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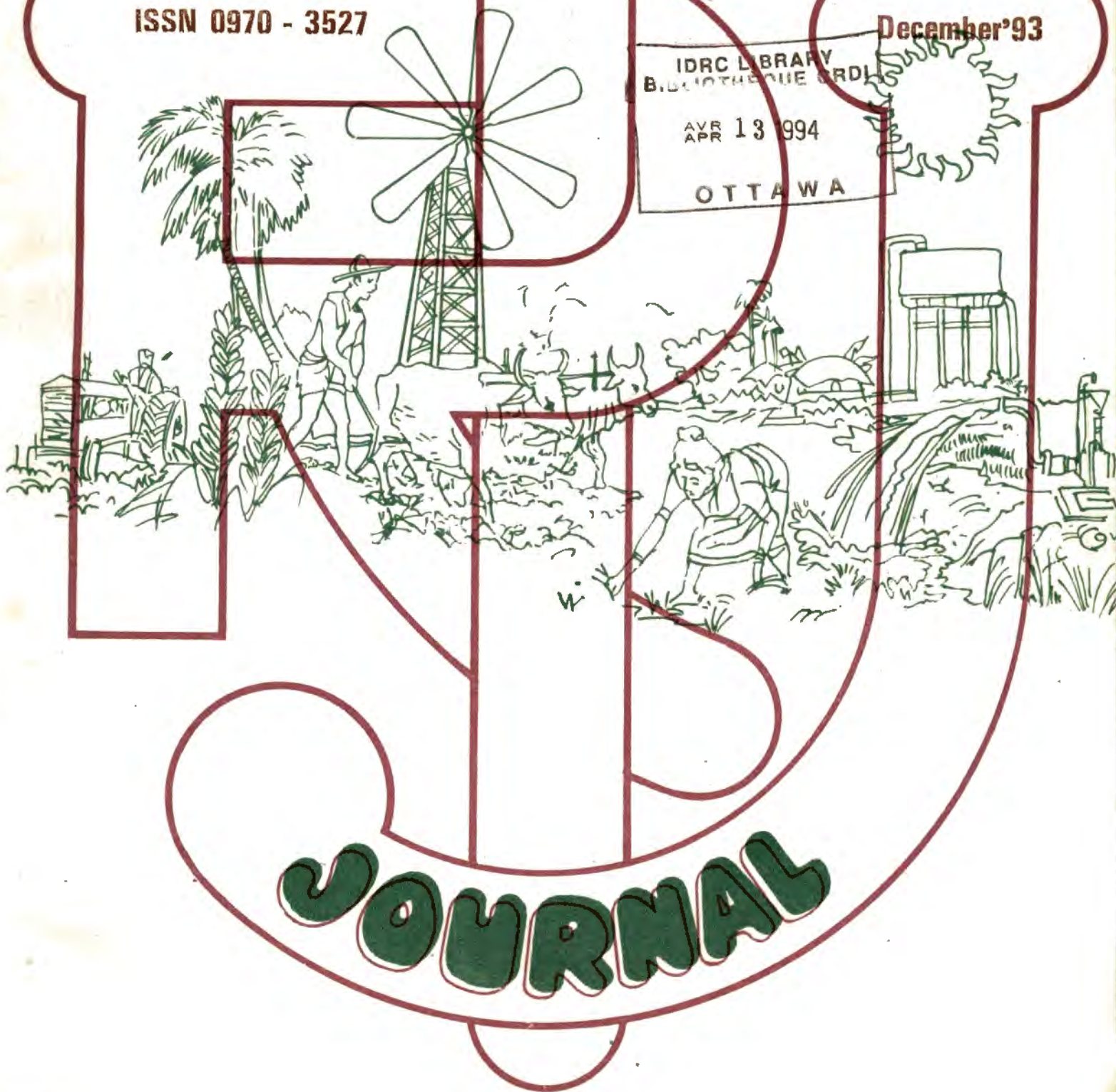
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Editorial

India is a classical state, the birthplace of the world's oldest and most advanced civilization.

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...the power seekers and power-brokers is busy in parochial skirmishes and street fights. It seems we can only pray now for the emergency of a true giant of a human-being strong enough to lead the nation out of this morass of 'development'.

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NUTRITIONAL PRODUCTS OF BAJRA

N.K. JAIN P. SETH J.S. BORDIA

Post Harvest Technology Scheme

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Pearl-millet forms the staple food of poorer class of arid and semi-arid region of Rajasthan and Gujarat. Despite having maximum fat and energy value among the major cereals and millet, pearl millet is considered as inferior food grain, due to its fibrous bran and gray pigments thereby posing difficulties in making soft dough and imparting gray colour to its products.

Processes were developed for making meshed and baked products from bajra using traditional technique. The sensory evaluation of developed products revealed their consumer acceptability. The energy and economic analysis of the products depicted their superiority in terms of nutritive value and cost. The equipments/gadgets have been identified to make these products at small scale level. It is recommended to introduce the developed nutritious products in child feeding programmes to alleviate the problem of malnutrition.

Pearl millet (*pennisetum typhoides*), commonly known as bajra occupies an important place in the grain economy of India as it can be grown in regions with comparatively low rainfall and can flourish well even under the adverse conditions of weather. It forms the staple food of

economically weaker section of society of Rajasthan and Gujarat in the form of 'Roti' and 'Khichari'. Despite having maximum fat (5%) and calorific value (3610 Kcal/kg) among the major cereals and millets, bajra and its products are not being accepted in regular diet by all section of people, due

to its fibrous bran and deep gray pigments which create difficulties in making soft dough and impart bitter taste and gray colour to its products.

Rajasthan contributes about 30 per cent to the total bajra production (4.8 million tonnes) of the country (1). Slowly a thrust is likely to come on better utilization of millets with the further increase in population.

Ready products of bajra such as meshed and baked products are very important not only from the view point of nutritional value and palatability but also because they are basically prepared foods which require a very little or hardly no preparation time before eating. Various studies were conducted on on-farm product development from bajra under All India Co-ordinated Research Project on Post Harvest Technology at Udaipur (Rajasthan). The products prepared from raw bajra alone were found to have very poor acceptability because of their gray colour, coarse texture, bitter taste and flavour. However acceptable products

were obtained from pearled bajra in combination with other cereals, pulses and oilseeds (2, 3).

Deosthale (4) and Desikachar (5) reported that nutritious food must contain locally available cheap cereals, pulses and oilseeds. They have found that the roasting of grain is a rurally accepted traditional processing technique which not only improves the taste, flavour, colour and texture but also destroys the antinutritional or toxic factors of raw grain. Therefore a study was undertaken for developing bajra based nutritious meshed and baked products with acceptability at rural threshold.

Materials and Method

Bajra, green gram, bengal gram, and groundnut were procured from the local grain market. These grains were cleaned using a pedal operated grain cleaner developed at Central Institute of Agricultural Engineering (CIAE), Bhopal. The fibrous bran of bajra was removed with the help of a CIAE grain pearler.

Development of meshed products

Flow process diagram for meshed products is shown in fig.1. Pearled bajra and other grain were sand roasted in an open pan on a smokeless chulha at 260-270 degree C temperature for 35-45 sec. The roasted grain were ground in a stone attrition mill and the flour was obtained by seiving through 45 micron seive. Total nine blends were made viz. bajra, greengram and groundnut in the ratio of 4:1:1, 5:1:1 and 6:1:1; bajra, bengalgram and groundnut in the ratio of 4:1:1, 5:1:1 and 6:1:1 and bajra, bengalgram, greengram and groundnut in the ratio of 6:1:1:1, 7:1:1:1 and 8:1:1:1. Bajra flour alone was used as a control. Ground sugar @ 25% was added in each blend and thoroughly mixed. The products were sealed in 400 gauge polythelene bags and stored at room temperature (15-25 degree C.).

Development of baked products

Fig. 2 illustrates the flow process diagram for baked products. Pearled bajra and other grain were ground and flour of

45 micron was obtained. Nine blends were made using the flour of bajra, greengram, bengalgram and groundnut as mentioned for meshed products. Vegetable fat was thoroughly mixed with sugar in an open pan. The flour, milk and baking powder were then added to it and mixed to obtain a homogenous mass. A smooth dough was made by thorough kneading. The dough was rolled and moulded. Then baking was accomplished in an electric oven at 190-200 degree C temperature for about 8-10 minutes. The product i.e. biscuits were then cooled to room temperature before sealing in 400 gauge polyethylene bags and stored at room temperature (15-25 degree C).

