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RESEARCH ARTICLE

A STUDY ON THE TECHNOLOGY DISSEMINATION OF GENDER FRIENDLY PROCESSING EQUIPMENT AMONG RURAL WOMEN IN INDIA

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Abstract

Rural Women form the most important productive work force in the economy of majority of the developing nations including India. Groundnut and turmeric are important field crops in Coimbatore, India which need more women labour for post harvest activities. The present system of threshing and decorticating groundnut is by manual methods involving women labour. Similarly, turmeric processing is done by conventional method of boiling and polishing which involves more time and drudgery for the farm women involved in the operations. Hence an attempt was made to introduce and disseminate primary processing equipment for groundnut and turmeric, among the rural women in the selected villages of Coimbatore district in India. The performance data on the equipment and the feedback by the rural women on the same were collected. Based on the feedback, 80 % of rural women expressed their willingness to adopt sitting type groundnut decorticator. Sitting type groundnut decorticator was commercialized through manufacturer and the same was adopted by rural women by sales of the above equipment during the study period.

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Introduction

Agriculture, the single largest production endeavor in India, contributing 25% of GDP, is increasingly becoming a Female Activity. Agriculture sector employs 4/5th of all economically active women in the country. It is estimated that women are responsible for 70 percent of actual farm work and constitute up to 60 percent of the farming population (Basu and Singh, 2004). Women play a significant and crucial role in agricultural development and allied fields, including in the main crop production, livestock production, horticulture, post harvest operations, agro/ social forestry, fisheries, etc. The nature and extent of women's involvement in agriculture, no doubt, varies greatly from region to region (Roshan and Ashok, 2011). Women have been traditionally involved in post harvest operations viz. threshing, cleaning, shelling, milling etc. Groundnut and turmeric are important field crops in Coimbatore district which need more women labour for post harvest activities. Groundnut (*Arachis hypogea*) or peanut is commonly called the poor man's nut. Today

it is an important oilseed and food crop. This plant is native to South America and has never been found uncultivated (Nautiyal, 2002). It was introduced into India during the first sixteenth century from one of the Pacific islands of China. The kernel contains on an average 25-29% protein, 47-50% oil, 3% fibre and other essential vitamins, minerals and amino acids (Basu and Singh, 2004). Groundnut oil is edible oil. India is a world leader in groundnut farming. Postproduction aspects of groundnut consist of storage of groundnuts, marketing of groundnuts, oil and cake, processing of groundnuts and utilization and consumption of groundnuts. As kernels are more susceptible to damage than pods, nuts are decorticated only a week or two before they are actually required to be sent to mills for crushing. Turmeric (*Curcuma longa*) is an important spice in India. A well managed turmeric crop comes to yield in 12 months and digging uproots the rhizomes. Turmeric is very important spice in India, which produces nearly entire whole world's crop and consumes 80% of it. India is by far the largest producer and exporter of turmeric in the world.

Turmeric occupies about 6% of the total area under spices and condiments in India (Moghe et al., 2012). Primary processing of turmeric is still being done with traditional means leading to many losses and difficulties (Kamble and Soni, 2009). The harvested rhizomes undergo curing, which involves various processes like boiling, drying, polishing and colouring. Boiling is the first post harvest operation to be performed in the farm level. In the traditional method of turmeric boiling, cow dung slurry was used in open vessels which lead to lower price of the produce. Dried turmeric rhizomes are polished for obtaining a smoother finish by removing the rough and hard outer surface and also for better appearance. There are two types of polishing, hand polishing and machine polishing. In the study area discussed in this paper, the present method of decorticating the groundnut is by striking against the floor using women labour. Similarly stripping of the pods is also done manually in the fields after harvesting. As for turmeric processing, boiling is carried in a conventional way, which is highly laborious and time consuming. Since the processing operations discussed above are carried out mostly by women, the drudgery involved is more. Moreover due to demand of labour, the farmers face problems during the harvesting season of the above crops. Hence the package of primary processing equipment for groundnut and turmeric was disseminated for adoption in the selected villages among the rural women in Coimbatore area of Tamil Nadu, India.

MATERIAL AND METHODS

I. Selection of villages for conducting the study

About twelve villages in the Avinashi taluk of Coimbatore district, India where groundnut and turmeric are predominantly grown were selected for the study. The self help groups and the farm women involved in processing of these crops in the selected villages were contacted by holding meetings and the benefits of the equipment were highlighted. The women involved in farming activities were in the age group of 45-60 years.

