been discussing with the leading technocrats and scientists but to no avail. This is inspite of some well known facts like, on the socio economic side : Rs. 8000 crore is the annual subsidy expenditure on chemical fertilisers and which is availed only by rich and very rich medium and big farmers ; on the technical side serious environmental pollution total impact of which in economic terms has never been assessed and likewise loss in fertility and other characteristics of soil, due to prolonged use of chemical fertilisers necessitating, over period of time, addition of micronutrients and the list is endless.

The aforesaid consequences become even more shocking when one sees living successful examples, at home and abroad both, of alternative agricultural pratices with equal or better results and without any use of agrochemicals.

We earnestly appeal to the scientific community to rise to the occassion and pressurise the policy makers to stop the plunder of mother earth and our economy and to give our future generation an environment for which they will not curse their forefathers.

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Article/Paper

IMPACT OF WATERSHED MANAGEMENT ON DAIRY DEVELOPMENT IN SHIVALIK FOOTHILL VILLAGES

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Earlier the Shivalik region of Northern India had lush green forests supporting large herds of milch animals and there was abundance of milk yield. With the passage of time, due to increasing population pressure, the area has been denuded resulting in replacement of high yielding by less productive milch cattle and deficit in milk yield. Integrated watershed management projects were taken up in Sukhomajri, Nada and Bunga villages of Haryana and also in Una district of Himachal Pradesh to rehabilitate the denuded areas on sustained basis and ameliorate the socio economic status of the people residing there. The projects were bond to increase the fodder availability and bring about a drastic change in cattle composition and availability of milk. Impact of the aforesaid programme on dairy development has been evaluated and presented in the paper.

There was 400 percent increase in fodder availability from forest area and 150 percent increase in fodder from agriculture crops in Sukhomajri. Similar increase in village Bunga was to the tune of 378 percent and 428 percent, respectively. Una watershed registered 81 percent increase in fodder from agriculture crops. Availability of fodder led to consequential increase in number of good breed buffaloes and so in milk yield.

There was an increase of 100%, 46 , 91% and 77% increase in milk yield in villages Sukhomajri, Nada, Bunga and Una respectively as a result of taking up watershed management programmes. The benefit cost ratios as a result of the programme worked out to 2.31 for Sukhomajri, 2.12 for Nada, 2.42 for Bunga and 1.28 in case of Una watersheds.

Thus the watershed management programmes in the adopted villages have gone a long way to provide a definite boost to dairy development.

INTRODUCTION

The Shiwalik region of Northern India had lush green forests supporting a large population and herds of milch animals. There was adequate milk for the population and also for selling in the market. Gradually, the scenerio has changed from surplus to deficit milk availability. The milch animals which were healthy produced good quantity of milk, slowly became puny and rickety yielding a pittance of half to one litre of milk. How did this happen ? Uncontrolled grazing by a large number of cattle, over the years on the hills and hill slopes, resulted in complete denudation. In course of the time the store house of fodder was exhausted. The villagers tried to counteract it by keeping more goats which were let loose in the hills for grazing. This only further aggravated the problem because the already inadequate fodder resources had to be shared by a large number of animals. The consequences of the relentless activity of the local people were accelerated soil erosion and washing away of top fertile soil, further reduction in fodder resources and reduction in milk yield. The villagers thought it to be an inevitable and insoluble problem When the scientists of CS & WCRTI, visited these villages for implementing watershed management projects, they were flabbergasted to see the damage done to the hilly areas. However, they were convinced that it was a man made problem and it was reversible.

The Integrated Watershed Management programme under the Operational Research Project, was first implemented at village Sukhomajri and then at Nada, Bunga (Ambala district, Haryana State) and Una (Himachal Pradesh). These projects have established that these areas can be rehabilitated through intensive efforts of the scientists and necessary support from the local people (Mishra et. al. 1980). A 'Catalyst' was needed to change the attitude of the people towards the hills. Rainwater harvesting by constructing small earthen dams and using the stored water for supplemental irrigation has resulted in vast changes in the agricultural profile of these villages. The rainwater has brought about a virtual transformation in the socio-economic conditions of the people. Where not even one crop was assured, farmers are now able to take two to three crops depending upon the availability of water in the reservoir. The villagers have started participating in the efforts to protect the hilly catchment areas, for the water in the reservoir comes from these areas which has given them high yields and high hopes. Respite from grazing and illcit cutting of vegetation has resulted in manifold increase in grass production from the hills The availability of fodder from agricultural fields also increased many times. These changes have been discussed in detail in this paper. Further an attempt has been made to assess the impact of watershed management on dairy industry in these villages and the cost benefit ratio of the dairy sector has been worked out.

INCREASE IN FODDER PRODUCTION

The grass production from the forest area increased by more than 400 percent and almost an equal increase in fodder production from agricultural crops was observed in Sukhomajri (Mittal et al. 1983). In case of Nada village denudation was more severe where the yield of natural grass from the forest was nerely 40 kg per hectare-enough fodder for one animal for only 3 to 4 days. Thus a single animal needed 70 hectares of hilly land for meeting its annual fodder needs (Mishra and Sareen 1987). After the adoption of watershed management programme, the fodder availability from forest area increased to 200 kg/hectare. Similarly, due to the facility of supplemental irrigation to agricultural fields, the fodder from agricultural crops increased by 150 percent (Agnihotri et al. 1986). In case of Bunga village, the grass production from forest area increased by 378 percent and from agricultural crops by 428 percent (Agnihotri et al. 1989). Una watershed also registered 361 and 81 percent increase in grass and fodder from hills and agricultural crops (Agnihotri et al. 1990).

The farmers in these villages have started cultivating berseem (Trifolium alexandrinum fodder for their animals after getting the facility of supplemental irrigation from harvested rainwater. The area under berseem fodder varied from 1.4 to 2.7 ha in village Sukhomajri and the average yield was 280 q/ha (Grewal et al. 1989). The area under berseem was 10 ha, in Bunga village which yielded, on an average, 320 q/ha. This fodder was not grown in these areas before the project. Even during the severe drought year of 1987-88, the farmers of Sukhomajri village preferred to grow berseem. It was grown over an area of 2.5 ha and the total production was 623 q (Grewal et al 1989). The farmers were able to feed their cattle in the worst drought year, which has made them to realize the importance of watershed management and rainwater harvesting.

INCREASE IN NUMBER OF MILCH ANIMALS

Extra quantity of fodder from agricultural fields as well as availability of more grass from hilly areas (which is now protected) motivated the farmers to keep more number of buffaloes (Table 2). Not only did the number of buffaloes increase but the less productive local breed has been replaced by better breed. Most families in these villages sold off their goats which were responsible for maximum damage to the hills. The goats were gradually replaced by buffalloes purchased by the villagers with their own resources. This has led to the process of economic development in these villages.

INCREASE IN MILK PRODUCTION

Increased availability of fodder both from the hills and from the agricultural fields and the increase in number of buffalloes resulted in a substantial increase in milk production in all the villages (Table 3. In Sukhomajri, milk yield had almost doubled during the period 1978-1983 (Mittal et al. 1983) In case of Nada village annual milk yeild increased from 213 thousand litres in 1980 (before the project)-showing an increase of 46 percent from all the milch animals. Similarly, Bunga village registered remarkable increase in milk yield from 222 to 652 thousand litres during the first four years after the project (Agnihotri et al. 1989). In case of Una ORP, the milk production went up by 77 percent after the implementation of watershed management programme (Agnihotri et al. 1990).

MANAGEMENT OF HILL RESOURCES

Hill Resource Management Societies (HRMS) have been constituted in all the adopted villages. It is registered society with a set of byelaws. The head of each family living in the village is a member of the society. The society is responsible for equitable distribution of water to all its members and protection of the catchment area from grazing and illicit cutting of trees etc. Anyone found grazing his cattle or cutting trees etc. is liable to be deprived of his share of water. The society can also impose other penalties as provided in the bye-laws. The HRMS has also been given the lease of grass cutting from the forest area, Earlier it was auctioned to private contractors. This has given a fillup to the concept of people's participation in protection of hilly areas.

COST BENEFIT ANALYSIS

Total monetary benefits as a result of development of dairy sector in all the ORP's were worked out (Agnihotri et al. 1986, 1989, 1990). Benefit cost ratios for the dairy sector were worked out taking into account fixed and variable costs and assuming the actually witnessed cycle of 4 years 12% discount rate (assuming 30 years life of dam. These ratios are 2.31 for Sukhomajri, 2.12 for Nada. 2.42 for Bunga and 1.28 in case of Una operation research project (Table 4). This has clearly established the economic viability of such projects for dairy development in Shiwalik foothill region.

CONCLUSION

The discussion offers enough evidence to conclude that watershed management programme could be used as an effective means for brings up dairy development in the Shiwalik foothill villages. The feasibility criteria of the programme ensured that

the investment in such development schemes was justified on economic considerations also.

Increase in the productivity of animals may stem from two directions, namely feeding and management and breeding. Compared to the farmer, breeding and selection are slower processes. Feed cost alone constitute nearly two third of the total cost of milk production. Any development programme which is not associated with the development of fodder resources is bound to give negative results. Watershed management programmes are aimed at developing as well as conserving permanent fodder resources to meet the requirement of the villagers. Better breeds of animals can be sustained only if proper feeding is resorted to. In view of this watershed management programme assumes considerable importance. However, these programmes will not succeed without the cooperation of the local people in protecting the hilly watershed from grazing and illicit cutting of vegetation.

Table 1 : Increase in annual fodder availability (q) from four watersheds.

Sector	Area (ha)	Sukhomajri		Increase in production (%)
		Before the project (1977)	After the project (1990)	
Forest	1279.7	1200	6014	401
Agriculture	24.3	1100	2745	150
Total	1304.0	2300	8759	281

Sector	Area (ha)	Nada		Increase in production (%)
		Before the project (1980)	After the project (1990)	
Forest	63.7	25	127	400
Agriculture	31.5	650	1624	150
Total	95.2	675	1751	159

Sector	Area (ha)	Bunga		Increase in production (%)
		Before the project (1983)	After the project (1990)	
Forest	127	114	545	378
Agriculture	164	1939	10242	428
Total	291	2053	10787	425

Cont :

Cont :

Sector	Area (ha)	Una		Increase in production (%)
		Before the project (1984)	After the project (1990)	
Forest	100	102	470	361
Agriculture	372	12226	22067	81
Total	472	12228	22537	84

Table 2 : Change in cattle composition (milch) before and after ORP's.

Name of ORP	Year	Number of animals		
		Buffaloes	Cows	Goats
Sukhomajri	Before ORP (1977)	129	5	144
	After ORP (1986)	291	11	10
Nada	Before ORP (1980)	141	197	91
	After ORP (1986)	220	87	20
Bunga	Before ORP (1988)	206	610	837
	After ORP (1985)	586	320	65
Una	Before ORP (1984)	533	97	281
	After ORP (1989)	683	138	270

Table 3 : Change in Annual milk yield (Litres) before and after the project.

Name of ORP	Before the project period		After the project period		Increase over the base Year (%)
	Year	Yield	Year	Yield	
Sukhomajri[1]	1977	1,21,900	1986	2,40,170	97
Nada[2]	1980	2,13,525	1986	3,12,440	46
Bunga[3]	1984	7,13,000	1988	13,65,440	91
Una[4]	1985	4,92,800	1989	8,71,400	77

1 = Mittal et. al. 1983, 1986
2 = Agnihotri et. al. 1986
3 = Agnihotri et. al. 1989
4 = Agnihotri et. al. 1990

Table 4 : Benefit cost ratio due to watershed management project.

Location	B/C ratio
Sukhomajri	2.31
Nada	2.12
Bunga	2.42
Una	1.28

REFERENCES

Agnihotri, Y., Mittal, S.P., Grewal, S.S. and Mishra, P.R. (1986). "Economic evaluation of water resource development in Shivalik foothills—A case study". Indian Journal of Soil Conservation. Vol. 14 (2), pp 7–14.

Agnihotri, Y., Mittal, S.P., and Arya, Swarn Lata (1989). "An economic perspective of watershed management project in a Shivalik foothill village". Indian Journal of Soil Conservation, Vol. 17 (2). pp 1–8.

Agnihotri, Y., Mittal, S.P. and Arya Swarn Lata (1990). "Economics of watershed management sans benefit from irrigation in shivalik foothill villages", presented at International Symposium on Water Erosion, Sedimentation and Resource Conservation, Oct. 9–13. 1990, Dehradun (India).

Grewal, S.S., Mittal, S.P., Agnihotri, Y. and Dubey, L.N. (1989). "Rain water harvesting for the management of agricultural droughts in the foothill of Northern India". Agricultural Water Management, Vol. 16, pp 309–322.

Mishra, P.R., Grewal., Mittal, S.P. and Agnihotri, Y. 1980, Operational Research Project on Watershed Development for sediment, drought and flood control, Sukhomajri. Bulletin, CSWCRTI, R. C., Chandigarh.

Mishra, P.R. and Sareen, Madhu (1987). "Sukhomajri, Nada–A new model of Eco-Development". Business India, Nov. 16–29, pp 79–84.

Mittal, S.P., Agnihotri, Y. and Madhukar, R.M. (1983). "Watershed Management and controlled grazing promotes Dairy Development in hill areas". Journal of Indian Cooperative Dairy Federation of India Vol. 6 (4), pp 19–23.

OPERATIONAL RESEARCH TRIALS ON ONION STORAGE STRUCTURES AT RURAL LEVEL

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Two concentric perforated type storage structures developed at CIAE were evaluated for their performance at farmer's field in the village Nabi Bagh. The structures were made of 25 × 25 × 2.5 mm welded wiremesh and each having storage capacity of one tonne onions. Constructional design of both the structures were same except that natural air was used in one structure whereas the other was attached with a blower to circulate the forced air. The first structure (natural ventilation type) was placed outside whereas the second one (forced air circulation type) was kept inside the shed. Onion were filled at the same time in both the structures and kept for about four months. Performance of both the structures were studied on the basis of maintaining onions quality during storage period. About 7 and 4% losses in natural and forced air ventilated types structures were observed respectively at the end of storage period. Both the structures performed well and have been found economical and suitable at farmer's level.

INTRODUCTION

Onion (*Allium Cepal*) is an important crop grown almost in every part of India. It is seasonal and perishable in nature but eaten in various forms throught the year. Therefore, proper preservation of onion is essential to over come the problem of demand and supply in the market. If crop is properly stored for 3 to 4 months. a farmer can get a good return, otherwise due to being perishable in nature it is sold on very less price during harvesting season. Therefore, there is need of suitable preservation technology and structure at rural level.