Sensory evaluation of developed meshed and baked products was done with the help of a 14 member consumer panel using hedonic test as suggested by watts et. al (1989). The quality parameters considered were colour, flavour, tasted, texture and overall acceptability. Each quality factor was evaluated on a 5-point scale ranging from excellent to very poor. The panel quality evaluation data were

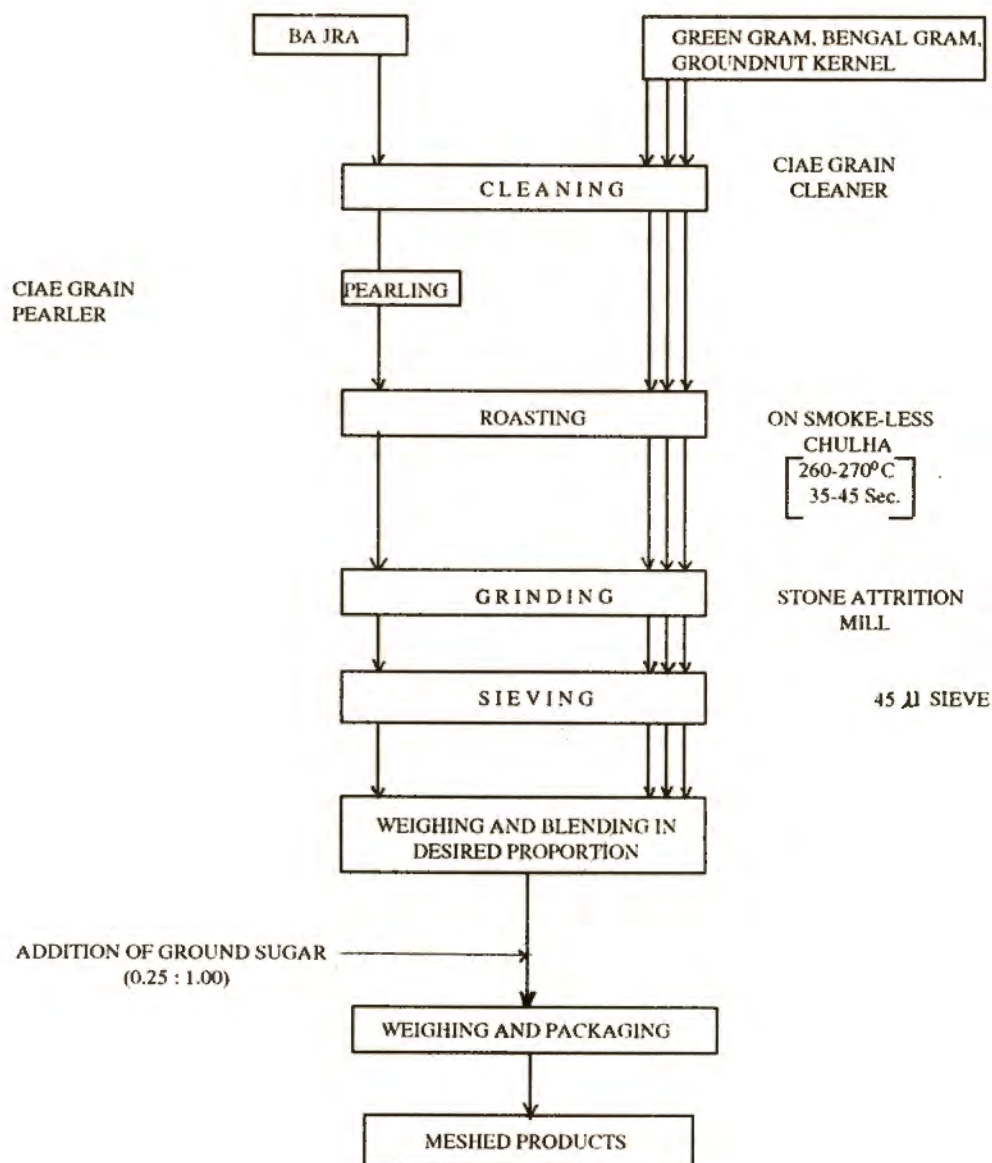


Fig. : 1 - Process Flow Diagram for Preparation of Meshed Products

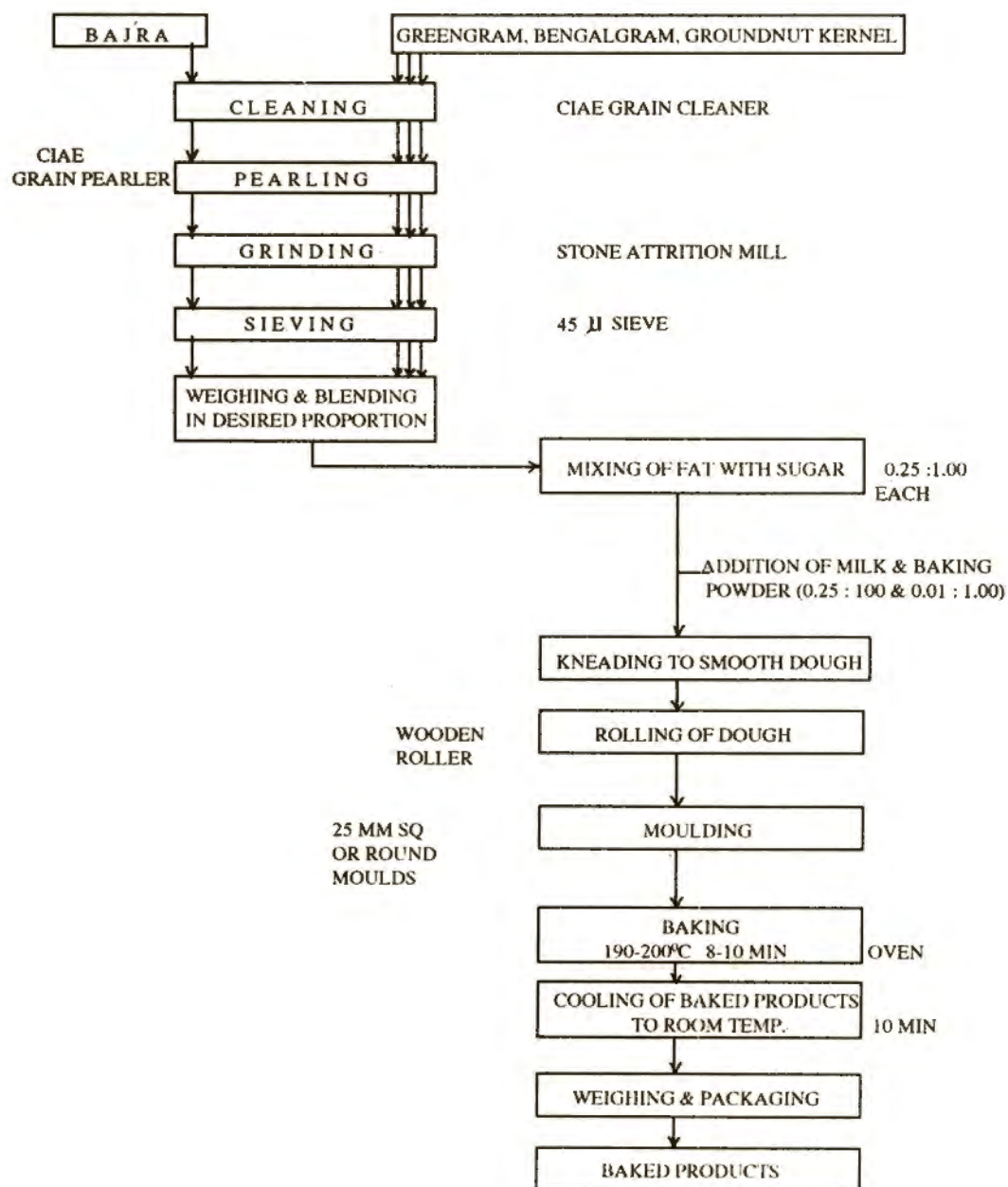


Fig. : 2 - Process Flow Diagram for Preparation of Baked Products

statistically analysed by adopting randomised block design (RBD) within observation per cell. The major nutrients, energy value and cost of the developed products was compared with that of commercially available products.

Results and discussion

The mean scores for quality parameters of meshed and baked products is presented in Table 1 and 2. Table 1 depicts that the meshed product developed with a blend of bajra, green gram, groundnut in the ratio of 5:1:1, with mean score for colour, flavour, taste, texture and overall acceptability as 3.57, 3.86, 4.14, 3.86 and 3.86 respectively, was found most acceptable by the consumer panel. The meshed product of bajra alone had the poorest acceptability. Table 2 shows that the baked product developed with a blend of bajra, green gram and groundnut in the ratio of 4:1:1 with mean score for colour flavour, taste, texture, and overall acceptability as 4.1, 4.0, 3.8, 4.1 and 4.1 respectively was

found most acceptable by the consumer panel.