The present practices of storing onion bulbs are generally, storing in gunny bags and spreading on the floor. In villages as revealed by a survey conducted by the PHT Scheme, Banglore Centre (1987), onion bulbs are being stored in some out door enclosures made out of shrubs and redgram stalks with a thatched roof. In Chikkaballapur (Karnataka) area onions are stored in out door structures known as 'Pendi', a local practice followed by most of the farmers. In case of large farmers, bigger structures built out of stone and wooden pillars with thatched roof were soon. However, these were not properly designed for aeration and were unsafe.

Besides these, practices of bagging. spreading on floor or storing in thatched enclosures caused considerable amount of rooting and sprouting of bulbs. This improper storage of onion was due to the lack of proper knowledge about storage technology of semi-perishable produce. Therefore. it is very much clear that, availability of proper storage structure plays a crucial role in the post harvest

handling of onions. Structures that contribute to, prolonged storage of onions would in large part increases the margin of profit that a farmer obtains from his crop. As stated above several local onion storage structures are available, but most of them have the most serious short coming i. e. lack of proper aeration. A proper understanding of these structures and subsequent research in this regard was revealed that low cost structures meeting the above requirement can be built for onion growers.

Hence keeping in view the present need of small farmers, two type of onion storage structures were designed and developed at CIAE. Apart from this, some work on storage of onion have been reported by Karmarkar et al, (1941 and 1959). Traditional low cost onion storage structures have also been designed at University of Agricultural Sciences. Banglore, Storage at very higher temperature (35°C) for one week has been found to hasten sprouting upon planting of bulbs (Kempen, 1970). Subbaramu, K. et al (1990) found that the loss due to sprouting of onion was low upto 5 months of storage in ventilated bamboo structure.

This paper in brief presents the finding on the performance of onion storage structures developed at CIAE under ORP trial at farmer's field.

MATERIALS AND METHODS

The two perforated concentric structures developed at CIAE each having one tonne storage capacity of onions and made of 15×25×2 5 mm welded wire-mesh were placed at the farm house of a farmer in village Nabi Bagh under ORP trial. As shown in Fig. 1 and 2, there is no major difference in the constructional design of both ; (i) natural and (ii) forced ventilated structures except the first was having an aspirator (3000 mm long and 600 mm diameter) and the second one was without aspirator. A blower of 0.5 hp was attached in second type structure to circulate the forced air through the onion's bed. Both the structures are having the diameter of 1,500 mm and height 2,000 mm. A concentric perforated duct of 300 mm diameter has been attached to outdoor structure. Each structure is divided in five equal compartments in such a way that sufficient space between two successive compartments is left empty for effective ventilation even after utilising the full storage capacity of a compartment. Each compartment is having two doors of 450 × 300 mm size for easy handling of the onions. The structures were evaluated for about four months.

Locally grown onions (Chandramukhi variety) available with farmers were spread over on the floor for about 48 hours for curing. Initial moisture content of the onion was determined and onions were filled in both the structures on the same day, Natural air ventilation type structure was kept out the shed whereas the forced air ventilated structure was kept inside the shed. Tarpoline was used to cover the outside structure during rains. In second structure a 0.5 hp blower was used for circulating the air as and when required The onions were stored in both the structures for about four months. Relative humidity and temperature of ambient condition were recorded daily at 2 P.M. during the storage period. Some important observations such as loss in moisture, spoilage per centage and sprouting percentage were recorded twice in a month at regular interval. For this purpose sample of one kg. was taken every time from all the observation points. The losses were calculated using following equation :

$$\text{Spoilage percentage} = \frac{\text{Weight of spoiled material in taken sample}}{\text{Total weight of sample}}$$

$$\text{Sprouting percentage} = \frac{\text{Weight of sprouted material in taken sample}}{\text{Total weight of sample}}$$

The data presents the average of three replications. Moisture content has been reported on wet basis in this paper.

RESULTS AND DISCUSSION

The storage period of onion was about four months (May to August). The variation in mean monthly

values of ambient relative humidity and temperature is shown in Fig. 3, The mean monthly ambient temperature and relative humidity at 2 P. M. during the trial varied from 28-43°C and 12-77% respectively throughout the experimental period.

In general the moisture content of onion during storage in both natural and forced air ventilated structures remain above 81% (Fig. 4). About 2% reduction in moisture content was observed after one months of storage in both the structures. After one month of storage decline in moisture reduction rate was very slow (Fig. 4). This is because, the rainfall occurs after a month of storage. relative humidity increased which reduced the reduction rate of moisture content in stored onions.

The purpose of providing ventilation was to dissipate the respiratory heat and remove water vapour which accelerates spoilage during storage. The solar-cum-wind aspirator designed for this purpose helped in circulating the natural air through the bed of stored onions into outdoor structure. A 0.5 hp blower was used to dissipate the respiratory heat and to take away the generated water vapour from stored onions kept in the indoor struclure. The forced air was circulated for about 2 hours on an alternate days, But during the rainy period, the forced air was circulated daily for two hours through the onion's bed.

The sprouting of onion bulbs was not observed upto 2 months of storage in both the structures. However. the spoilage of onion bulbs was noticed during the second month but it was not significant. The decay of opinion bulbs and sprouting showed an increase after two months of storage. The spoilage and spouting losses of onions were observed as 4.1 and 2.30%, respectively in natural air ventilated structure and 2.20 and 1.5% in forced air ventilated structure at the end of the storage period (Fig. 5 and 6).

The peeling loss is the removal of outer cover of onion. It occurs mainly during handling and transportation of the onions. Peeling losses were in the range of 2% in both the structures.

The onion price in the market at the time of storage was about Rs. 1.50 per kg. At the end of storage period. the onions were being sold at the rate of Rs. 3 to 4 per kg. Thus, a small period of storage can provide a good return to the farmers who are bound to sell the onion at a very low price at the time of harvesting.

CONCLUSIONS

1. Air ventilation through the bed of stored onions is one of the most important parameters in this type of storage system.
2. Onions could be stored in natural air ventilated storage structure for about 4 months with 7% losses and in forced ventilated structure with 4% losses.
3. The storage losses were found slightly lesser than the earlier report due to the better quality of onion stored this time.
4. The structure meets the economic and utility needs of a common onion growing farmer.