The cost of accepted meshed product was worked out as Rs. 7.50 per kg based on the prevailing price of raw materials as on March 31, 1992 which is about 1/6 of the cost of commercially available products like Farex and Ceralac. The energy value of developed meshed product (3910 kcal/kg) is quite comparable with market product (4100 kcal/kg). The cost of accepted baked product was worked out as Rs. 16 per kg, which is about 3/4 of the commercially available maida (wheat) biscuits. The nutrients such as protein, fat and energy value of developed product was also found comparable with commercially available product and is in conformity to IS : 1656-1985 (Table 3). Thus bajra based ready products developed using locally available raw materials and traditional technique were found nutritious and cheap, hence could be used as supplementary baby food for alleviating the malnutrition of infants.

Table-1 : Quality factor evaluation of bajra based meshed products.

S. No.	Product composition	Mean score for each quality factor				Overall acceptability
		Colour	Flavour	Taste	Texture	
1.	B:GG:GN (4:1:1)	3.57	3.57	3.57	3.43	3.71
2.	B:GG:GN (5:1:1)	3.57	3.86	4.14	3.86	3.86
3.	B:GG:GN (6:1:1)	3.43	3.33	3.71	3.43	3.57
4.	B:BG:GN (4:1:1)	3.71	3.29	3.43	3.14	3.57
5.	B:BG:GN (5:1:1)	3.43	3.29	3.43	3.14	3.57
6.	B:BG:GN (6:1:1)	3.29	3.57	3.71	3.43	3.71
7.	B:BG:GG:GN (6:1:1:1)	3.29	3.29	3.29	3.43	3.43
8.	B:BG:GG:GN (7:1:1:1)	3.71	3.57	3.29	3.43	3.29
9.	B:BG:GG:GN (8:1:1:1)	3.29	3.29	3.14	3.14	3.29
10.	B (control)	3.71	3.29	3.71	3.57	3.43

S.Em = ± 0.206

CD 5% = 0.572

B = Bajra, GG = Green gram, BG = Bengal gram, GN = Groundnut

Table-2 : Quality factor evaluation of bajra based baked products

S. No.	Product composition	Mean score for each quality factor				Overall acceptability
		Colour	Flavour	Taste	Texture	
1.	B:GG:GN (4:1:1)	4.1	4.0	3.8	4.1	4.1
2.	B:GG:GN (5:1:1)	3.0	3.5	2.8	3.1	3.2
3.	B:GG:GN (6:1:1)	3.7	3.5	3.7	3.5	3.8
4.	B:BG:GN (4:1:1)	3.2	3.1	3.2	3.0	3.4
5.	B:BG:GN (5:1:1)	3.2	3.5	4.0	3.5	3.5
6.	B:BG:GN (6:1:1)	3.2	3.2	3.7	3.4	3.2
7.	B:BG:GG:GN (6:1:1:1)	3.7	3.7	3.8	4.0	3.7
8.	B:BG:GG:GN (7:1:1:1)	3.0	3.0	3.1	3.2	3.1
9.	B:BG:GG:GN (8:1:1:1)	3.8	3.8	4.1	4.0	4.0
10.	B (control)	2.4	3.1	3.1	2.8	2.7

S.Em = ± 0.228

CD 5% = 0.630

B = Bajra, GG = Green Gram, BG = Bengal Gram, GN = Groundnut

Table-3 : Nutrients and cost comparison of bajra products with commercially available similar products

S. No.	Product & composition	Protein %	Fat %	Carbo-hydrate %	Kcal/ 100 gm	Cost Rs./Kg
1.	Meshed product B:GG:GN (5:1:1)	12.46	8.12	67.00	391	7.50
2.	Farex *	15.50	7.50	70.50	410	50.00
3.	Ceralac *	15.50	9.00	67.50	413	54.00
4.	Baked product B:GG:GN (4:1:1)	10.10	21.50	57.30	464	16.00
5.	Wheat (Maida) Biscuit *	7.70	16.00	63.30	433	25.00

* Commercially available products

B = Bajra, GG = Green Gram, GN = Groundnut

Conclusion

Bajra based nutritionally cheap meshed and baked products can be prepared using traditional skill. These products have good potential as supplementary babyfood and ready to

eat snacks.

Acknowledgements

The authors are thankful to the ICAR for financing the study through AICRP of PHT.

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WOOD ENERGY IN MALAYSIA

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Wood is an important traditional fuel in Malaysia. It is utilised as domestic fuel in the rural areas. It is also used in some important industries such as the smoking of rubber sheets, the curing of tobacco and the manufacture of bricks. Charcoal, a secondary fuel from wood is also used in the domestic sector but its most important use is in the steel and cement industries. In this paper we re-evaluate the importance of wood as a source of fuel and explore the possibilities of its utilisation in the long term.

Wood has been an important domestic fuel in Malaysia since time immemorial. In the rural areas today wood still is the major domestic fuel, sometimes complemented by kerosene [1,2]. In the industrial sector wood is an important fuel in the smoking of rubber sheets, the curing of tobacco, the manufacture of bricks, traditional pottery making, and small-scale food manufacturing. Charcoal, a secondary fuel produced by the carbonization of wood is also an important domestic fuel in the urban areas. Use of charcoal in the steel and cement industries

is also very significant so much so that Malaysia has to import annually almost 50% of her charcoal requirement from neighbouring charcoal producing countries, Indonesia and Thailand. It is envisaged that wood fuel will still play an important role until the end of the century.

The sources of wood in Malaysia are the rubber plantations, where rubberwood is made available through the replanting process, the timber industry, where waste wood from the sawmilling process is available for fuel and the mangrove swamps, which produce high quality fuel

wood for primary wood fuel as well as feedstock for charcoal production. In the rural areas domestic fuel is normally obtained from rubber plantations and secondary forests. The latter produce a variety of wood suitable for burning.

Although Malaysia has sufficient wood resources the harvesting of fuelwood, especially from the mangrove swamps has been tightly controlled by the Forest Department, hence the increasing imports of charcoal. With proper management and planning wood fuel can be maintained as an important resource in the long run. Study shows that the production of firewood and charcoal increased steadily until 1978 and remained more or less constant since 1979. This is no estimate of the amount of wood fuel used domestically in the rural areas.

Energy is obtained from the combustion of wood or charcoal. The gross calorific value of oven-dried wood averages 17.9 MJ/kg while that of charcoal is 27.9 MJ/kg. The study also reveals that calorific values of the wood and the charcoal for some species of wood

which are important sources of wood fuel in Malaysia.

Wood Energy Research in Malaysia

Most of the research on wood energy in Malaysia is carried out at the Forest Research Institute of Malaysia (FRIM) under the institute's Wood Waste Utilisation Programme. Some important research work has recently been started in the universities.

Some aspects of wood energy studied in these projects include charcoal production, wood and charcoal gasification, wood briquetting and stove design.

Charcoal Production

In Malaysia charcoal is produced in three types of kilns : the saw dust clamp, the beehive kiln and the transportable metal kiln. In the saw dust clamp the charge, normally sawmilling wastes, is stacked in a pit, covered with a mound of saw dust and fired. After the exothermic stage is completed the holes are covered with sand to extinguish the fire. The

charcoal produced by this method is of variable and low quality.

The beehive kiln is the most important method as almost 80% of the charcoal produced in this country is by this method. The charge in this method of production is mangrove wood (Sp. *Rhizophora*) and rubberwood. The charcoal produced by this method is of high quality with fixed carbon content between 70% and 80% and is suitable for industrial use. Studies have been carried out to determine the optimum carbonization process and to assess the suitability of using various types of wood as the feedstock. It has been established that most of the varieties of wood available in the country are suitable for producing high quality charcoal. This is discussed in reference 4.

The transportable metal kiln is a new development. It is expected to be increasingly used in the rubber replanting process because of its transportability. The kilns can be taken to the areas where the felling of rubber trees is in progress, hence saving in the cost of transportation of the raw wood. The kiln is also suitable for use

in the vicinity of the sawmills as the volume of charge required is not too high when compared with the beehive kiln. Various types of material can be used as the feedstock in the kiln.

Gasification

Research on the gasification of charcoal is being carried out both at FRIM and at the Faculty of Mechanical Engineering, Technology University of Malaysia. FRIM has developed a lot of experience in running a diesel engine with a gasifier, whereas in the university gasification work was started only recently. In both institutions the fixed bed down draught gasifier is utilised. Pilot trials run by FRIM have indicated that small-scale gasification of charcoal has application potential, particularly in the remote areas of the country. However, a lack of trained persons to operate the gasifiers must first be overcome.

Wood Stove

In the rural area wood fuel is usually burned in the open burning three stone or

triangular support hearth. The utilisation of fuel in this manner is inefficient. Such a burning system is also inconvenient because of the smoky fire produced. The efficiency of these open burning stove is less than 7%. Research on stove design and characteristics is being carried out at FRIM and at the Department of Physics, National University of Malaysia. The objective of this project is to find the optimum stove design in terms of efficiency, ease of fabrication and ease of handling and operation. Tests have been performed on stoves available in the market. The efficiency of these stoves range between 12% to 19%. Field tests on these stoves will be carried out in the near future in order to assess their acceptability.

Conclusions

Wood fuel in the form of firewood and charcoal is still very important both for domestic and industrial use in Malaysia. Good quality charcoal can be produced by the beehive kiln and the transportable metal kiln. Use of the transportable metal kiln should be encouraged especially in the

vicinity of the sawmills as the saw dust clamp which is widely practiced now produces low quality charcoal. Gasification of wood and charcoal has a potential for wider applications but operator training has to be provided before this can be achieved.

In the rural areas firewood will be used for domestic fuel for a long time to come. The introduction of better and more efficient stoves will bring much relief to the rural housewives. Further research on stove design and field trials will have to be conducted.

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"Every 1% decrease in the ozone layer creates a 6% increase in skin cancer. During the past 50 years, the number of skin cancers has doubled every decade and the increase in deaths from skin cancer is only surpassed by lung cancer among smoking women."



SHELTERBELTS TO PROTECT FRUIT ORCHARDS IN DESERT REGIONS

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Shelterbelts one of the most important means of improving farm land production and reduction in wind velocity and evaporation, result effective moisture and soil conservation. This paper deals in detail about its effect, selection of species, planting technique and its effect on soil.

The shelterbelts are strips of trees and or shrubs grown and maintained to lessen exposure risks or to reduce exposure effects of strong winds. The growing of tree shelterbelts has high significance in desert region of western Rajasthan, where strong winds blow over a longer period from March to July (Table-1) and sometimes extending upto September and cause severe damage to agricultural fields, canals, roads and villages. The climatic endowments in this part of India, are conducive for growing datepalm besides pomegranate and ber Mertia and Vashishtha (1985). The strong dusty winds experienced during the fruiting period of datepalm (March to July), lead

to fruit drop and particularly the damage in quality at the ripening stage of fruits is considerable. Similarly considerable damage is also caused in severe winter season to pomegranate and Ber fruits. Shelterbelts create a favourable crop environment in the particular habitat and protect the sheltered object on leeward side.

Sheltering Effect

The creation of shelterbelt is one of the most important means of improving farmland production. The studies at CAZRI, reveal that major shelter effect extends to over twenty five times the belt height on leeward side. The major

manifestations of shelterbelt effect include reduction in wind velocity and evaporation giving rise to effective moisture and soil conservation. Studies at two times belt height have shown 5 to 14% reduction in pan evaporation on the leeward side during monsoon and summer season respectively [Gupta et al; 1984, Muthana et al, (1984) and Mertia (1993)]. The consumptive water use and water use efficiency by crops have shown increase away from the belts on leeward side and maximum at twenty five times the belt height.

Choice of shelterbelt species

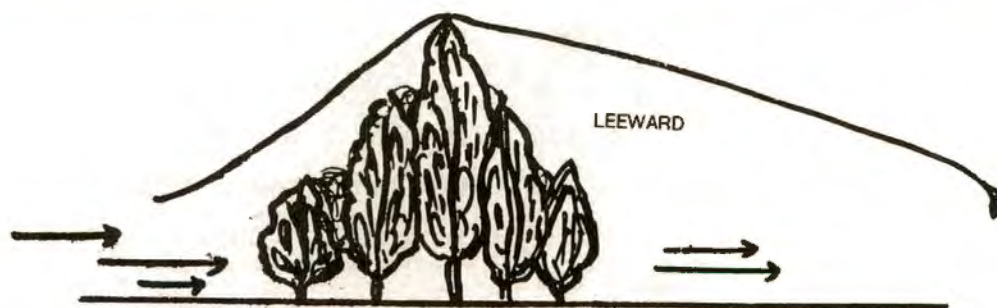
Selection of species is very important aspect which determines the successful establishment and effectiveness of a shelterbelt. In early trials, *Acacia tortilis* and *Dalbergia sissoo* were planted but in recent studies the *Cassia siamea* belts have shown more effectiveness than *A. tortilis* and *Prosopis juliflora* because of comparatively more leafy branches dropping to ground level. The use of *Cassia siamea* belts is specially more suitable for deep sandy loam soils situated in areas having comparatively higher rainfall (250

mm).

However, *Prosopis juliflora*, *Acacia tortilis*, *Tamarix articulata* and *Colophospermum mopane* are more successful in shallow sandy soils.

Planting technique

The strips of tree and or shrub species should be planted in staggered way perpendicular to the prevailing wind direction. The structure of these should be pyramidal in shape i.e. the central row with tall plants and bushy and short height plants on the flank rows or on the lateral rows (Fig-1). The seedling raised in nursery should be planted at 3m x 3m spacing in three rows or five rows. With introduction of series of three tree row shelterbelts at 165 m intervals (35x height of belt, assuming the widely attained 5m height for the trees); about 3% of land is lost under belt area and an additional area of nearly 25% is within the zone where trees compete for moisture. Over the remaining 60-65% of the area, crops are raised. For the full utilization of distance protection shelterbelts should be 12 to 15 times their height in length Mertia, et al (1988).



There does not seem any option against the use of shelterbelts in this desert part, but it ranks high under different kinds of afforestations in this region. The District Rural Development Agency (DRDA) provides suitable species free of cost to selected farmers and a maintenance allowance of Rs. 3/- per plant depending upon survival after a period of two years. The systematic felling of *P. juliflora* and *T. articulata* plants with suitable replacement have offered a channel for supplementing existing resources of fuel wood and small timber for farm implements.

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Table-1 : Extremes of monthly wind velocity data of Jaisalmer.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year												
1988 - Highest	15.2	22.6	30.1	28.6	36.2	38.8	45.8	35.6	29.9	15.1	7.9	13.3
Lowest	3.3	3.9	4.9	5.1	6.8	4.0	8.2	2.8	5.3	2.6	1.1	2.4
1989 - Highest	17.5	11.4	17.7	23.0	35.9	36.6	37.5	32.0	27.3	13.9	11.0	7.3
Lowest	2.6	3.1	3.2	4.5	5.4	11.7	7.6	4.5	3.6	2.1	2.0	1.9
1990 - Highest	15.6	11.9	20.4	17.9	29.3	34.8	41.0	39.7	26.3	13.5	15.3	20.5
Lowest	2.6	2.8	2.8	3.7	4.8	10.4	3.8	6.6	4.8	1.9	1.4	



PERFORMANCE EVALUATION OF SOLAR PHOTOVOLTAIC (PV) REFRIGERATOR

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The storage capacity of the battery used with PV solar refrigerator should be more to run it effectively during summer. If the battery is fully discharged refrigerator should be turn ON after two hours of charging. The level of electrolyte should be maintained for normal functioning of refrigerator.

One of the most attractive applications of solar energy is solar refrigeration. In rural areas for the storage of medicines and vaccines, solar refrigeration is certainly an attractive approach. In India about 30 percent of perishable food products are lost annually due to lack of preservation facilities. To establish the technical feasibility of solar refrigeration several theoretical and experimental work has already been carried out but many technical and economic problems still remain unresolved. In order to test the technical

feasibility of a photovoltaic solar refrigerator performance of a solar refrigerator has been studied in this paper.

System Description

Solar PV refrigerator consists of the following components. (Fig. 1)

- (i) Array
- (ii) Storage Battery
- (iii) Refrigerator

Array

It consists of 8 similar modules (Fig. 2) to charge the storage battery which are

connected in series parallel combination to get desired power. Each module consists of 42 solar cells. One set of four modules is connected in parallel and such two sets are connected in series. The maximum current and voltage from the array was observed 12A & 20V respectively.

Storage Battery

Two lead acid batteries each of 12V, 120AH were connected in parallel. This combination is connected in parallel with refrigerator as the source of power.

Refrigerator

Refrigerator used was Japan made. Rating of refrigerator was as follows :-

- (1) AC 50 W 220/240 V 0.23 A 50 Hz
- (2) DC 12V 4.5 A

About 48 gm of freon was used as refrigerant. The refrigerator was of 15 litre capacity with weight 16 kg. It had five modes of operation starting from refrigeration (REF) mode to freeze mode and other three modes were in between these two modes. The minimum

temperature of refrigerator was observed about 4°C when the system is operated on REF mode. Thus to cool a substance below 4°C and above freezing temperature, system should be operated on the other three modes in between REF and freeze mode.

Method of Study

Array of solar powered refrigerator was inclined at 30° N latitude. The charging and discharging through refrigerator was studied on REF mode. The effect of level of electrolyte in battery was also studied during its charging and discharging. The solar refrigerator was installed at Daudnagar, Raebareli, Uttar Pradesh.

Results and Discussion

Charging and Discharging of Battery Simultaneously

Array charging of storage battery and discharging through refrigerator was studied simultaneously in the month of May when the ambient temperature is expected to the maximum. Array voltage,

current, refrigerator temperature, ambient temperature, battery position with insolation are reported in Table 1 & 2.