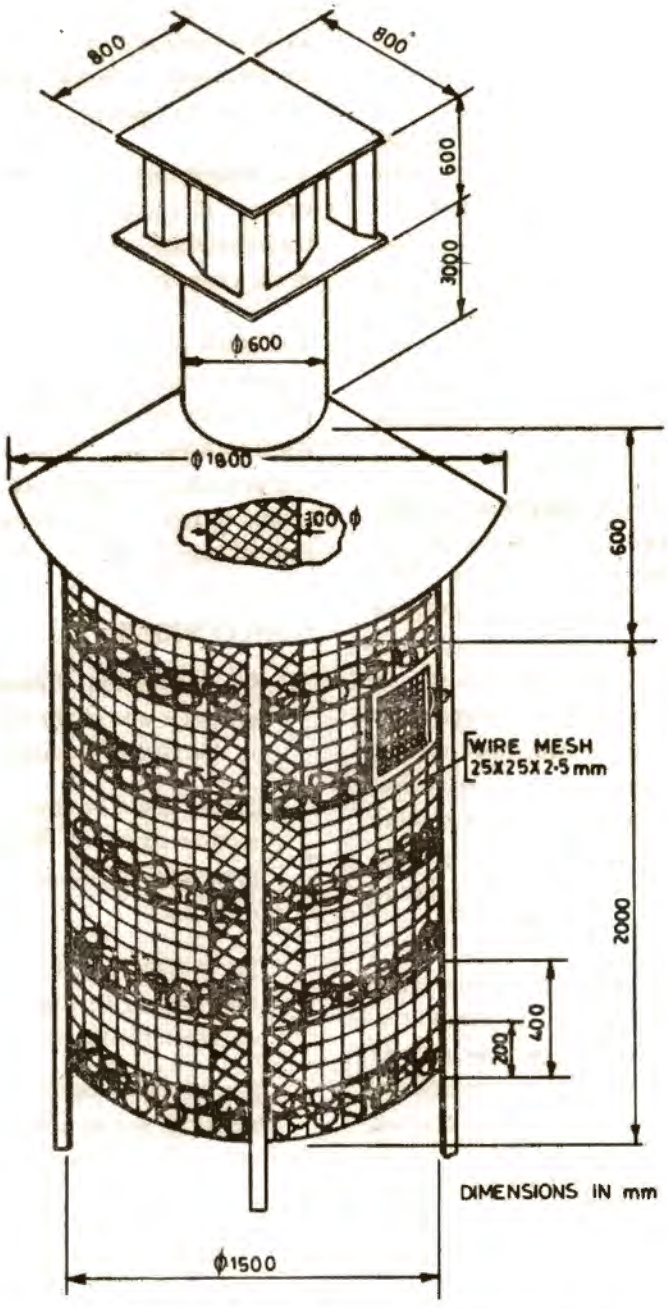

FIG. 1. NATURAL AIR VENTILATED ONION STORAGE STRUCTURE

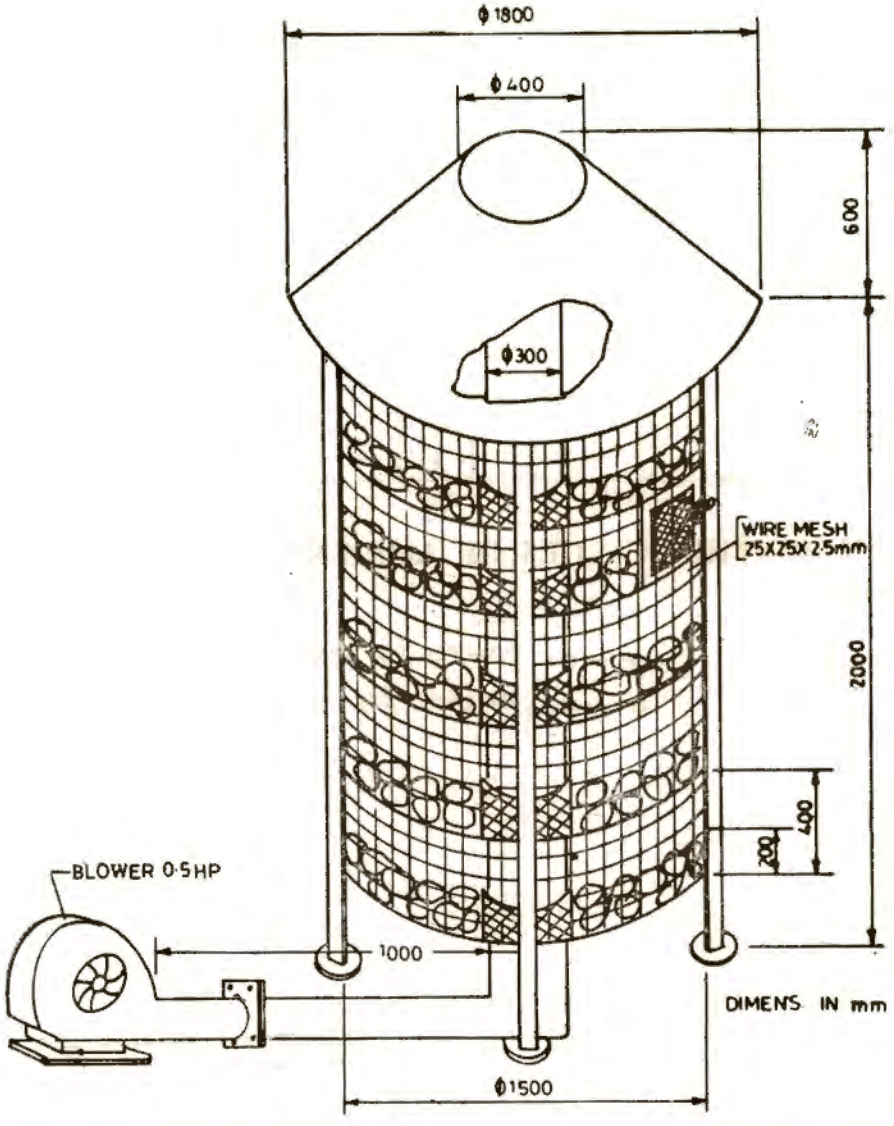

FIG 2. FORCED AIR VENILATED ONION STORAGE STRUCTURE

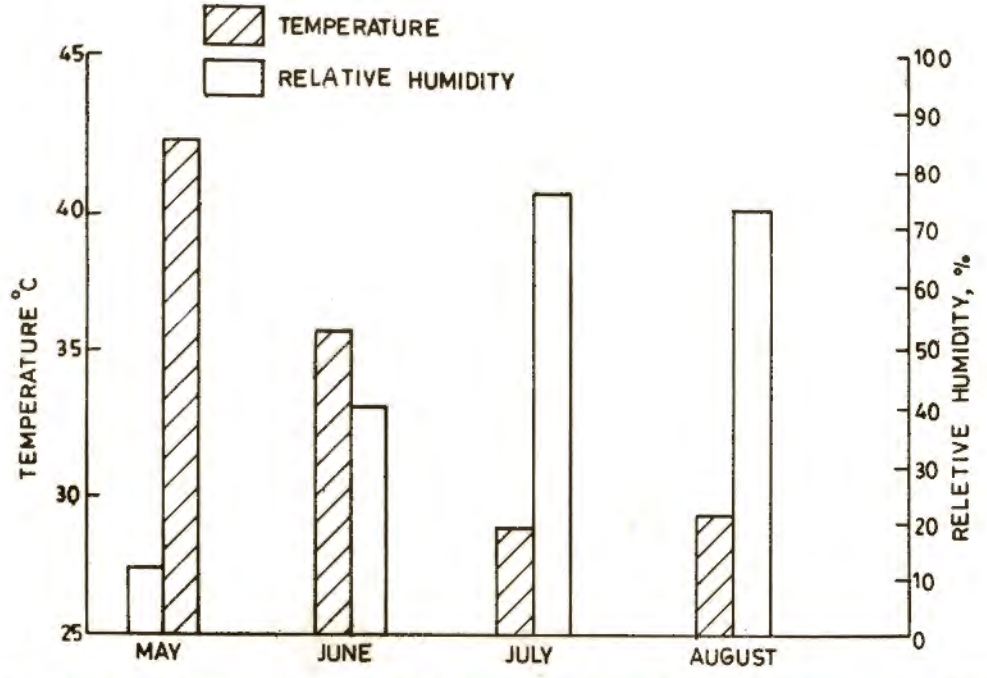

FIG. 3 MEAN MONTHLY VALUES OF AMBIENT CONDITION DURING STORAGE

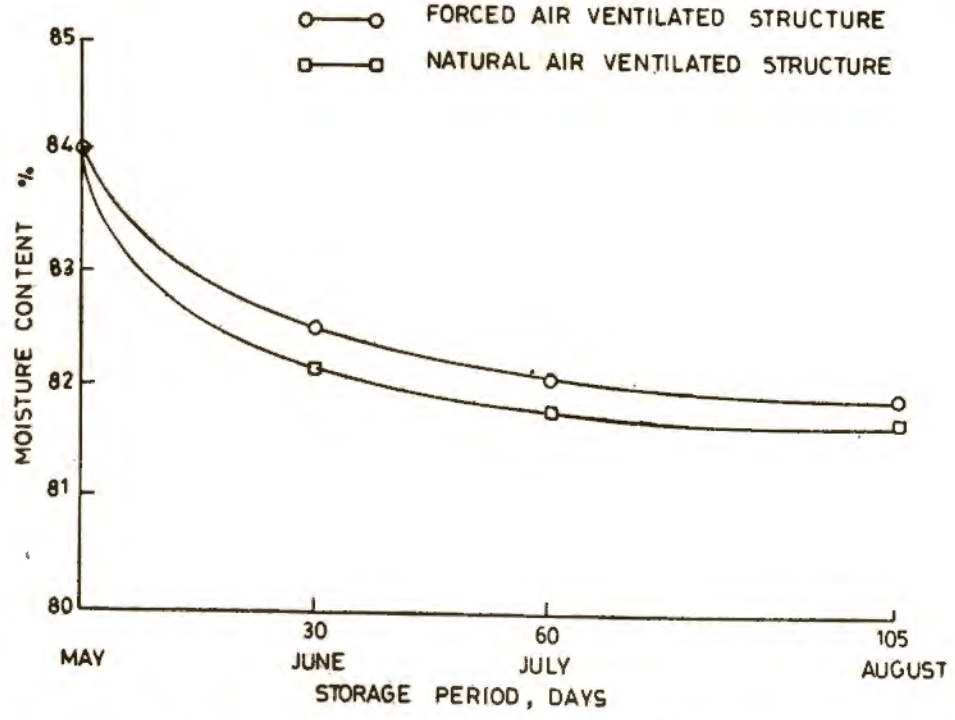

FIG. 4. VARIATION IN MOISTURE CONTENT DURING STORAGE

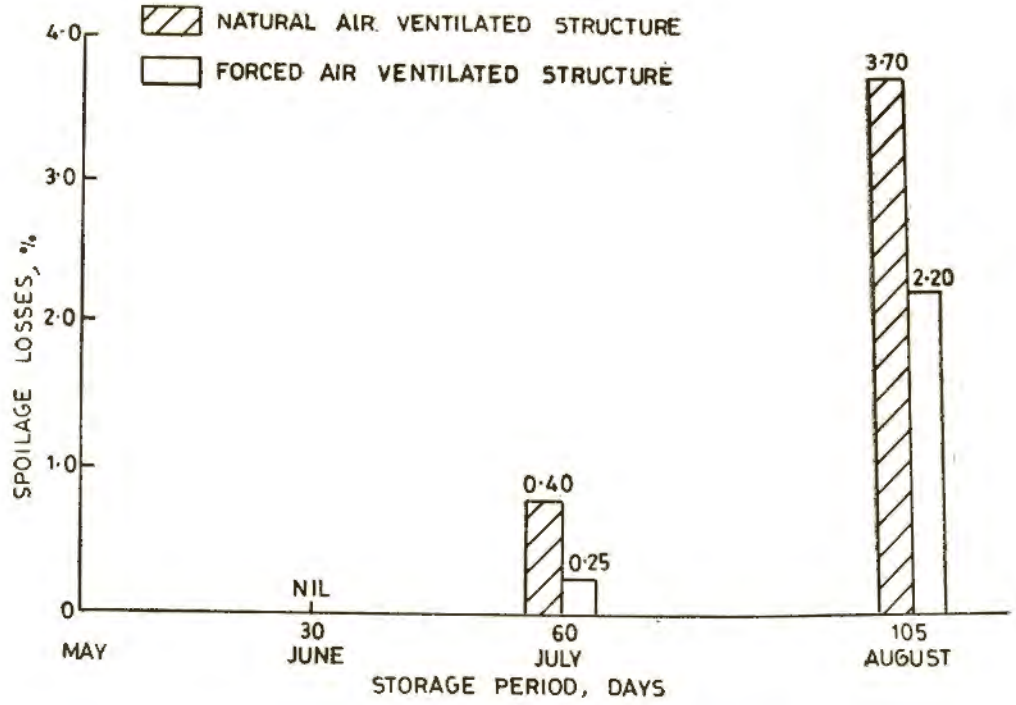

FIG. 5—VARIATION IN SPOILAGE LOSSES DURING STORAGE

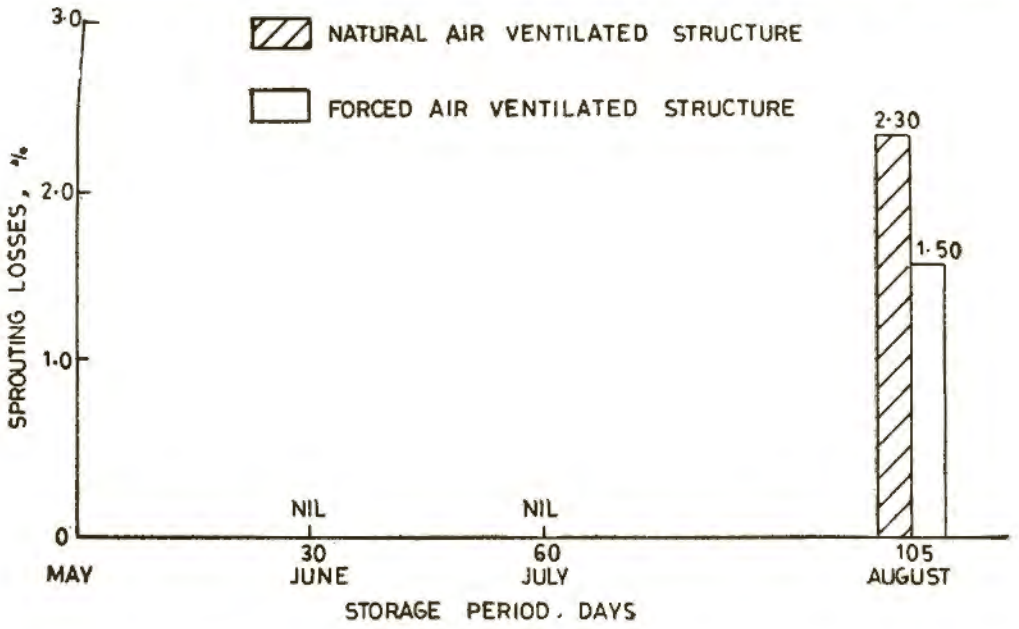

FIG. 6.—VARIATION IN SPROUTING LOSSES DURING STORAGE

REFERENCES

Karmorkar, D. V. and Joshi, B. M., 1941. Investigations on the storage of onion. Indian J. Agril. Sci. II, 82-84.

Kempen, J. V. 1970. Shortening the breeding cycles in onion. Made lingen Proefstation voorde. Groenteteelit inde voller ground No. 47. pp : 27.

Krishnamurthy, K. C. at al, 1987. Harvest and post harvest technology of onion, Research Bulletin. UAS Bangalore.

Shukla, B. D. and Gupta, R. K, 1989. Development and evaluation of farm level structures for onion storage. Paper presented in XXVI Annual Conv. of ISAE.

Subbaramti, K. at al, 1990. Ventiated bamboo structure for onion storage. Article published in onion news ietter for the TROPICS, No. 2, pp : 38-39.

A NEW PAINT FOR SOLAR COOKER

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Effect of Mat Black paint and a mixture of Mat Black paint and apexior No. 3 has been studied. A mixture with ratio 1 : 1 may be considered a suitable paint for box type solar cooker.

INTRODUCTION

Box type Solar cooker have gained maximum popularity among all other existing models because of simplicity of handling and operation. S. K. Philip et. al has made a study about the condition of Solar Cooker sold in Gujarat. It was observed that about 84% of solar cooker had to be repainted. Recently a survey report for a few IREP blocks also revealed similar problems in Uttar Pradesh.

In order to make box type solar cooker more popular among the users, it was essential to work on paint problem. In the present work a new paint has been suggested. This paint has increased the efficiency of solar cooker as well as has reduced the frequency of repainting.

EXPERIMENTAL DETAILS

Two box type solar cookers of identical size (Table-1) were used to study the effect of new paint. The new paint is a mixture of Mat black paint and Apexior No. 3 (1 : 1). Details of Apexior No. 3 has been described seperately. The following tests were carried out to study the effect of paint :

1. Stagnation Temperature Test.
2. Water Heating Test.

STAGNATION TEMPERATURE TEST

For stagnation test both Cookers were exposed simultaneously to sunlight and temperature of air inside the cookers, solar irradiance on a horizontal plane and ambient temperature were recorded at an interval of half an hour. The cookers were kept with their reflector facing south and inclined at the same angle.

WATER HEATING TEST

This test was performed by heating 1.00 kg of water in aluminium containers of same capacity. Both cookers were kept under the same condition and temperature of water in both cookers were recorded with time of the day. The value of solar irradiance at the time of measurement was also recorded using pyranometer.

RESULTS & DISCUSSION

The stagnation as well as water heating tests were made to study the effect of Mat Black paint and mixture of Mat Black paint and Apexior No. 3 (1 : 1).

PERFORMANCE TEST OF COOKERS

To study the performance of both the cookers, stagnation temperature and water heating tests were carried out under the same condition. This test was made to compare the working of both cookers (Cooker I and Cooker II). It was planned only because Cooker I was a new and Cooker II was already in use for the last one year. The stagnation temperature test revealed that the stagnation temperature of Cooker I (136°C) was 10–15°C more than Cooker II (122°C) which has been shown in Fig. 1. Similarly during water heating test, the temperature of water in cooker–I was observed about 5°C more than Cooker II (Fig. 2). This temperature difference was observed due to presence of condensed vapour between glazing surface of Cooker II.

EFFECT OF MIXTURE OF MAT BLACK PAINT AND APEXIOR No. 3 (1 : 1) :

(a) Cooker I was painted with mixture of Mat Black paint and Apexior No. 3 (1 : 1) and Cooker II with Mat Black paint.

It was observed that the air temperature of Cooker I was greater than Cooker II. The variation in temperature with the change in time for both the cookers are shown in Fig. 3. The stagnation temperature of Cooker I (144°C) was recorded about 7°C more than Cooker II (137°C). During water heating test the rate of rise of temperature in Cooker I was observed more than Cooker II (Fig. 4).

(b) Cooker I was painted with Mat Black paint and Cooker II with mixture of Mat Black paint and Apexior No. 3 (1 : 1).

It was observed that the air temperature in Cooker II was greater than Cooker I. The change in temperature in Cooker II has always been more than Cooker I (Fig. 5). The stagnation temperature for Cooker I and II was recorded as 118°C and 121°C respectively.

The rate of rise in temperature of water in Cooker It was observed more than Cooker I (Fig. 6). The difference in temperature of water during water heating test was found about 7–8°C.

CONCLUSIONS

A combination of Apexior No. 3 and Mat Black paint (1 : 1) may be considered a suitable paint for box type solar cooker. This mixture increases efficiency of solar cooker and minimizes peeling of paint problem. However cleaning of glazing surface should be made regularily otherwise transmittance of surface is abnormally reduced.

Table 1 Data of Solar Cooker

	Specification	*Data*
1.	Mirror Size	53.2×52.6 cm²
2.	Glazing size	50×51 cm²
	Material	Toughened glass
3.	Absorber tray	
	Top dimension	50×50 cm²
	Bottom dimension	41.5×40.9 cm²
	Material	Aluminium sheet
	Depth of tray	7.0 cm
4.	Type of support	wheel

DESCRIPTION OF APEXIOR NO. 3 (BRITISH PAINT)

A preservative coating for metal surface in contact with salt water and fresh water at temperature below 50°C wet heat or 230°C dry heat in sheltered locations such as covered or interior steel work, application is recomended on Exposed metai

surface of submerged stern portions of strips, Condensers, air coolers, Cold water tanks, air washers, centrifugal pumps, piping, boiler, fronts, stoker, wind boxes, ducting, chimneys etc.