It is well observed that with the decrease in insolation, array voltage and current is affected appreciably. This gives a total load to the battery and battery voltage decreases abruptly. From Table-1 it appears that if insolation is maintained refrigerator temperature decreases but battery voltage is maintained as expected. However, when the refrigerator temperature is at lower value at the beginning the battery voltage remains as such if the insolation is appreciable.

Charging and Discharging of Battery Separately

Charging of storage battery was studied with array voltage and current of 20V and 12A respectively. With this input when charging of battery was studied, the rate of charging was quite normal. The battery voltage increased from 9.00 V to 12.70 V within 6 hours. However, if the level of electrolyte is not maintained properly, the rate of charging was

considerably low and maximum battery voltage was found to be about 10.90 V.

Discharging of battery through refrigerator, when it was on REF mode, reveals the following facts :

1. Discharging rate in the first hour is very high and in first half hour it is greater than second half hour. In first half hour the decrease in temperature is about 14 °C while in the next half hour it is about 9°C. Later on discharging rate of battery decreases successively.
2. With a decrease of temperature from 35°C to 8°C in two hours, battery voltage decreased by 2.20 V.
3. For a change in temperature from 35°C to 4.7°C battery voltage changed from 12.70 V to 10.47 V.

Conclusions

1. Refrigerator should be turn on when the battery is fully charged so that charging and discharging could be maintained. However, if this situation does not exist, first hour discharging may fully discharge the battery.
2. If the battery is not fully charged,

refrigerator should be operated only after two hours of charging.

3. To operate the system on freeze mode, capacity of the battery should be increased.
4. The refrigerator, after sunset, should only be turn on when the battery is fully charged and it should be turn off after three hours of operation.
5. The system should never be operated

of level of electrolyte in the battery is not sufficient.

6. In winter, refrigerator generally works efficiently because the ambient temperature is observed low resulting minimum power loss.
7. In summer, four batteries connected in parallel with the refrigerator may enable it to work for twenty four hours.

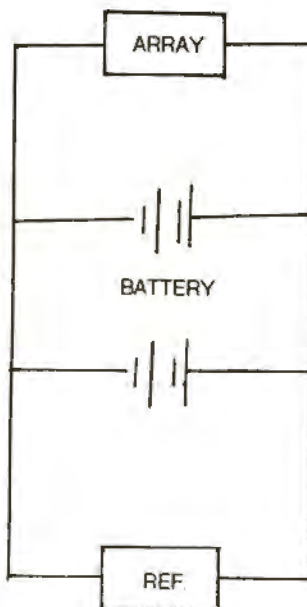


Fig. - 1

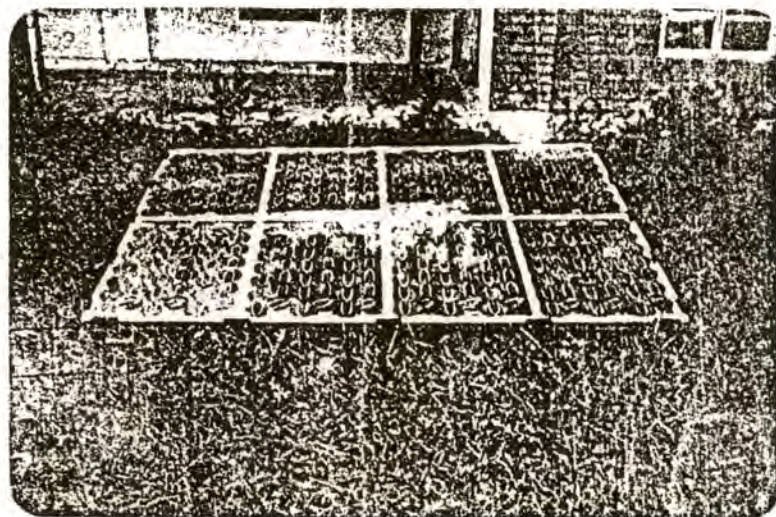


Fig. - 2

Table 1 : Out put of different components of solar powered Refrigerator at different insulations with ambient temperature

S. No.	Insolation (Watt/ m ²)	Array voltage (volt)	Array current (amp.)	Ambient temp. (°C)	Refrige- rator temp. (°C)	Battery Voltage (volt)	Specific gravity of Battery	
	Normal	Panel						
01-	260	40	7.5	1.6	29.4	29.2	10	1195
02-	300	60	8.5	1.6	29.4	28.0	10	1190
03-	800	680	13.0	10.0	33.0	32.4	10	1190
04-	820	700	13.0	10.0	33.0	28.7	11	1195
05-	820	720	13.0	10.0	33.0	26.5	11	1195
06-	820	720	13.0	10.0	33.0	24.3	11	1195
07-	820	740	13.0	10.0	33.0	22.2	13	1195
08-	820	740	13.0	10.0	33.0	21.0	13	1195
09-	820	760	13.0	10.0	34.0	17.9	13	1195
10-	820	760	13.0	10.0	34.0	16.4	13	1195
11-	840	780	14.0	10.0	34.0	14.5	13	1195
12-	840	780	14.0	10.0	34.0	13.1	14	1195
13-	840	800	14.0	10.0	35.0	11.5	14	1200
14-	820	720	14.0	10.0	35.0	10.2	14	1200
15-	820	720	14.0	10.0	35.0	9.6	14	1200
16-	820	800	14.0	10.0	35.0	9.3	14	1200
17-	820	800	14.0	10.0	35.0	9.2	14	1205
18-	840	820	14.0	10.0	35.0	9.0	14	1200
19-	840	820	14.0	10.0	36.0	8.0	14	1200
20-	840	820	14.0	10.0	36.0	5.3	14	1200

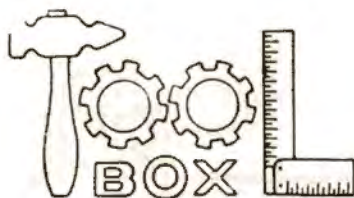


"A good physician anticipates tests needed before a crisis".



S. No.	Insolation (Watt/m ²)	Array voltage	Array current	Ambient temp. (°C)	Refrige- rator temp. (°C)	Battery Voltage	Specific gravity of Battery
21-	820	800	14.0	10.0	36.0	4.3	14
22-	820	800	14.0	10.0	36.0	4.0	14
23-	820	800	14.0	10.0	36.0	3.5	14
24-	840	820	14.0	10.0	36.0	2.7	14
25-	840	820	14.0	10.0	36.0	2.3	14
26-	840	820	14.0	10.0	36.0	7.7	14
27-	820	780	14.0	10.0	36.0	1.0	14
28-	820	780	14.0	10.0	36.0	0.3	14
29-	840	760	14.0	10.0	36.0	0.3	14
30-	820	700	14.0	10.0	37.0	0.1	14
31-	820	680	14.0	10.0	37.0	-3	14
32-	840	680	14.0	10.0	37.0	-6	14
33-	840	680	14.0	10.0	37.0	-7	14

Table 2 : Out put of different components of solar powered Refrigerator at different insulations with ambient temperature



PAPER SLATE

The paper slate which is used for writing purpose for the students at lower standard of education. It is made by the plastic coating over the conventional paper slate materials as hard board, soft board, plywood etc. By the use of plastic materials certain remarkable properties are achieved, such as longer life, easy to handle, light in weight, clear expression of the words etc. Chalk as white batti (chalk) are used over it for writing as in case of conventional slate.

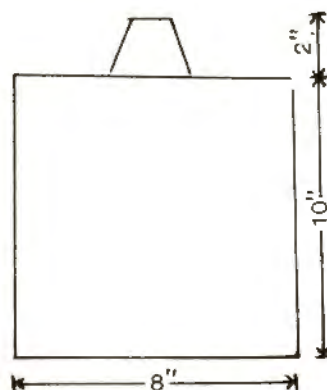
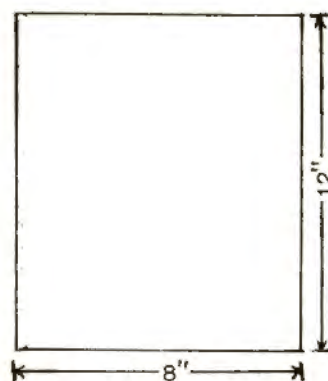
MATERIALS REQUIRED FOR MAKING PAPER SLATE

1. Plastic granules (Polystyrene)
2. Toluene
3. Kajal
4. Card board

MANUFACTURING PROCESSES

Step First

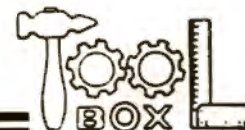
Cut the soft paper board in required size (Fig. 1) and then give the desired shape to the paper slate.



(Fig. - 1)

Step Second

Polystyrene granules are mixed to the toluene solution and keep the solution for 7-8 hours i.e. the solution of toluene



and polystyrene must be used after 7 hours of the mixing, so that clear solution is made (See Fig. 2a, 2b).