Type	—	Single pack	Dry film Thickness	—	35 microns
Application	—	Brush or Roller	Drying Time	—	Touch dry 3-4 hours
			Flash paint	—	above 30°C
			Colour	—	Black
			Finish	—	Glossy

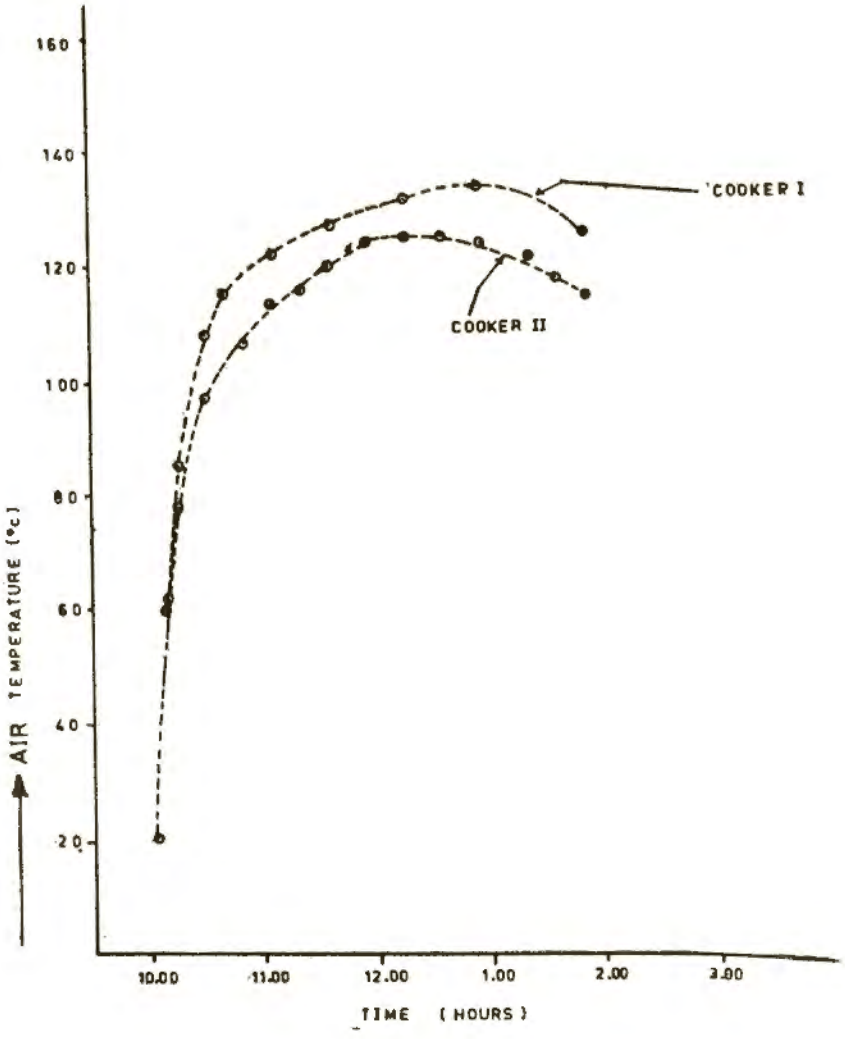

FIG. 1 STAGNATION TEMPERATURE TEST

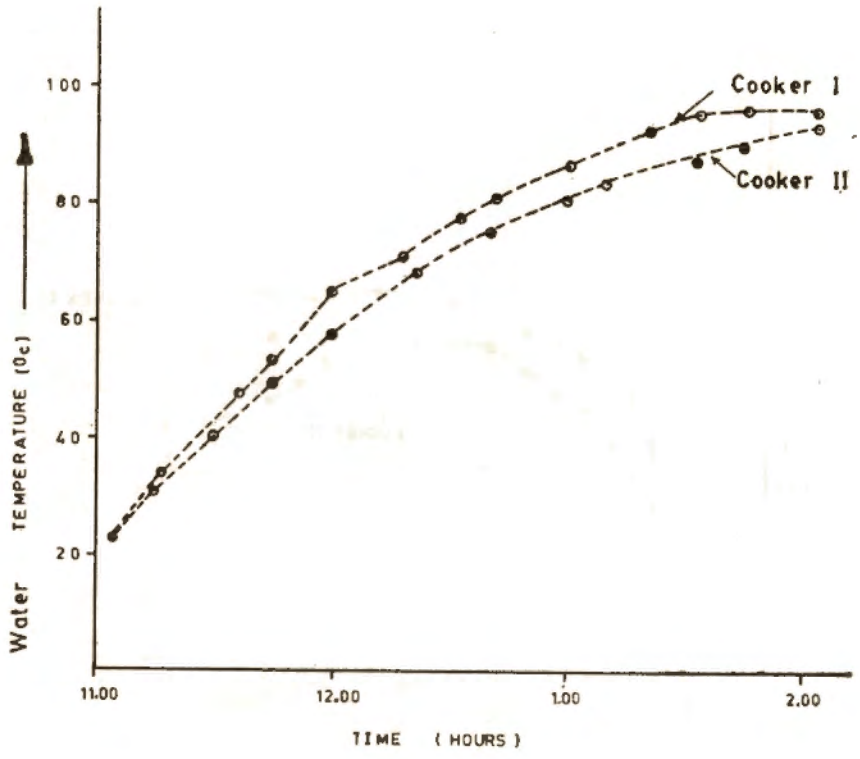

FIG. 2 WATER HEATING TEST

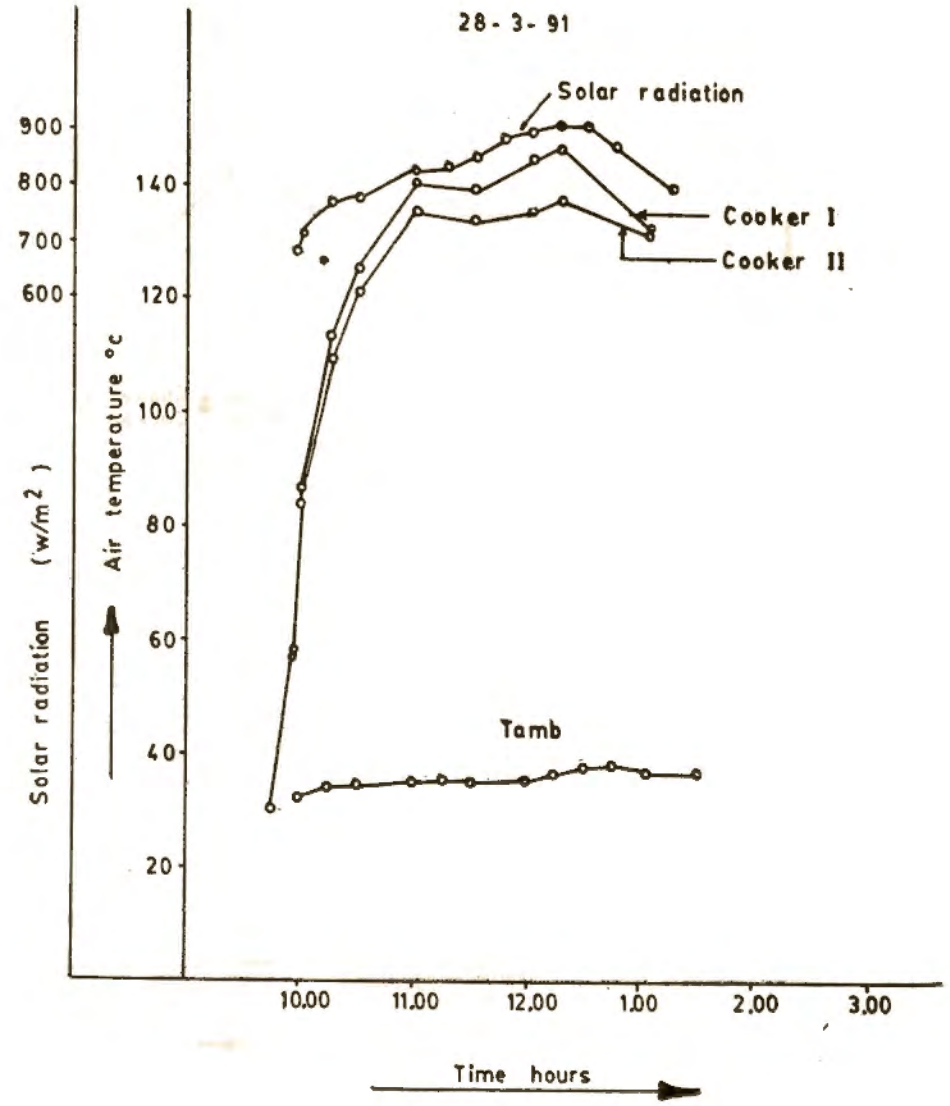

FIG. 3 STAGNATION TEMPERATURE TEST

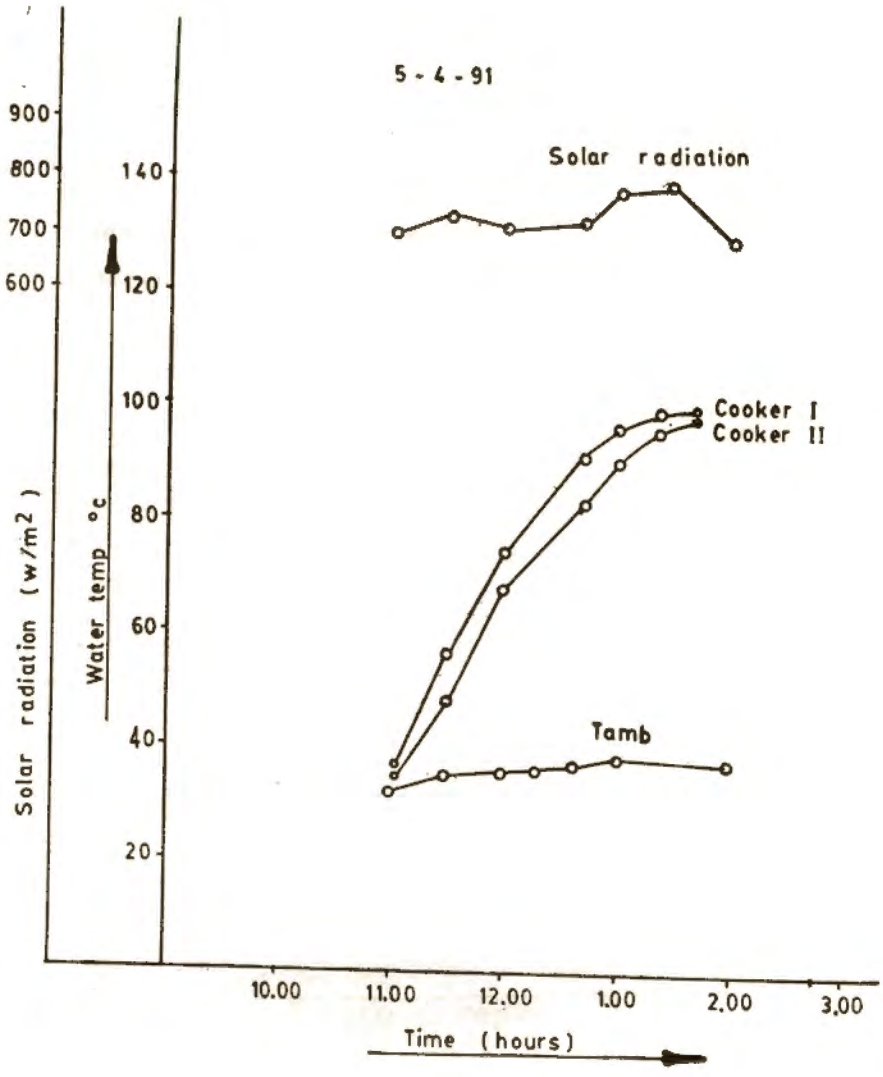

FIG. 4 WATER HEATING TEST

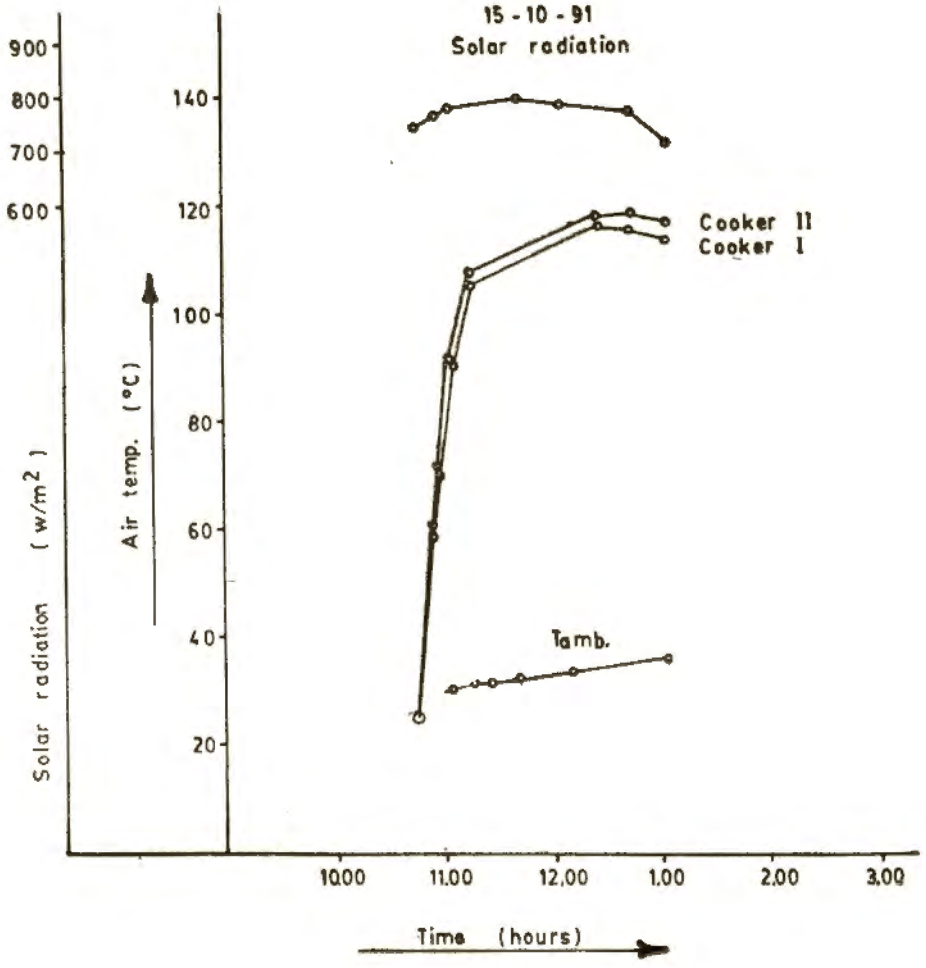

FIG. 5 STAGNATION TEMPERATURE TEST

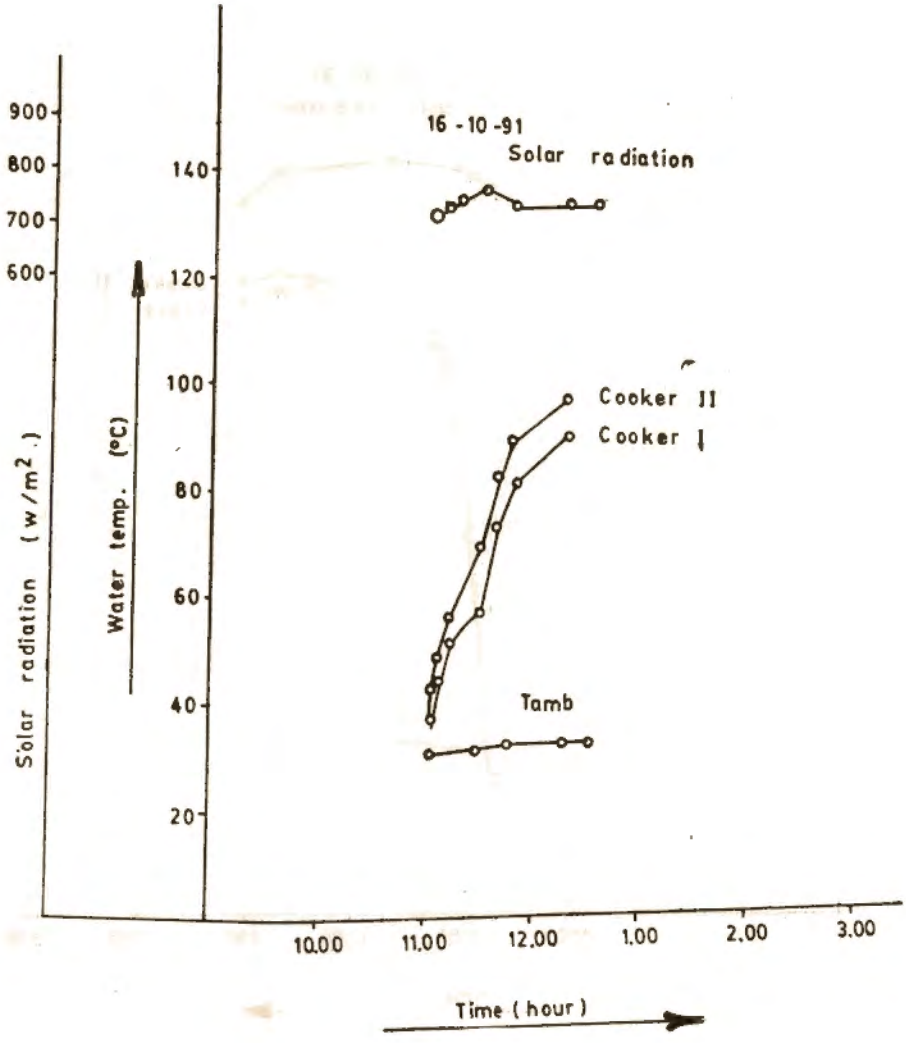

FIG. 6 WATER HEATING TEST

PORTABLE HAND OPERATED PIRN WINDER

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This paper deals with the design and fabrication of a portable Hand operated pirn winder suitable for handloom weaving industry. The design, and development of the pirn winder are dealt with. The paper also describes the material requirement, details of assembly and performanee evaluation of the machine.

INTRODUCTION

Pirn winding is an important process which affects the quality of the fabric. performance and productivity of the looms.

Many developments in pirn winding with respect to speed, tension control, stop motion etc. have been made only for power loom sectors, but no such appreciable improvements are found in the field of hand loom weaving.

So in order to promote the weaving performance. as well as to improve the living standard of handloom weavers, an attempt has been made to fabricate a simple hand operated portable pirn winding device suitable for handloom sector.

The cost of the pirn winder is comparatively cheap and it can be fixed of any convenient place, The operation is also very simple and convenient.

DESIGN AND DEVELOPMENT

Handloom weavers cannot afford for costly equipments and are in need of simple, cheaper mechanical devices.

With this view in mind, this portable hand operated pirn winding device has been designed.

MATERIAL REQUIRED :

1.	100 T. Spur gear wheel	1 No.
2.	Single start worm wheel	1 No.
3.	Handle	1 No.
4.	Spindle	1 No.
5.	Suitable cover	

All these components can be easily procured from the local market.

DETAILS OF ASSEMBLY !

The handle is connected to a 100 T spur gear wheel. which in turn is meshed with a single start worm wheel.

The worm wheel is connected to a spindle where the pirn can be mounted for weft yarn winding. By this assembly the handle to spindle speed (revolutions) ratio become 1 : 100.

The spur gear and the worm wheel are suitably supported.

The whole assembly is enclosed means of suitable casing as shown in the figure.

PERFORMANCE EVALUATION

The working performance of this portable pirn winding device is found to be better than churkas due to the following reasons :

1. As friction is minimised between elements, smooth running has been noticed in this newly designed equipment while in churkas much energy is wasted to overcome the friction between the rim of the churks and the rope.
2. This device can be placed at any convenient position, so that the strain of the operator becomes less.
3. The life of this portable pirn winder is also expected to be more.
4. In the case of churkas, the transmitting ropes are usually knotted at their ends which hinders the smooth running of the winding device, this problem will not arise in this new pirn winder.

Thus the over all performance of this winding device is found to be better than that of churkas.

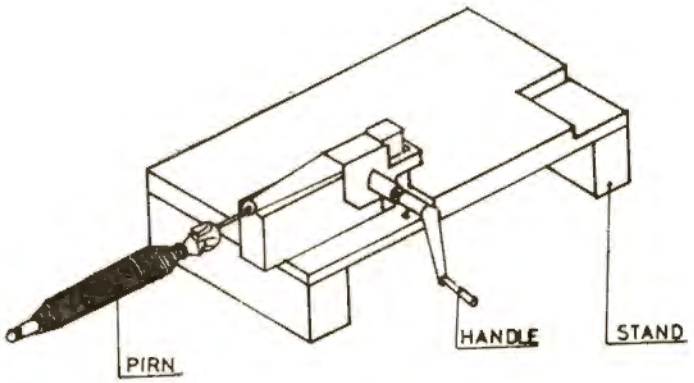
ADVANTAGES :

The followings are the advantages and limitation of the newly developed system.

Advantages :

1. The machine cost is much cheaper. The cost of churkas is around Rs. 160.00 while that of this new portable pirn winder is only Rs. 85.00.
2. No slippage, as gear wheel is used.
3. Smooth flow

   (In case of charkas, the rope ends are knotted which sometimes hinder free movement).
4. Less space requirement.
5. Less energy is required as the mass of moving element is much low. (In case of churkas the mass of the wheel is comparatively more).
6. Portable, and can be used at any convenient ; place ; so less strain for the handloom weavers.
7. More utilisation of energy.
   (in case of churkas energy loss due to friction is more).



PORTABLE PIRN WINDER

APPROPRIATE POST HARVEST TECHNOLOGY FOR PERISHABLE FOODS OF DRYLAND AREAS

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Although, the dry land area of our country is quiet large, but this area is having low perishable food supply. It is estimated that about 30-45 percent of total production of perishable foods is lost in post harvest handling and processing.

In this paper the problems associated with the processing and handling of perishable foods of dryland areas is high lightened. Some solutions to these problems are suggested. It is suggested that there is vast potential of direct heating mode solar dryers in processing of perishable foods of dryland areas. The traditional method of open sun drying has very limitations. These areas have plenty of sun shine hours for about 300-325 days in a year. The farmers may earn a net profit of Rs. 100 per day by simply investing Rs. 4000 in form of solar cabinet dryer.

Further, in this paper, some appropriate post harvest technology is identified and presented for corn ; Bajra, Gunda, Ker, Sangri, Kumtiya, and other perishable foods of dry land areas.

INTRODUCTION

The loss of foods in the post harvest operations is not new, it has always been a problem for mankind. In these days of rapidly enlarging populations in dry land areas where food is already short, there is an increasing urgency to do a better job of conserving mankind's food supply in order to alleviate hunger and malnutrition. In dry land areas many activities have been directed towards reducing losses in cereal grains, oil seeds and grain legumes. But, so far yet very less attention is given on the problems of post harvest losses in food products other than cereals.

PROBLEM

Post harvest losses of perishable products are more serious in dry land areas. However, the additional constraint to improving this situation is that in these areas the number of scientists and technologists concerned with perishable products processing is significantly lower than those inv lved in production research. Today, enormous volumes of quality horticultural crops produced in technologically advanced countries are made available to millions of people through improved post harvest processing and handling. These processing procedures are not fully recognised in less deve-

loped countries like India. Further, with perishable foods, storage, packaging, transportation and handling technologies are practically non-existent in dry land areas. The perishable foods of dry land areas are quite different in processing and preservation technologies.