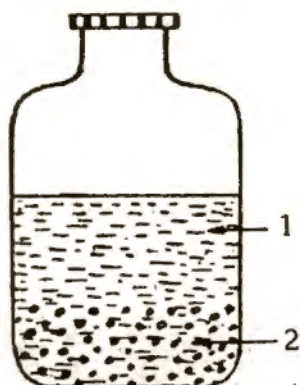


Fig. 2(a) 1. Toluene 2. Polystyrene

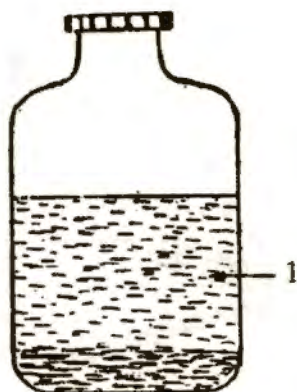


Fig. 2(b) 1. Prepared Solution

Step Three

Small amount of this solution is kept in another flask and mix some amount of kajal to it. But clotting of kajal is prevented, when it is completely dissolved. Add some Kajal the tally and mix it with solution, then again some amount of Kajal is mixed and repeat the process until the required mixture is achieved. Then this solution is mixed with the previous container in which solution of toluene and polystyrene is kept (See Fig. 3a, 3b & 3c).

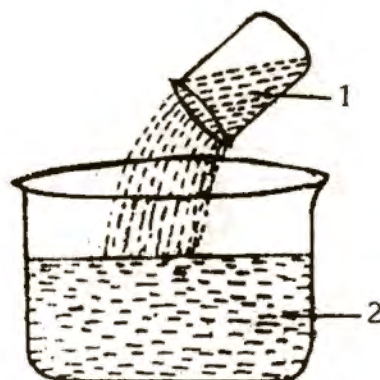


Fig. 3(a) 1. Kajal 2. Plastic Solution



Fig. 3(b)

1. Stirrer 2. Solution (Plastic granules + Toluene + Kajal)



Fig. 4(a) 1. Paint

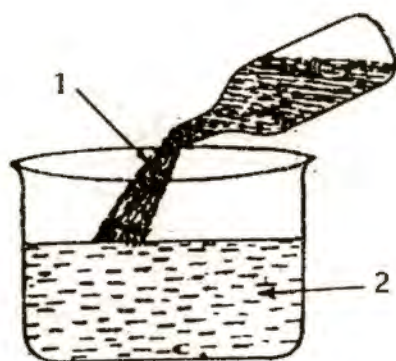


Fig. 3(c)

1. Polystyrene + Toluene + Kajal
2. Plastic Solution only

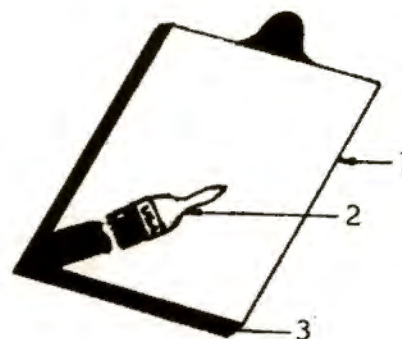


Fig. 4(b)

1. Card Board 2. Brush 3. Paint

Step Five

This paint (solution) is coated over one side of Card Board very carefully so that the thickness of the paint remain constant over the surface. Now the coating is done on the side of the Card Board and kept it for drying (See Fig. 5).

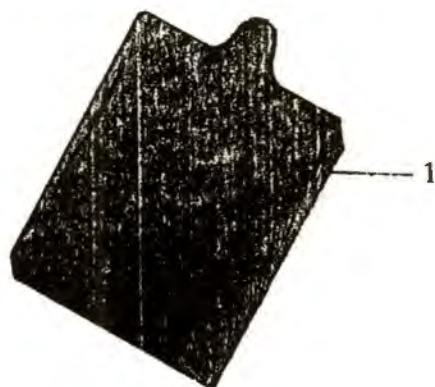


Fig. No. 5

1. Plastic coated paper slate

Step Sixth

In this way on each surface, two coat of the painting must be done.

RAW MATERIAL REQUIRED FOR

15 Nos. OF PAPER SLATE

	quantity	App. Amount
1. Card Board		
12" x 8"	15 Nos.	Rs. 20.00
2. Polystyrene	150	Rs. 10.00
Grannule	gram	
3. Toluene	500	Rs. 50.00
	millilitre	
4. Kajal	75 gram	10.00

Rs. 90.00 only



*"The earth has enough for every man's need
but not for every man's greed".*

— M.K. Gandhi



BIOGAS DIGESTORS GENERATE ELECTRICITY

Developments in West Germany and Denmark have now led to the use of biogas digestors for power generation and heating.

The Folkecenter for Renewable Energy in Denmark has designed and installed a horizontal biogas digester at Sindrup and a silo (vertical) digester at Boddum. The horizontal plant is designed with a standard steel tank as digester. The tank is placed on two foundations with a slight tilt. It is insulated with mineral wool and covered with weather resistant aluminium plates.

The biogas-plant operates as a continuous semi-mixed digester. It is filled from the lower end and automatically the same amount of digested slurry will overflow at the upper end. Agitation is done by a slowly rotating (3-4 rpm) horizontal shaft with individual arms arranged in a spiral to reach every corner of the digester. The shaft is driven by a gear motor.

The slight tilt of the digester will in

combination with the agitator, transport the sediments to the lower end, where it can be removed through a bottom valve. The heating of the digester (where needed) is provided by a water jacket heat exchanger in the lower end, where the slurry enters the tank. Over-pressure and underpressure are regulated by simple water locks.

The digester has a capacity of 150 m³ and produces around 160 m³/day gas. The plant is mesophilic and thermophilic and ranges upto 400 m³/day. At the one in Sindrup, the input used is pig dung. The plant produces around 10 kW electricity.

SILO DIGESTOR

The silo biogas plant is designed with a standard steel tank. The tank is constructed on a 30 conical concrete foundation. The steel top has a similar coning. The tank is insulated with 200 mm mineral wool and covered with weather resistant aluminium plates.

The silo biogas plant operates as a flow through digester, filled from the bottom and with an overflow outlet at the

top. The agitation of the biogas-slurry is done in three separate ways.

1. Two propellers placed at the bottom and on the top of the wall.
2. Circulation of biogas through 20 gas nozzles at the bottom of the tank.
3. A mammoth pump circulating the slurry from bottom to top.

Sediments like sand can be sucked from the bottom of the cone through a pipe. A polyethylene heat exchanger spiral is placed just above the bottom of the digester tank. Positive pressure and vacuum is regulated by two simple water locks, integrated in the standard tank. The tank has a large water lock at the top which serves as a safety valve.

The silo digester at Boddum has dimensions of 400 m³ vertical producing about 208 m³/day gas. It can produce about 10-13 kW of electricity.

To achieve maximum efficiency, the biogas plants are supplied with a cogeneration unit to produce electricity and heat. The electricity can be used locally for different purposes or can be sold to the national grid, if present. The heat can

be used for farm buildings, crop-drying and cooling systems.

PHOTOCATALYSIS FOR CLEAN WATER

In the Netherlands, researchers are working on a new eco-friendly water purification method based on ultraviolet light and a titanium oxide catalyst. Water is purified through the introduction of energy and air. This allows chemical and activated sludge systems to be disposed off with and leaves almost no residue.

Micropollutant contaminations such as those caused by dyes, detergents, aromatic substances and biocides have traditionally caused problems in the treatment of industrial effluent. This is where the *photocatalytic cleansing method* is most applicable. It is suitable for use where stringent demands are placed on water quality, such as in pharmaceuticals, foods industries, and in greenhouses.

According to the Netherlands organisation for Applied Scientific Research, TNO the technique allows the removal of a wide range of contaminants

from effluent. Several private companies are helping to refine the process.

BANANA CURE FOR KIDNEY STONES

Banana peels and spinach hold the promise of a potential cure for kidney stones.

Scientists at the Radiation Biology and Biochemistry division of the Bhabha Atomic Research Centre have obtained two different enzymes from banana peels and spinach which could counter kidney stone formation.

Kidney stones are mainly calcium oxalate deposits formed due to an increased level of oxalate in body fluids.

Oxalate oxidase, the enzyme obtained from common banana peel, can degrade oxalates into carbon dioxide and hydrogen peroxide. The enzyme glyoxylate reductase, obtained from spinach, has also been found to be effective in preventing oxalate formation.

The enzymes have been tested on animals and found effective in preventing oxalate formation.

Animals implanted with membrane bags containing banana oxalate oxidase preparations, could degrade intraperitoneally injected radioactive oxalate, indicating its potential use in stone diseases.

In the second approach, scientists tested the feasibility of preventing the synthesis of oxalate. When the enzyme glyoxylate reductase was intraperitoneally administered, it was found to prevent the formation of oxalates.

The potential use of this enzyme therapy technique for the treatment of kidney stones in humans, however, remains to be investigated.

SOLAR-POWERED INSECTICIDE SPRAYER

A solar energy powered insecticide sprayer for agricultural purposes has been developed by a group of students at the Mechanical Engineering Department of the Government Polytechnic at Tiruchi.

First, sunlight is converted into electricity using solar cells mounted on top and is stored in a battery. The charging is done using a voltage regulator since the

amount of sunlight received does not always remains constant. The battery then runs a motor.

Spray mixture is fed by gravity to a spinning disc at its centre. A constant supply of the spray solution is obtained by an air bleed capillary tube.

The disc is connected to the shaft and is made of acetyl co-polymer. Its inside is grooved to improve the liquid flow on the periphery. The disc can rotate upto a maximum of 5000 rpm. A plastic tank of capacity eight litres is fitted to the sprayer for storing the chemical. A nozzle regulates the discharge rate of the chemical for example at 25 cc, 50 cc, or 75 cc. The sprayer is expected to cost about Rs. 1,200.

SUBABUL WITH RICE STRAW

The nutritional value of rice straw improves when it is fed along with subabul leaves to cattle according to studies conducted at the National Dairy Research Institute, Bangalore. Two to three kgs of subabul leaves mixed with five to six kgs of rice straw of dry fodder sufficed for an

animal weighing 250 to 350 kg. In terms of digestible crude protein, one kg subabul fodder is equal to one and a half kg of concentrated mixture. Subabul fodder did not have any effect on the intake of dry matter.

PESTICIDE RESIDUES IN FOOD ITEMS

Recently, ICMR tested some food items for pesticide residues. The results of the study showed that in all food items examined (in rural and urban sector) virtually all contaminants were higher than prescribed tolerance level, both according to the Indian Prevention of Food Adulteration (PFA) Act, 1954 and international legislations.

According to the report, priority was given to the determination of residues of HCH-isomers, which are organochlorine pesticides, and DDT-complex in bovine milk (post harvest) and infant formula food.

The analysis of 2,205 samples of bovine milk collected from 12 states showed widespread occurrence of HCH-isomer residues. It was found that

high proportion of bovine milk samples were found to be contaminated above legal limits.

The study detected DDT-residues in 82 per cent of the samples. About 37 per cent contained DDT-residues above the prescribed tolerance level. Data on 186 samples of 20 commercial brands of infant formula food showed that 70 and 94 per cent respectively had DDT and HCH residues. The levels exceeded the prescribed tolerance level in about 8 percent of cases. Fortunately, it is the low dietary intake of formula food that seems to save the children.

The other major problem in the presence of metals such as arsenic, cadmium, lead, copper and zinc in infant food, canned fruit products and turmeric. Heavy metal contamination is cumulative and highly toxic. It has direct and indirect effects on health that include kidney damage, cardiovascular diseases, hypertension, growth inhibition and some heavy metal contaminants are also carcinogenic.

FUEL CELL POWER FOR THE 21st CENTURY

British gas is one of the leading companies in UK who are involved in the research of Fuel Cell Power Plants which are perceived to be one of the most promising new power generation technologies. These fuel cell plants offer means of providing/expanding energy services, with minimum impact on the environment.

A fuel cell, like a battery, is an electrochemical device for converting the chemical energy of a fuel directly into electricity without any pollution hazard. When connected to a continuous external fuel supply, it is capable of fulfilling the same duty as conventional, engine-based power generation system.

British Gas, carried out a study of the long term economic feasibility of a combined heat and power system incorporating a 200 KW solid oxide cell fuelled by natural gas. The study showed that such a system could be commercially attractive provided the natural gas could be used directly inside the fuel cell stack.

GENERATING ENERGY FROM BIOMASS

Every year, millions of tonnes of biomass like agrowaste, leaves etc. are produced in our country and their proper handling/destruction creates a big problem by way of unnecessary cost & atmospheric pollution. Profitable utilization of this huge material has been engaging the attention of technocrats, for years, experiments were going on to effectively utilize this biomass for Energy Generation Research work for developing a safe and efficient disposal technique was all along in progress.

Now Scientists from the Nimbakar Agricultural Research Institute (NARI) in Maharashtra, have developed a gasifier, to produce power in the range of 10-15 kW through gasification of sugarcane leaves. Tests on a 15 kVA diesel genset powered by a sugarcane leaves gasifier showed that 70-90 percent diesel substitution could be achieved with 5 kW load. This gasifier is safe and non-polluting, also produces char which is 15-28% fuel. The char boosts the overall efficiency of the system to 80-85% and forms an excellent briquetting fuel for

cooking, when mixed with a suitable binder.

POCKET WATER PURIFIER

What looks like a different version of a simple straw at first glance is a pocket water purifier developed by the Defence Research and Development Organisation (DRDO) which enables users to get microbe-free water from raw resources.

One has to just suck the available water through the straw to strip it of all bacteria, making the device simple and rapid.

The cost of production of each straw is only Rs. 20.

Even highly polluted water can be made safe for drinking with this treatment, reports *Technology Focus*, a bulletin of the DRDO. Each water purifier can purify about 30 litres of water.

The backbone of the device is a strongly cationic divinylbenzenestyrene resin containing quaternary ammonium ions bounds with trivalent ions of iodine.

When water is drawn through this device, the trivalent iodine ions

decompose to bi-and univalent ions. The amount of iodine released is sufficient to kill bacteria and provide potable water.

The device is harmless for occasional use, but has two limitations, says.

It is not recommended for use by pregnant women, and is not suitable for highly brackish water.

REUTILIZATION OF FIBRE- REINFORCED PLASTICS

Mitsubishi Heavy Industries in Japan has developed a system for the reutilization of fiber-reinforced plastics (FRPs), in what is said to be the world's first system to recycle FRP into fuel or methanol reports.

FRPs which have been extensively used are difficult to dispose of because of the toxic gases that are generated when FRP is burnt.

The new system crushes used FRP into 10 cm square pieces, which are treated at a sufficiently low temperature in order not to melt the glass fibres present in the feeds. As a result, the glass fibers

are efficiently separated. The glass-free FRP is then gasified by a special process.

There are two approaches for the reutilization of FRP—the gasification heat is recovered to generate power, and the gases produced are used as the starting materials for methanol.

GENERATION OF POWER FROM WOOD WASTES

Using waste wood from a sawmill and seawater as a coolant, researchers from the IISc (Indian Institute of Science), Bangalore, have set up a 100 kW power generation system in the Andaman and Nicobar islands. The system has been developed by IISc's Centre for the Application of Science and Technology to Rural Areas under a project sponsored by the Department of Non-conventional Energy Sources. It consists of a wood gasifier using waste wood from a sawmill and a diesel engine genset, and its economics is comparable with that of a similar 3.7 kW system. It is being claimed that such systems based on renewable

energy resources can save 60-80% of diesel consumed in normal diesel based generation.

A LOW-COST SOLAR STILL

The critical design aspect in the newly developed solar still is the float and ceramic tiles. These are designed in such a way that the total weight and the buoyancy are matched so that the bottom of the tiles constantly touches the water.

High density polyethylene pipes have been used for fabricating the float. The black ceramic tiles cover the entire water surface area of the tank and they have the porosity to absorb water quickly. The material can be the mud, used for making pot or water filter candles. The size of the tiles may be 15x15 cm and the thickness may be around 10 mm. One square metre of area can produce around five litres of distilled water daily.



"To date, more than 700 chemicals have been detected in U.S. drinking water, 129 of which the Environmental Protection Agency calls 'dangerous', including industrial solvents, metals and radioactive substances."





BIO RESOURCES '94

Four Organizations: Biomass users Network, the Commonwealth science council, the International Energy Initiative and the Stockholm Environment Institute are jointly organizing an international conference "Bio Resources '94", with the theme, "Biomass Resources: A Means to Sustainable Development", from 3-7 October '94, at Bangalore. Bio-Resources '94 will bring together the best thinkers, most successful practitioners and leaders involved in all aspects of biomass resource production, conservation and utilization. The objective of the Conference are: Increase awareness of the importance of biomass resources, Emphasize the potential of biomass as a renewable and sustainable resource, Identify and evaluate successful cases that demonstrate the benefits of well-managed bioresources, bring together the key player in national and international areas. This international conference will highlight the themes: Energy, Sustainability, Environment & Health and Encouraging

Bioresource use.

For further information contact :

La Rocco Associates
2 Erie Street
Montclair NJ
USA 07042

TECHNOLOGY DATA BANK

The role played by information in the selection and application of specific technologies and in the formulation of policies and strategies for industrial and technological has become crucial in the context of technological change. In this context National Institute of Small Industry Extension Training (NISIET), Hyderabad, will organize a Training Programme on "Technology Data Bank" at its Institute during 31st January to 4th February '94. The objective of the programme are: To appreciate the role of technology information in development, to impart-knowledge and skills for setting up technology data bases, To facilitate transfer of technology through data banks.