In dry land areas, it is distressing to note that so much time in being devoted to collect the perishable foods from remote areas, in their season of availability only to be wasted about couple of weeks after harvest. It is therefore important that appropriate post harvest processing and handling operations be identified and popularized to reduce losses and make the perishable foods available throughout the year.

Most of the perishable foods of dry land areas offer more storage problems than other food stuffs as they are physiological active, they can be easily invaded by spoilage and susceptible to moisture loss. particularly if harvested in summers. The areas having high temperature low relative humidity. Therefore, the chances of food spoilage by loss of moisture resulting in skin shrinkage is very high. The proper storage conditions play an important role in keeping perishable foods in good conditions over the period of time as well as saving them from post harvest losses. Although, there are so many causes but the amount of moisture content present in the product at the initiation of of processing or even at any other stage thereafter, is the single most important factor influencing the food quality. The rate of deterioration increases with moisture. The high moisture content encourages mold growth and affect biological activity of mold, insects and bacterias. At lower moisture content foods may be stored for longer periods.

SOLUTION

Preservation of foods by drying is one of the oldest method adopted by mankind. In fact, most of the perishable products grown is dry land area are preserved by dehydrated them than by any other methods. The dehydration of foods has many advantages. It reduces the weight by 80-90 percent and increases shelf life by 25-35 times.

The labour requirement in processing and distribution also reduced considerably. The drying may be done by either by sun or with the help of mechanical dryer.

The traditional method used in dry land areas is open sun drying of products. But this practice suffers from contamination and infestation by mold dust, parasite, insects, animals and eggs. Further, the drying rate is slow resulting is and fungus growth. More over sometimes incomplete and uneven drying results because of rainfall or high humidity. These discrepancies can be removed with the help of solar dryers. Although, various types of solar dryers have been developed, but for drying of perishable foods of dry land areas the common tray type direct heating mode solar dryer is the best. The cost of this dryer is approximately Rs. 3000.

The prices of perishable foods in their season is very low which increases considerably in off season. The farmers/enterpreneurs may earn a good profit by selling dehydrated foods is off season in these areas.

APPROPRIATE POST HARVEST TECHNOLOGY :

A variety of perishable foods are grown in dry land area. Each product has different post harvest story for its preservation and processing. However, a good number of products are dehydrated in this area and consumed. But, the appropriate technology is yet not established for their processing. Some of the perishable products grown is dry land area can be processed as follows :

1. Corn :

Corn (Zea mays) is one of the dry land area's most versatile crops. It can be processed in to

various feed ingredients, industrial products and alcoholic beverages. Although, corn milling is modernized in some developed countries, but unfortunately in dry land area's this processing technology is not suitably adopted. There are two methods of milling of corn, dry milling and wet milling. Besides germ for corn oil extraction and husk and deoiled germ, etc., for feed, grits (mainly used for breakfast cereals) are the main products of corn dry milling whereas pure starch is the major product of wet milling. The products obtained by wet milling technology of corn are presented in Table—1 along with their feed/food and industrial uses. The flow diagram of corn wet milling & refining processes are given in fig. 1.

2. Bajra :

Pearl millet is one of the very important crop of dry land area.

A good number of preparations of pearl millet are made and accepted in this area. However, the major problem associated with it is the low shelf life. Almost all preparations need Bajra flour, and it can't be stored over 1-3 weeks. Therefore, only pearled Bajra is stored. The post harvest processing is practically non existent for this crop. Although, efforts were made to prepare biscuits and extruded products from it. The flow process chart for extruded products is given in fig. 2.

3. Ker :

Ker is an important fruit of dry land area used as picle and vegetables. The flow process chart for dehydrated ker vegetable is given in fig. 3. The small fruits without seeds are more valuable than big fruits. The drying of ker can be achieved in simple direct heating solar dryer.

The fresh ker can be processed into pickle. The kers are cleaned and steeped in sodium chloride solution fo 2-3 days. The solution is changed 2-3 times so that fermentation takes place. The oil (250 g.) is heated to frying temperature and then it is cooled and chilli (50 g), saltrai (100 g), (50 g) is mixed for 1 kg ker. 7-10 days later the pickle is ready.

4. Gunda :

The green unripe fruit is used as dehydrated vegetable and as pickle. The flow process chart for dehydrated vegetable is presented in fig. 3. The dehydration may be done in mechanical dryer or with the help of solar cabinet dryer. The dehydration process may take 7-10 days if dried in clear sunny day in open yard. This time may be reduced to 2-3 days if solar cabinet dryers be used. The further, decrement in time is possible with the help of mechanical dryer. The ingredients is the Gunda (1 kg) pickle are chilli powder (100g), methi (50 g) rai (50 g) Kalaunji (25 g), salt (150 g) and oil (500 g). The ingredients are mixed and stuffed in Gunda and kept in dry place for 7-10 days. Although, the pickle is ready in 10 days period.

5. Other Products :

Karunda, Kumtiya, Ambolia, Kachri, fog are some other products grown in dry land area. Generally all these products are consumed dehydrated. These products are sold at the rate of Rs. 3 to Rs. 6 per kg. at the time of harvest in season.

The moisture content at this stage is 80-85 percent. The cost of dehydrated product varys from Rs. 80 to 100 per kg. with moisture content of 5 percent and less. The farmer or enter preneur may earn a net profit of Rs. 100 per day by mere investing Rs. 4000 in form of solar cabinet dryer.

REFERENCES :

(1) Anonymous, (1988). Compendium on post harvest technology of perishable foods. Prepared by Deptt. of Extension Education. Rajasthan College of Agricultural, Udaipur.

(2) Chakorvarty, A. and De, D.S. (1981). Post Harvest Technology of cereals and pulses. Oxford & IBH Publishing Company, New Delhi.