For further information contact :

The Registrar

NISIET

Yosufguda

Hyderabad - 500 045

**BIO ENERGY FOR AGRICULTURE
AND FORESTRY**

Bio Energy Society of India is organising its 8th Annual Symposium on the theme "Bio Energy for Agriculture and Forestry", at New Delhi on 4-5 February '94.

The Symposium aims at bringing together experts (Scientists, economists, foresters, extension-specialists, sociologists, technologists, planners etc.) system managers, voluntary agencies and like minded personnel on a common platform to discuss and evolve approaches for using bioresources as a source of energy for agriculture and forestry sectors. Beside other topics related to agriculture and

other fields the symposium will cover some special topics: Bio-Energy Information, Bio-Energy Extension, Bio-Energy Conservation and Efficiency.

For further information contact :

Prof. M.R. Vijayaraghavan

Dept. of Botany

University of Delhi

Delhi - 110 007.

AIT TRAINING PROGRAMMES

Continuing Education Centre of Asian Institute of Technology, Bangkok offers many Training Programmes every year at their centre. These Training Services are on the programme areas such as agriculture and water development, industrial technology, rural development, education and development. Some of the selected programmes from their schedule for the year are:

TITLE	PARTICIPANTS	DATE (1994)
1. Small-Scale Water Resources Development	Senior Govt. Administrators	21st March-2nd April.
2. Human Resource Management	Managers & Administrators, HRD Specialists & consultants	28th March-6th April.
3. Environmental Awareness Seminar	Senior-Middle level Managers of Organisations	20-29 April & 7-16 September.
4. Managing Rural Dev.	Rural Dev. Planners and Managers.	2nd May-27th May.
5. Toxic & Hazardous Waste Management	Environmental Sanitary Engineers, Scientists & other involved in waste management.	6th June-1st July.
6. Environmental Impact Assessment and Review	Environmental Protection & planning Officials & Project Managers	25th July-19th Aug.
7. Planning & Design of Small Scale Irrigation projects.	Planning and Design Engineer.	22 Aug.-14 Oct.
8. Information Technology and Management.	System Analysis Information Scientist and MIS Managers	31st Oct.-11th Nov.

For further information contact :

Admissions

Continuing Education Centre

Asian Institute of Technology

GPO Box 2754

Bangkok 10501 Thailand.

SUSTAINABLE DEVELOPMENT STRATEGIES

Society for International Development, will hold its 21st World Conference on "People's Rights and Security: Sustainable Development Strategies for the 21st Century". from 6th to 9th April '94 at Mexico.

The conference is a unique opportunity to review that how can we put people-centred development into practice to alleviate poverty and provide sustainable livelihoods for all and, how do we ground sustainable development in greater community self reliance, responsibility and local management of the environment ?

The main theme of the seminar are: Putting people first, Principles of human centred development protecting people and the Earth for sustainable development, Governance and Institutions for self-reliant societies.

For further information contact :

Society for International Development (SID), International Secretariat
Plazzo Civiltà del Lavoro
00144 EUR, Rome Italy.

INFORMATION NETWORKING

Information Service Division, I.E.R.T., Allahabad will hold three training programmes on "Information Management and Networking" at IERT, from 22-24, 26-28, Feb'94, and 1-3 March '94.

The objective of the Training Cum-orientation Programme is to create awareness, for the Information Management and Networking activities, among the people working in CDRTs Community Polytechnics and also Voluntary Organisation working on Rural Technology and Environment. This programme is the first step to establish a Network of like minded organisations. After providing training, the aim of this programme is to include the participant organisations in Indian Network of Environment and Rural Technology, sponsored by International Development Research Centre, Canada.

For further information contact :

Incharge
Information Service Division
Institute of Engineering & Rural Technology
26, Chatham Lines, Allahabad.





BANK FINANCE AND RURAL DEVELOPMENT

The Indian banking system has undergone a major structural transformation after the nationalisation of major commercial banks. In the post nationalisation period, inspite of massive deployment of credit to rural areas and particularly to weaker section, there is feeling that credit deployed has gone into the drain and did not reach the hitherto unreached and benefit them.

In recent years, the "Class Banking" has become "Mass Banking" and the strategy of credit deployment has undergone revolutionary changes. The poverty stricken poor among the poor in rural areas, has become the target group for the upliftment. This is a strategy by which the benefit of planned efforts percolates down to the "extra poor". To access the efficacy of the financing of weaker sections by commercial banks, a systematic field level evaluation study become necessary. This type of analytical studies are necessary to quantify the correlation between bank credit, income

generation asset position and employment creation among the beneficiaries and also to study the productivity of credit in improving the economic conditions of the neglected section of the society. The present micro-level study is a novel attempt which aims at quantify the benefits accrued to the Weaker Section beneficiaries engaged in agriculture, animal husbandry, artisanal activities and petty trading.

"Bank Finance and Rural Development", by S. Krishnama Raju, Published by Discovery Pub. House, New Delhi, Pp. 351, English, Rs. 400/-

THIRD WORLD SCIENCE AND ENVIRONMENT PERSPECTIVES

It is an interdisciplinary journal aimed at providing a forum for disseminating research in various aspects of science and environmental policies in the Third World Countries. It envisages promoting exchange of views and experiences among these nations in the fields of science and environment and its relationship with people, both at policy and action levels.



It seeks to promote scientific and technological co-operation at the institutional level, and a sense of commonalty among the scientists of these nations in their role in the advancement of science suitable for varied national situations. In its approach, the journal emphasises less on the methodological aspects and is largely concerned with actual problems and issues related to science and society.

This quarterly publication covers as a regular feature some special articles, view points, special reports, documents, reviews and news related to science development and environment.

"Third World Science Environment Perspective", is a quarterly journal published by Centre for Science, Technology and Environmental Policy Study (STEPS), C-5 Jangpura Extension, New Delhi - 110 014, India, Published only in English.

TISGLOW

TERI Information Service on Global Warming (TISGLOW) aims to keep policy

makers, scientists and technologists abreast of latest developments in the subject of global warming and climate change. It disseminates current information in the form of selected articles, abstracts digests, book reviews and news related to global warming with special reference to developing countries.

TISGLOW published biannually by the Information Research Centre on Global Warming, Tata Energy Research Institute, 102 Jor Bagh, New Delhi.

NETWORK NEWS:

The Biomass users Network believes that ecologically sound agriculture and forestry- along with local, value-added processing-is the key element in reducing poverty, promoting efficient management of natural resources and ultimately, to sustainable development in rural areas of developing countries. This is crucial in helping to maintain global environmental stability. The 'NETWORK NEWS' is a bimonthly newsletter of Biomass users Network, with the view to create a link between the users for cooperation in



developing countries and strengthening national capabilities to increase production and use of biomass resources as mean of advancing economic, social and ecological well being, primarily in rural areas. Four main subject areas of the newsletter are:

1. Protection, rehabilitation, and development of degraded and fragile lands.
2. Revitalization and diversification of the sugarcane industry, to protect the

environment.

3. Sustainable production and efficient utilization of biomass fuels.
4. Promoting economically viable and environmentally sound utilization of agricultural residues.

"NETWORK NEWS", published bimonthly by Biomass Users Network, Rua Rancisco Dias Velho, 814, Brooklin Novosao Paulo SIP, Bazil-CEP 04581.



"More than 50 percent of the world's annual wood production is utilized as fuel and of this, 90 percent is used in the developing world.



SUBSCRIPTION FORM

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Information Service Division

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Allahabad - 211 002 (INDIA)

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RURAL TECHNOLOGY JOURNAL

AIMS AND SCOPE :

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

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

NOTE FOR THE GUIDANCE OF AUTHORS :

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

The Editor
Rural Technology Journal
Information Services Division
Centre for Development of Rural Technology
Institute of Engineering and Rural Technology
26, Chatham Lines, Allahabad—211002 (India)

There is no limit to the length of contribution, but it is suggested that a maximum of 6,000 words or equivalent be used as a guide (approximately 6 to 7 pages).

1. The complete manuscript should be written in English and the desired order contents of Title, Abstract, List of Symbols, Main Text, Acknowledgement, Reference and Appendices. The Standard International System of Units (SI) should be used.
2. The manuscript should be typed on one side of the paper only (preferably 8"×11" bond paper) with double spacing between lines and 1.1/2, margin on the left.
3. Two copies of the manuscript and illustrations (one set original) should be sent to the Editor.
4. The title should be brief (maximum of 150 characters including blank in between words or other non-alphabetical characters) and followed by the author's name, affiliation and address.
5. Internationally accepted standard symbols should be use. In the list of symbols Roman letter should precede lower case.
6. Graphs, charts, drawing sketches and diagrams should be black and white prints of glossy paper and preferably 3.1/2"×7" size.
7. Illustrations should be numbered consecutively, given proper legends and should be attached at the end of the manuscript.

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