Table : 1 Corn wet milling products & their uses :

Products	Feed/Food Uses	Industrial uses
1. Germ oil & meal Foods	Live Stock	Soap, glycerine, Lather dressing
2. Refined oil	Cooking oil & margarine	Pharmaceuticals
3. Steep water	Yeast food	Phytic acid
4. Glutem & hulls	Livestock & poultry feeding	—
5. Starch	Chewing, baking powder, brewing confectionery	Textiles, paper boxes, cosmetics adhesives
6. Syrup	Canned foods, ice creams, soft drinks jellies, confectionery	Textiles, Pharmaceuticals tobacco
7. Sugar	Bakery products, Jams, Jellies, ice-cream, canned foods	Rayon, tanning, fermentation brewing, vinegar fermentation products

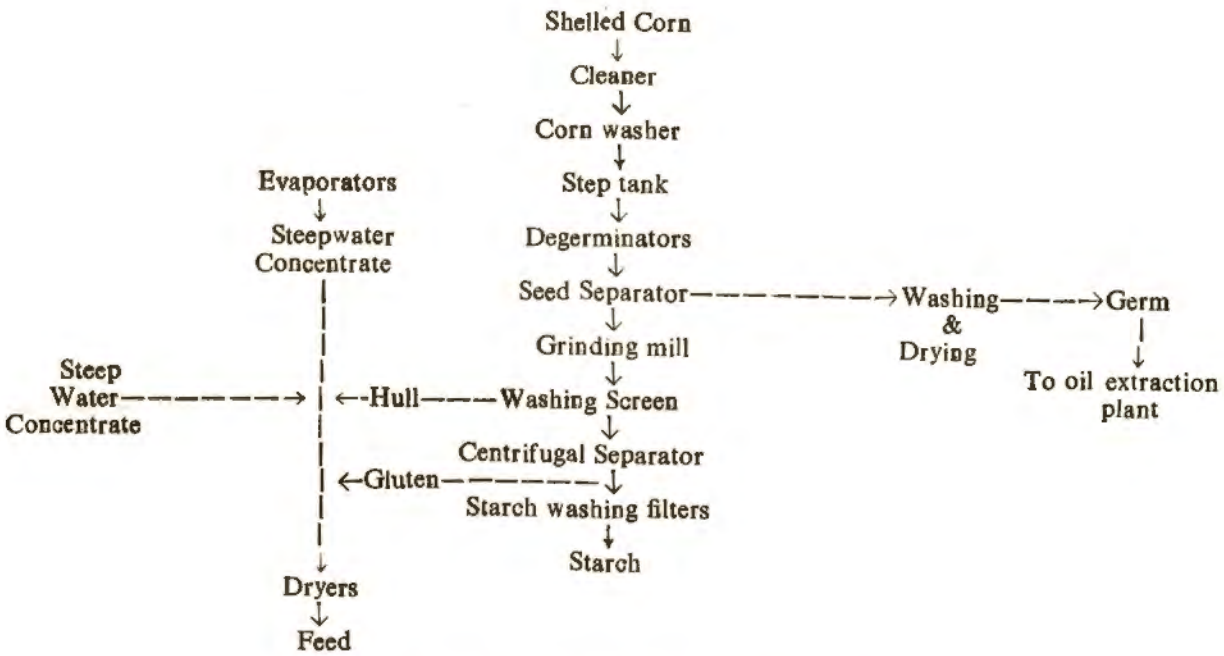


Fig. 1—Flow diagram of corn wet milling & refining processes

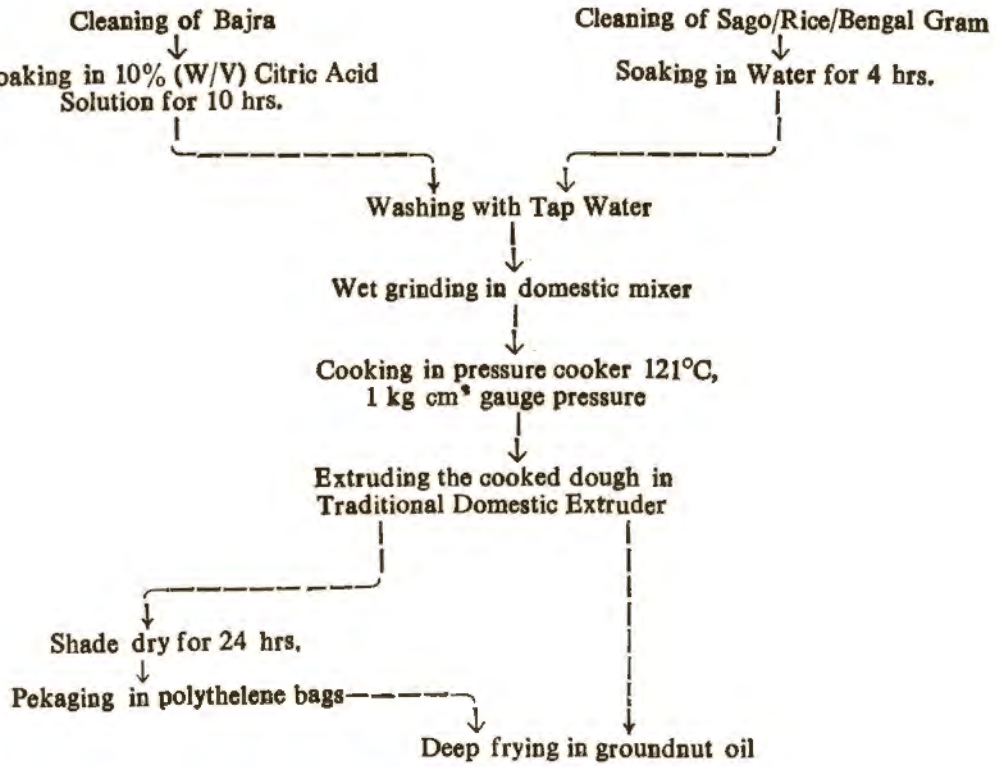


Fig. 2—Flow Process Chart for extruded product of Bajra

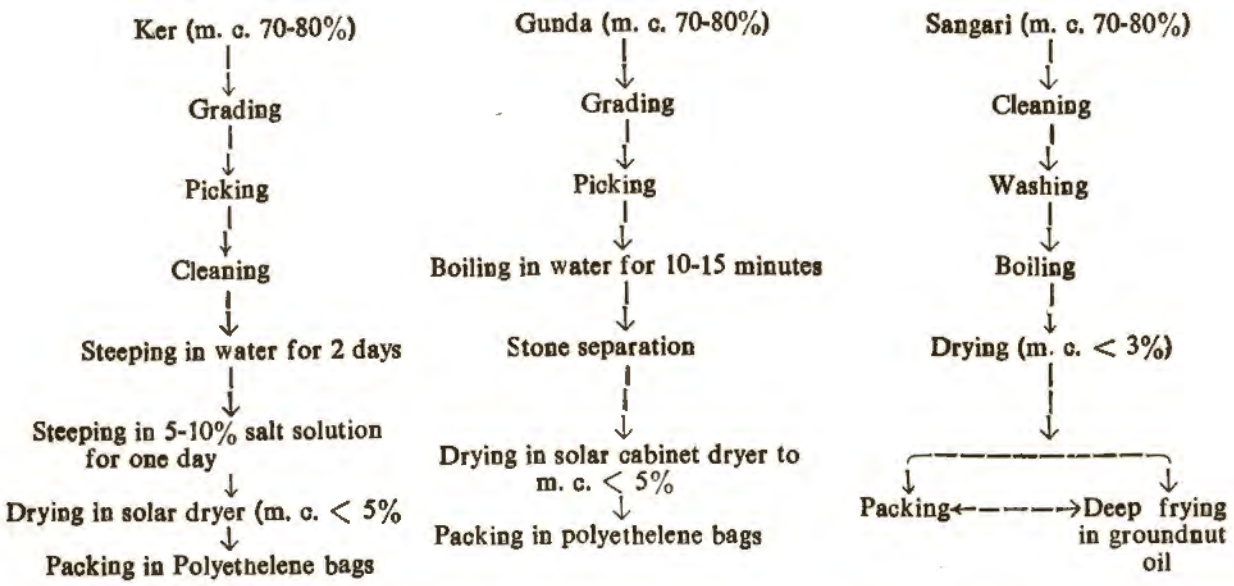


Fig. 3—Flow process chart for dehydration of Ker, Gunda and Sangari.

Information on Rural Technology Products/Processes

SIMPLE TECHNOLOGIES FOR PRODUCING COCONUT SHELL CHARCOAL

BACKGROUND

Like in other developing countries charcoal is very popular cooking fuel in Indonesia. Because of the worsening fuelwood situation in the country, shortages of high quality charcoal have been experienced. In rural Indonesia, coconut shells are available in large quantites. These coconut shells are not being utilized to any significant extent due to poor transportation facilities and the lack of technology for upgrading them. There is the need therefore to develop an appropriate technology for converting coconut shells in the rural areas to charcoal which is much less bulky and more valuable.

Yayasan Dain Tama, a small community development group based at Pontianak West Kalimantan, has developed a simple technology for producing coconut shell charcoal. The main aim of this development work was to provide the rural people with another mean of increasing their income. The technique developed involves the use of 200 litres drum as a kiln. It has been claimed that this technique is the most efficient and cost effective way of manufacturing coconut shell charcoal compared with other techiques which have been tried. he efficiency of conversion in term of weight has been reported to be as high as 25%, which is twice as high as that of the traditional method. Morever, production time per batch is only about 20 hours, which is very short.

MATERIALS AND EQUIPMENT NEEDED

Materials

The materials needed in the production are : (i) coconut shell and (ii) kerosene.

Equipment

The equipment needed in the production are : (i) a modified 200 litre drum : (ii) a gunny sack and (iii) a sieve.

PRODUCTION PROCESS

The production process can be summarized as follows.

1. *How to prepare the Drum for Processing.*
   a. Choose a drum of 200 litre capacity.
   b. Make a hole with a diameter of 30 cm in the middle of the upper part of the drum. The small round plate is to be used as a cover.
   c. Make small holes at the bottom part of the drum so as to faciliate air circulation.
   d. Fix a cross wooden handle or bamboo onto the round plate so that it will not fall down when used as a cover.

2. *How to Burn the Coconut Shell.*
   a. Put some stones under the drum.
   b. Fill 1/3 of the drum with coconut shell.
   c. Put a little kerosene just enough to start the burning of the coconut shell.
   d. Keep the fire for 5 minutes (you will see black smoke coming out of the drum).
   e. After 5 minutes, cover the drum to put out the fire and wait untill while smoke comes out of the drum.
   f. Open the lid and let the smoke come out.

g. When the white smoke is thinner it means that the coconut shell has turned into charcoal.

h. Add more coconut shell as much as 10 kgs into the drum and wait until black smoke comes out which is a sign of burning of the coconut shell. Then go on with the same procedure until the drum is filled up with charcoal.

Altogether, the process of burning a drum of coconut shell into charcoal takes 8 hours of continuous burning.

3. *Post Burning Process.*

a. After 8 hours, take the drum down (take out the stones).

b. Fix the lid and seal the space between the lid and the drum with some leaves and mud so that no smoke may come out of the drum. It is important to note that there should be no white smoke comes out of the drum because if it does, all charcoal is likely to turn to ash.

c. Keep the drum sealed for a night (12 hours).

4. *How to Take the Charcoal Out of the Drum.*

a. Take out the seal and open the lid.

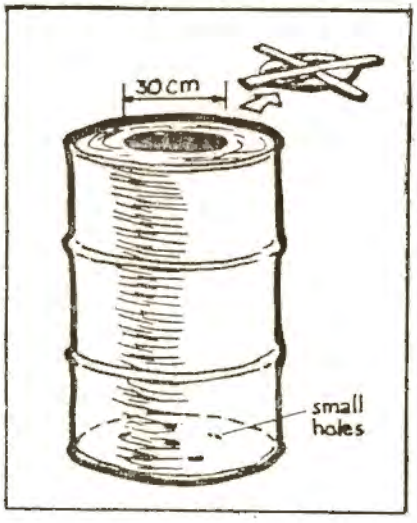
b. Prepare a gunny sack or plastic on the ground.

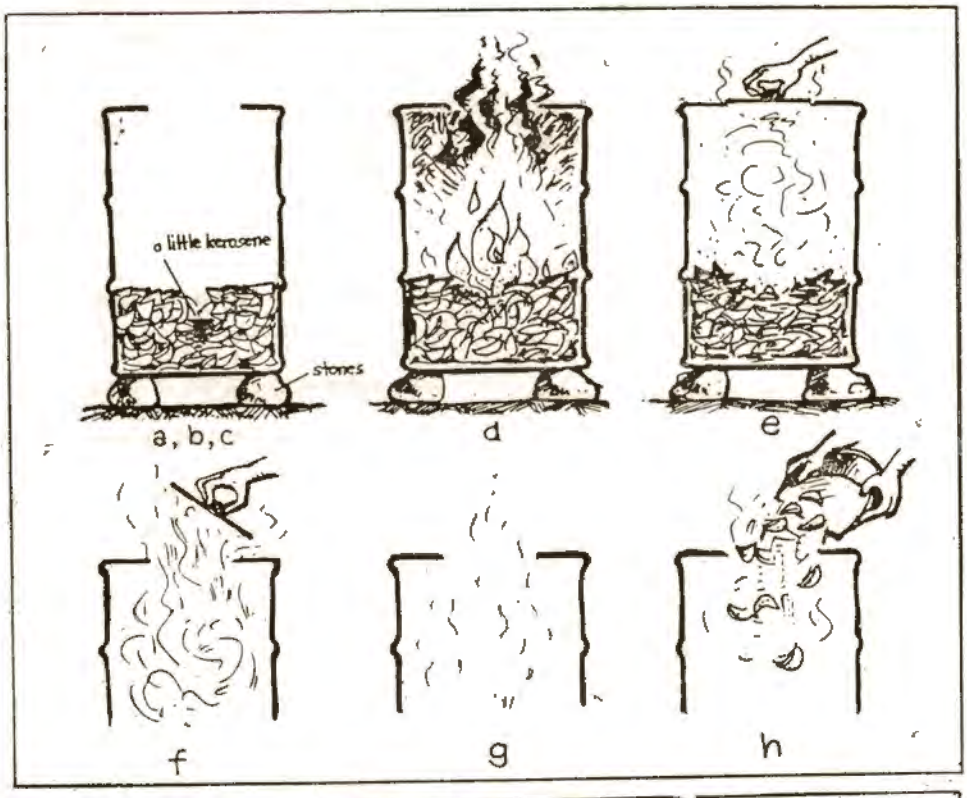
c. Turn the drum up side down to get the charcoal out.

e. Sieve it to get rid of the ashes.

f. Keep the charcoal in gunny sack.

g. When storing them, do not ever put them on the ground. Put the sack of charcoal on pieces of wood.




a little kerosene
stones
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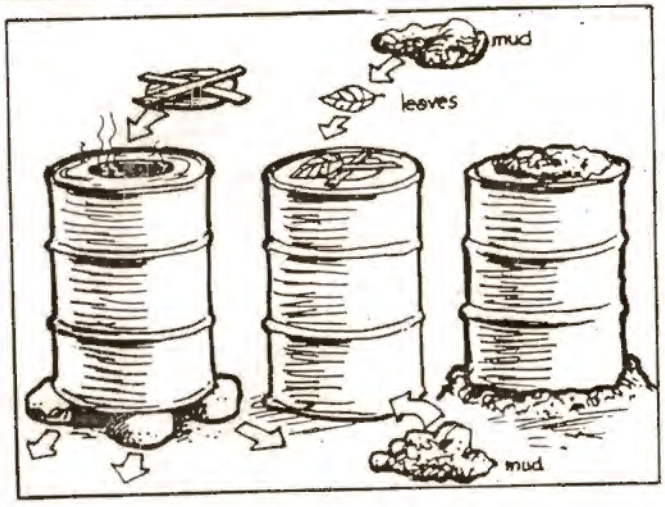
mud
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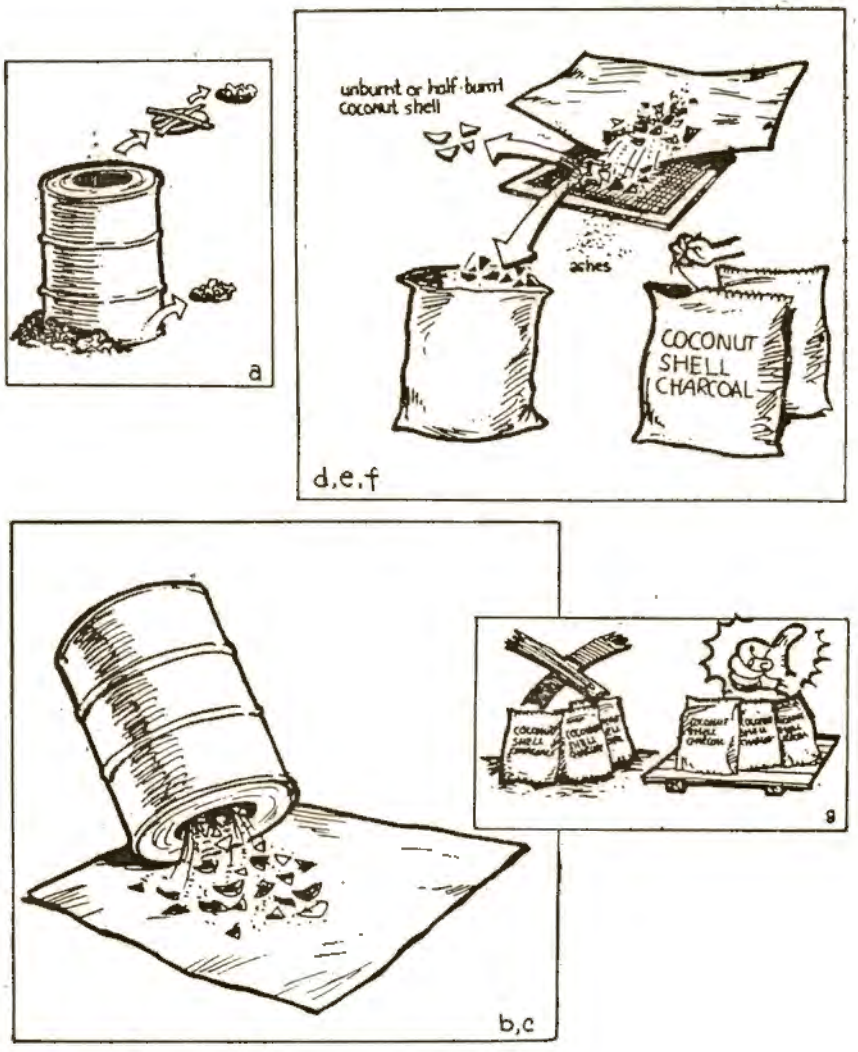
a
unburnt or half-burnt coconut shell
ashes
COCONUT SHELL CHARCOAL
d,e,f
b,c
g

SPOT LIGHT

PIPELINE FOR SOLAR ENERGY

ISRAELI scientists plan to test a promising commercial process for the transport of vast amounts of solar energy from desert regions to industrial areas hundreds of kilometres away by pipeline.
The world's first methanator pilot plant designed for solar energy applications has been built at the Weizmann Institute of Science in the town of Rehovot.

It is a key component of the chemical heat pipe an appliance for the conversion of solar radiation into chemical energy in the form of a mixture of hydrogen and carbon monoxide. The resulting synthesis gas may make it possible to store the energy of the sun over substantial periods and if required transport it over long distances.

The process is being developed jointly by specialists from the Canadian Institute for the Energies and Applied Research and their colleagues at the Weizmann Institute, says a journal published by the UNDP.

The promise of the new technology has led to proposals for the establishment of a global organisation devoted to the development of solar power, which is being considered by the influential energy committee of the United Nations Economic Commission for Europe (ECE).

The new institute would be modelled on the United Nations International Atomic Energy Agency (IAEA).

The solar facility comprises 64 giant computer controlled mirrors that track the sun and concentrate its energy onto a 54 metre high receiving tower.

This concentrated solar energy is absorbed in a special chemical reactor where methane and other hydrocarbons can be converted into synthesis gas. The energy rich gas can be stored and sent by pipeline to the point of use. The energy present in the synthesis gas is recovered by means of the methanator by converting it back to methane and in the process releasing high temperature heat.

USES : The heat can be utilised in many ways according to the user's needs. The methane produced by the methanator may be returned to the solar plant to be used again for the production of synthesis gas, thus completing a closed loop system that neither uses any fossil fuels nor emits any gases into the atomosphere.

The feasibility of this process has been demonstrated by Mr. Moshe Levy of Weizmann's materials research department who has carried out many successful tests of the complete cycle at a 10 kw power level.

RICH SOURCE OF VITAMIN A DISCOVERED

The blue-green algae Spirulina is one of the richest sources of vitamin A, whose deficiency continues to be a major public health problem in India, scientists from the National Institute of Nutrition (NIN), Hyderabad, report.

What's more, it can save considerable foreign exchange spent in importing synthetic vitamin A and carotenes for various public health programmes.

Vitamin a absorption in both test rats and children fed with Spirulina is comparable to the absorption of synthetic vitamin A in control cases.

The tiny thread-like algae which many people dismiss as scum in ponds can be harvested, mass cultured, and spray or sun-dried to form a supernutritious dark green powder that is rich in proteins, vitamin A and B-12.

A gram or two of the powder meets the daily vitamin A needs of pre-school children and most of the requirements of older children and adults.

NIN studied the effect of Spirulina supplementation in rats and children, using algae samples provided by the Murugappa Chettiar Research Centre (MCRC), Madras, which has developed the technology for mass culture and production of dry Spirulina powder.

Short-term studies did not reveal any adverse effects of feeding 10 per cent Spirulina in the diet. During the trials, pre-school and school children received daily supplements of one or two grams of Spirulina for a month, in various preparation such as "laddus" made of Bengal gram power, "sambhar", chutney and curries.

The children accepted the supplementation without any fuss, although they preferred chutney the most and did not show any adverse effects.

The studies in animals and humans are "encouraging" and Spirulina can be added in Indian diets to provide vitamin A.

Preformed vitamin A is present in foods of animal origin such as liver, meat, eggs, milk and fish which are expensive and beyond the reach of the poor.

Plant foods such as green leafy vegetables, carrots, papaya and mangoes contain yellow pigments called carotenes, some of which can be converted in vitamin A in the intestines.

Unlike the green leafy vegetables and fruits which rot and lose their vitamin A on drying, Spirulina can be dried and stored for a fortnight at room temperature, or a month in a refrigerator, without much loss of the vitamin.

Rural Indian women can be easily taught how to cultivate Spirulina in their backyards and use it daily, apart from the leafy green vegetables, in their diet.

Spray-dried Spirulina can be regarded as a long-shelf-life vegetable.

However, owing to its light weight and dark green colour which some people do not like, it may be difficult to incorporate more than one to two grams of Spirulina in a meal.

Therefore, it cannot be considered as a replacement for vitamin A in some intervention programmes where large doses of the vitamin are needed at six-monthly intervals.

SEWAGE GAS FOR POWER GENERATION

A feasibility study report on the use of Sewage Gas for Power Generation has been carried out for the Pirana Sewage Treatment Plant at Ahmedabad. The Sewage Treatment Plant which treats 52 million gallons of sewage per day has a potential for generating 10,620 m^3 of biogas per day, with a calorific value of 4,500 Kcal/m^3. The potential gas generation can easily sustain a 650 kW gas based power-station to meet the energy requirement of the sewage treatment plant with a possibility of surplus gas for other use. The study revealed that the cost of power generation varies from Rs. 0.60/kWh to Rs. 0 80/kWh. The Central Government has been approached for financing the actual implementation of the project.

GASIFICATION : GAINING POPULARITY

Though Gasification technologies have been initiated in developed countries, it is the developing world, which has taken a lead in tapping their potential. India already has numerous Gasification Programmes at implementation and R and D stage.

With the intiation in diesel prices and scarcity of supply, many more users are opting for Gasifier Systems. The feedback from the beneficiries also has been very encouraging with reports of an average diesel replacement of over 60 percent. Minor operational problems are being solved at the user level itself. During 1989-90, 175 HP capacity and 3.10 HP capacity gasifier engine pumpsets have been

installed in rural areas for irrigation purposes. 7 Stirling Engine Systems running on 100 percent biomass have also been installed at various places in Gujarat to demonstrate the viability of this technology.

CFRI PROCESS FOR SMOKELESS BRIQUETTES RELEASED TO INDUSTRY

A process developed by the Central Fuel Research Institute, Dhanbad, for the manufacture of smokeless, water-resistant fuel briquettes has been released to industry.

A Kanpur-based firm would set up a 25 tonnes-per-day capacity plant using low-grade cooking coal from Jharia coalfields and washery midlings or sinks from the Dugdha coal washery. Commercial production is expected to start by June this year.

The CFRI process consists of initially crushing the raw material, primarily midlings or low-grade cooking coal, to optimum fineness and mixing it with an inorganic binder.

The mixture is briquetted by a low-pressure twin roll press and the resulting green briquettes are devolatilised in a self-heated devolatiser.

The total anticipated investment for a 25-tonnes-per-day plant is between Rs. 1.2 and 1.5 million. depending on the extent of mechanisation, reports a newsletter of the Council of Scientific and Industrial Research.

GOVT. PANEL MOVE BLOW TO ECOLOGY

The Committee of Secretaries (COS) to the government has decided that public sector projects that cost upto Rs. 200 crores would not longer require environment impact assessment (EIA) clearance from the ministry of environment and forests.

Those concerned about the rapid destruction of the environment fear that there is a strong move to dilute the (EIA) if not do away with it altogether.

Now projects that cost less than Rs. 200 crores needs only clearance of the state pollution control boards. Mining projects of less than 500 hactares will be cleared by the state departments of mining and zoology (in case of minor minerals) and by the Indian Bureau of Mines for major minerals. Since the bureau of mines is subordinate to the department of mines, there is a fear that it may be reduced to a rubber stamping authority.

Allowing projects upto Rs. 200/ – crores to come up without the EIA means power plans upto 200 MW can come up without an environment clearance. It is estimated that it costs about Rs. 1 crore to generate one MW of power. There will be a spurt in 180 and 200 MW projects just to avoid the EIA. The Tehri dam, it may be pointed out, started off as a Rs. 125/ – crore project but today its costs is estimated at Rs. 3,500/- crores.

The EIA exemption for mining on 500 hectares virtually means that you can have quarrying of the scale seen in Dehra Dun and Mussorie without any hindrances. The Dehra Dun limestone quarrying by 106 licencess was on 500 hectares. No project was more than 90 hectares. The impact of limestone quarrying, however small, is disatrous of or the evnvironment.

The environment and forest ministry is now trying again to have the EIA exemption for mining area reduced from 500 hectares to 20 hectares.

EFFECTIVE USE OF POLYETHYLENE WASTE

A new process to reuse polyethylene waste by cracking it into oil has been developed by Japan's Agency of Industrial Science and Technology Industrial Research Institute at Hokkaido.

The new process is a two-stage catalytic process. using natural zeolite as the catalyst, producing

higher-quality gas oil than the conventional process which depends on thermal cracking only, without being accompanied by carbon deposition.

Waste from various types of plastics such as polyethylene exhaust from homes and factories are at present mostly disposed of by burying. However, it is becoming increasingly difficult to find good disposal sites as the volumes of the wastes continues to rise.

This situation has prompted a search for techniques in thermally crack plastic materials. The processes developed so far produce only wax like oil of offensive odour. In addition they produce large quantities of carbon as a byproduct which is deposited on reactor walls.

The new process tries to crack polyethylene as one of the representative plastic materials, to produce higher-quality fuel oil. Unlike the conventional process that depends on thermal cracking, it thermally treats polyethylene in two stages in tanks packed with catalyst of natural zeolite.

The first and second tanks operate at 450 degrees celsius to produce 4.8 kg. per hour of transparent, high quality oil without carbon deposition. The researchers plan further work to commercialise the process.

DECOMPOSABLE PLASTIC FROM FOOD WASTES

A process that converts starchy food wastes and byproducts into a lactic acid-based plastic that fully decomposes into harmless chemicals when exposed to moisture of sunlight might be commercially available soon.

Argonne National Laboratory in the United States has licensed key steps in its BioLac process to Kyowa Hakko USA Inc., the subsidiary of Japan's Kyowa Hakko, which deals with fermentation products.

Kyowa Hakko plans to carry out further research aimed at commercialisation. The BioLac plastic has potential applications for products such as compost bags, coatings for paper, seeds, pesticides and fertilisers.

It could also find use in mulch films for time-release of pesticide and fertilisers. In the two-steps that have been licensed, one converts glucose, found in starchy food wastes, into lactic acid, the other converts lactic acid into polylactic acid.

TAPPING IDLE ANIMAL POWER

Every year some 160 million tonnes of forest wood, bushes, greenery disappear from the already depleted bioresources of the country to meet the domestic energy requirement. According to Environment Minister himself, only 30 million tonnes of this is authorised felling; as much as 130 million tonnes of firewood is felled and removed clandestinely of illegally or both.

At this rate it would not be long before the forest cover of the country would come down from the present 10 percent within a decade-a dangerously low level of forest cover from the 22 percent it had in 1947. Particularly in a country facing thick rainfall during three to four months of the year and a dry climate for the rest of the nine or eight months (except in the west coast region and north-east), such depletion of forest cover could be disastrous, leading to floods, droughts (alternately or in the same year). Some day there would not be enough forest cover even for the annual requirement of firewood.

DONT DEGRADE DONKEYS

(While the braying of the donyey is considered auspicous the donkey is seen with contempt.)

The donkey belongs to the Equidae family of the Perissodactyla group comprising horses and zebra. There are two types of donkeys common in India-the small grey and the large white. The former is dark grey in colour with Zebra like markings and is found in most parts of India, The latter is light grey to almost white in colour and commonly met

with in Kutch. The average height of the small gray donkey is 0.81 m and that of the large white variety is 0.93 m.

While donkeys exist all over India, that are found in large numbers in Andhra Pradesh, Gujarat, Tamil Nadu, Rajasthan, Uttar Pradesh and Kannataka. Their presence is very small in Kerala, West Bengal, Himachal Pradesh etc.

Donkeys need little attention and only small quantities of rations. They manage well on poor quality forage and can with stand exposure to rain and cold weather. Donkeys are handy and useful pack animals. Their pace is about 3 km per hour and they can cover more than 24 km in day. Donkeys are able to haul 1/2 to 3/4 tonne in suitably designed cartys.

It is unfortunate that when there is so much need for draught animal power we in India, are not developing the donkey which an intelligent animal, contrary to popular belief, and is about the most economical to maintain, as China is doing. As petroleum becomes more scarce and more expensive there is no alternative for poor countries like India but to utilise draught animal power (DAP) more and more. It is a peculiar Indian characteristic that while the braying of the donkey is believed to indicate auspiciousness, we treat the donkey itself with the utmost contempt. It is high time we realise the usefulness of the donkey treat it preperly and utilise its services.

'HYBRIDOMAS'—THE SOURCE OF MALARIA ANTIBODY

Our body's defence organisation has two types of lymphocytes (a type of white blood cell) T and B. While the T lymphocytes are responsible for eliciting immunity against the invading disease causing organisms (pathogens), the B cells produce antibodies against the organisms. The antibodies eventually circulate in the blood and fight the invaders. When our body is infected with a pathogen or inoculated with a foreign agent, the T and B cells get sensitized. B cells produce antibodies not only against the antigens present on the outer cost or the pathogen but also for the speeific determinants of each of the antigens. Separation of these antibodies into individual entities is almost impractical. Each class of antibody is produced by a different line of lymphocytes. In theory, if a sensitized antibody producing lymphocyte is isolated and cultured, large amounts of identical antibody can be produced in the laboratory. These antibody producing cells, however can not survive for longer periods in artificial conditions.

In 1975, scientists G. Kohler and C. Milstein from Cambridge, England, developed a technique for mass production of required antibody. This techniques involves fusion of antibody producing cells with an 'immortal' cancer cell called myeloma cell. The resulting cell is called hybrid myelomas or hybridomas. These cells multiply uninhibitedly in cultures and produce monoclonal (same type) antibodies.

Using hybridomas, large amounts of monoclonal antibodies are now produced either by culturing the selected hybrid in the laboratory or growing them as tumours in the body of mice.

BATTERY OPERATED PESTICIDE SPRAYER

Agricultural engineers in Tamil Nadu have developed a battery-operated pesticide sprayer which is claimed to be more efficient and less expensive than the ones currently in use.

The new sprayer with double or triple spinning discs has been developed by scientists at the College of Agricultural Engineering, Tamil Nadu Agricultural University, Coimbatore.

It consist of two direct current (DC) micro motors, a 10-litre capacity pesticide tank, two 6-Volt rechargeable batteries, and hose connections from the tank.

The operator holds the T-handle in his hand and with the pesticide tank, batteries and frame behind him, walks in the field to spray the pesticide.

The only modification in a triple disc sprayer is the presence of three micro motors with spinning discs, instead of two in the double disc sprayer.

The double disc sprayer can cover 0.30 hectares in an hour and the triple one 0.45 hectares, compared to 0.1 hectares covered by conventional manually operated knapsack sprayers.

The new sprayers reduce water requirement by 40 percent, says a report by Coimbatore scientists A Tajuddin and R Karunanithi in the journal "Invention Intelligence".

The cost is also considerably reduced working cut to Rs. 15 to spray one hectare with the spinning disc sprayers, compared with Rs. 30 taken by power-operated sprayers and Rs. 45 by manual ones.

Each double spinning disc sprayer coats Rs. 1,700 and triple disc sprayer Rs. 2.300 compared to Rs. 3000 needed for a power sprayer.

Once the batteries are fully charged, the sprayers work for 16-17 hours.

The sprayer is suitable for medium and tall crops provided their height does not exceed that of the pesticide tank.

RURAL DEVELOPMENT COURSE

Department of Extra-Mural Studies, University College of Wales, U. K. will conduct a eight week **Rural Development Course** in September-October 1992, at Wales, U. K.

This eight-week course aims to give guidance to men and women involved in the day-to-day-running of rural development programmes in the developing world. It concentrates on the particular problems of each participant bringing in specialists in the fields of agriculture, education, health and management.

For further information :

Mr. Richard Hartnup
Rural Development Course
Dept. of Extra Mural Studies
9 Marine Terrace
Aberystwyth, Dyfed,
Wales SY 232 AZ
United Kingdom.

POWER GENERATION FROM NON-CONVENTIONAL ENERGY SOURCES

Department of Electrical Engineering, Regional Institute of Technology, Jamshedpur will organise an ISTE Summer School on "Recent Advances in Power Generation from Non-Conventional Energy Sources" from May 25 to June 6, 1992, at Jamshedpur.

To create awareness and update information the Recent Advances in Power Generation from Non-Conventional Energy Sources, the participants will be exposed to be following topics.

1. Wind Power Conversion Technology.
2. Different Schemes of Converting Wind Energy into Electricity
3. Recent R & D work in Wind Energy Conversion.
4. State of the Art of Solar Power Generation
5. Mini and Micro Hydel and Tidal Power Plants
6. MHD Power Generation
7. Recovery of Energy from Bio-mass and processing of Wastes
8. Electricity Generation from Bio-mass
9. Energy conservation and Management

The course is for teaching Institutions and Engineers from Industries, Government and semi-government organisation :

For Further information contact :

Dr. J. R. P. Gupta
Department of Electrical Engineering
Regional Institute of Technology
Jamshedpur—831014.

PLANNING AND DESIGN OF BUILDING AND ENVIRONMENT :

Continuing Education Centre. Asian Institute of Technology in collaboration with Asia Training Centre on Ageing, HelpAge will organise a workshop on "Planning and Design of Buildings and Environment for Older and Disabled Adults" from August 31 to Sept. 11, 1992 Bangkok, Thailand.

This workshop aims to enhance awareness among the participants of the needs and problems of elderly and disabled adults living in rural and urban communities in the developing countries. The workshop provides a framework for search of practical solutions on planning and design of residential houses, day centres, day care centres, work places, public buildings and environment for elderly and disabled adults. It advocates adoption of a participatory approach in identification of type of required facilities, planning, design and cost estimation etc.

The workshop is for senior planners, architects and engineers non-governmental social workers with similar responsibilities, and also for professors in schools of building and architecture.

For further information contact :

Admissions
Continuing Education, Center.
Asian Institute of Technology
G. P. O. Box 2754
Bangkok 1050.
Thailand.

ENERGY MANAGEMENT AND CONSERVATION IN INDUSTRY :

The Institution of Engineers (India), Bhubaneswar will be organize a "Seminar on Energy Management and Conservation in industries", on July 20, 1992.

Energy saving under the present shortage conditions has become a subject of great concern. The objective of the seminar is to give an insight into the state-of-the art of technology of energy saving and bring out recommendations after proper discussion by the participants.

The participants will be exposed to the following topics :

1, Energy Conservation Methodology.
2. Energy Conservation in Power Plant.
3. Reduction of T & D Losses.
4. Energy Conservation in Induction Motors used in Industries.
5. Energy Conservation in Transport Sector.
6. Energy Conservation in Industrial Lighting.
7. Energy Saving in Domestic Appliances.
8. Role of Electronics in Energy Saving.

For further information contact :

Mr. P. C. Mahapatra
Organizing Secretary
The Institution of Engineers (India)
Sachivalaya Marg
Unit IV
Bhubaneswar—751001.

ABSTRACTING INDEXING :

National Institute of Small Industry Extension Training, Hyderabad will be organise "Short-Term Intensive Programme on Abstracting and Indexing" from 13-24 July, 1992.

Information is considered a valuable national resource. There is a great demand for the rights information of taking fruitful decisions by the specialists in all fields. The objective of the programme is (i) to cover principles of abstracting, indexing, searching and information technologies, (ii) to provide practice and impart skills to the participants in information processing techniques as a means for creating database (iii) to prepare participants for effective and efficient use of information technology to enable them to provide speedly access to information.

The following topics will be cover in the programme :

1. ABSTRACTING : Concept, types guidelines, planning and organising and abstracting service and evaluation of abstractors and abstracting.
2. INDEXING : Subject analysis of documents, subject indexing, concepts, methods and models, indexing languages, indexing models, information products and Services, searching, market of information services etc.
3. COMPUTER APPLICATIONS : Application Micro Computers for database design and development, Computer applications in abstracting and indexing, the saurus construction etc.

The training programme is intended for persons working in technical information centres, documentation and information centre, academic and research institutions, public and private sectors, industrial development, extension organisations in government or corporate sectors responsible for documentation and information work.

For further information contact :

National Institute of Small Industry Extension Training
Yosufquda
Hyderabad—500045.

RURAL ENERGY CRISIS : A DIAGNOSTIC ANALYSIS

Energy crisis has multidimentions. While much publicised issue pertains to scarcity of commercial sources of energy like petroleum, electricity, coal and gas an equally important but much neglected issue pertains to energy problems of the rural people On account of fast deforestation, dwindling supply of firewood and gradual commercialisation of traditional fuel sources it has become very difficult for the folk to secure adequate energy supply at a cost which is affordable by them, Micro-level study of rural energy consumption need to be periodically carried out to assess the impacts of various policy measures and to assess the changes taking place in rural areas. Rural people especially women and children are subjected to drudgery of collecting fuel wood from far off places spending on an average even more. If there is such acute scarcity of energy on one side there is huge wastage of available resources due to ignorance and inefficient methods of energy use. This study is an attempt to understand the various aspects of rural energy problems. The study is based on the information gathered at grassroot level and obervation of day to day domestic requirement of energy. This book also examines the working of smokeless chulhas and gobar gas plants and brings out the problems experienced in their application.

The complete study is divided into eight chapter : Rural Energy : A problem, Energy consumption patterns in selected vill ges, consumption of Twigs and Branches, Agricultural Waste, commerci l source of energy, Rural Energy Consumption pattern across the vllages-An overview, New Technology for Rural Energy and the last chapter is for conclusions. Bibliography and index.

"Rural Energy Crisis : A Diognostic Analysis" by Hemlata Rao Published by Ashish Publishing House, New Delhi, 1990, pp 178, English Rs. 200/-.

WATER POLLUTION :

Water is a liquid of life, as there can be no life without water, Pure water is an animinating fluid while polluted water is a real course for living beings. This book elucidates an upto-date authoritative coverage of literature concerning the work done in abroad and India on both lentic and lotic waters covering aspects on algae as pollution indicator and effect of environment, industrlal effluents and heavy metals and other chemicals on algae. It also describes the procedural details about collection identification, qualitative and quantitative determination culture of algae, and physico-chemical analysis of water systematic enumerations of chlorophyceae, Bacillariophyceae, Euglenineae and cyanophyceae coupled with illustrations have also been taken into account. All these accounts have been evaluated in the merit of their inter-relationships. Special attention has been given of such wide aspects on algae and water pollution has augmented the value of the monographic work on present day and futuristic problems.

"Water Pollution", by A. K. Tripathi and S. N. Pandey published by Ashish Publishing House, New Delhi, 1990, English, pp 326, Rs. 300/-.

RURAL ECOLOGY :

Ecology is the study of particular type of system, called eco-system whereas human ecology is the study of an eco-system where at least one of the component is man. Thus human ecology is a branch of ecology which studies relationship between organism and his environment. The theme of this study is human ecology.

The aim of this book is to provide a conceptual frame work for studying man-environment relationships of micro level. Sometimes, the specific is transformed into general such as, the landform combinations transcendenting into Khadar-Zones and series. On the other occassions, a deductive model is used to seek order in the specific conditions preveiling in these villiager. The components of the flood plain eco-system is defined in the language of the general systems theory. Unfortunately entropy could not be measured in the absence of the required data. The aim is not to provide data, but to offer a frame-work for raising and ordering data.

Some interesting laws of rural ecology emerge from the study of the specific villages of the study area.

"Rural Ecology" by C. Mumtamayee Published by Ashish Publishing House, New Delhi, 1989, pp. 214, English, Rs. 200/ –.

SOLAR–POWERED DESALINATION

In Africa, chronic drought conditions are reducing access to and the quality of, drinking water, particularly for those living in arid regions, surface water sources and shallow wells are not being replenished naturally. In Botswana, recurring droughts have left 80% of the population reliant on water from boreholes. Drilling such bore holes is an expensive proposition and the water is often scarce or saline. One possible solution to this dilemma is solar desalination. This book summarizes the results of an intensive 3 year field study carried out by the Solar Energy Section of the Rural Industries. Innovation centre (RIIC) with the support of International Development Research Centre (IDRC) on the technical performance and suitability of various small scale desalinators. Their finding indicates that small scale desalinators can provide a clear, palatable distillate, that certain models can provide a consultant and adequate supply of potable water when the distillate is added to salty water from traditional sources and that the technology is readily acceptable to remote area dwellers (RADS). The study also highlights the importance including intended beneficiaries in management of a new technology, in this case, the siting, construction, operation and maintenance of the desali nators.

The study is devided into seven chapters: Introduction, choosing a technology, designing stills for harsh condition, installing and operating the stills, Maintaining the stills, comparing costs of alternative technologies and conclusion.

"Solar Powered Desalination" by R. Yates, T. Woto & J. T. Tihage, published by IDRC, Canada, 1990 English pp 55.

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AIMS AND SCOPE :

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3.	Spot Light	—	(News and Views)
4.	Futurama	—	(Forthcoming Events : Training Programmes, Seminars, Symposium, Workshop etc.)
5.	Book Bag	—	(News on Books and Publications)

NOTE FOR THE GUIDANCE OF AUTHORS :

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

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