II. Description of the primary processing equipment for groundnut and turmeric

a) Sitting type groundnut decorticator

The unit consists of a steel frame, arch shaped perforated screen and three peg type shoes attached to operating arm. The shoes are casted, arranged in arch fashion and joined to the operating arm. Groundnut pods are placed in the hopper and with reciprocating motion of the operating arm,

decortication takes place. The kernels and shells pass through the screen and could be cleaned separately.

b) Power operated groundnut stripper

It consists of a rotating spiked tooth cylinder and a blower powered by 1 HP electric motor. Stripping is done by holding the pod portion of the groundnut vine, over the spiked cylinder. The stripped pods fall below and are collected separately. Chaff and the lighter pods are blown out with the help of the blower. It can be operated by two to three persons.

c) Manually operated groundnut stripper

The equipment consists of a square frame of four vertical pegs and a horizontal strip of expanded metal fixed on each side of the frame in the form of a comb. Stripping is done by drawing a handful of vines across the comb with a slight force. The structure facilitates its use by four women simultaneously. Small stools are also provided as an additional facility for comfortable sitting posture while stripping the pods.

d) Improved turmeric boiler

The unit consists of an outer container, four inner containers made of perforated sheet and a lid. The turmeric rhizomes are filled in the inner containers are placed inside the outer container having water. The unit is placed on a furnace fired by agricultural waste. First boiling takes about 25 minutes followed by 10-15 minutes in the subsequent batches. Since boiling is by steam, the rhizomes are boiled uniformly compared to the conventional method.

e) Turmeric polisher

The unit consists of a hexagonal rotating drum made of perforated sheet metal powered by single HP motor. Dried turmeric rhizomes are filled inside the drum and rotated. The dried scales of turmeric are removed by the abrasive action against the drum and also on one another where by the turmeric gets polished. The dried scales left behind after polishing are collected through a separate outlet at the bottom.

III. Field demonstration of primary processing equipment for groundnut & turmeric

Field demonstration, mass awareness programmes and exhibitions were conducted with the selected primary processing equipment such as sitting type ground nut decorticator and groundnut stripper (manual & power operated) turmeric boiler & polisher.

IV. Collection of feed back on the primary processing equipment for groundnut & turmeric

The feedback on the performance of the equipment introduced among the farm women in the selected villages was collected through a prepared questionnaire. The problems with the current method of processing, the ease of operation and the advantages with the introduced gender friendly equipment and their willingness to adopt the same were covered in the feedback survey.

RESULTS AND DISCUSSION

I. Field performance of sitting type groundnut decorticator

The sitting type groundnut decorticator was demonstrated in the selected villages and found to be widely adopted. The performance of the equipment during the demonstration was observed and the results are shown in table 1.

Table 1: Performance evaluation of sitting type groundnut decorticator

S. No.	Parameters	Results
1.	Power required	Nil (manual)
2.	Total weight of pod fed	2 kg
3.	Whole kernel	95 %
4.	Damaged kernel	< 5%
5.	Labour requirement	One

The performance data revealed that the shelling efficiency of this equipment was higher and it could be easily operated by a single person. The cost of operation for decorticating 100 kg of groundnut was worked out to be 42 INR using sitting type decorticator whereas by manual decortication employing human labour the same works out to be 300 INR per 100 kg of groundnut. The farm women were highly satisfied with the performance of the equipment and they expressed their willingness to adopt the same (Fig. 1).

II. Field performance of groundnut strippers

In the present system of groundnut stripping, the harvested groundnut vines are heaped in the fields and the farm women separate the pods from the vine by stripping with hands. Since the farm women were not aware or exposed to the equipment for stripping, the groundnut stripper (manual and power operated) were popularized among the farm women in the selected villages where groundnut is predominantly grown. The performance of the equipment at field condition was collected and is presented in table 2.



Fig.1 Field demonstration of sitting type groundnut decorticator

Table 2: Comparison of manual and machine operated groundnut stripping

S. No.	Parameters	Power operated groundnut stripper	Comb type stripper	Stripping by hand
1.	Labour requirement, man h/100 kg	4.5	28	10
2.	Un threshed pods, %	1.4	12.5	0.8
3.	Broken pods, %	-	0.5	-
4.	Energy required, hp	1.0	-	-
6.	Threshing efficiency, %	98	87	99

From table 2, it could be seen that the performance of power operated groundnut stripper was better compared to comb type stripper as well as manual stripping. The threshing efficiency of power operated groundnut stripper was found to be 98%. The cost of operation for stripping 100 kg groundnut was worked out and it was found to be less in the case of power operated groundnut stripper. The women preferred the power operated groundnut stripper than the manually operated one, due to the fact that stripping was faster and less cumbersome.

III. Field performance of improved turmeric boiler

The raw turmeric rhizomes after harvesting are boiled in iron pans in the fields prior to drying. The conventional boiling takes much time and very laborious for the farm women who do the boiling operation. Hence the improved turmeric boiler where the rhizomes are boiled under steam was introduced among the farm women in the selected villages and the performance data on the equipment was collected during the field demonstrations which is given in table 3.

Table 3: Comparison between conventional and improved method of boiling turmeric

S. No.	Parameters	Conventional boiling	Improved method of boiling	% savings over conventional
1	Capacity , kg/hr	180	500	-
2	Boiling time for each batch, min.	45	14	69
3	Fuel used, kg/batch	50	23	54
4	Water used, liters/batch	26	7	73
5	Cost of operation, INR/100kg	43	35	20
6	Drying time, days	22	15	32
7.	Effect of boiling	Non-uniform	Uniform	-

The two prominent varieties of turmeric BSR 2 & Salem hybrid was boiled in the improved turmeric boiler. The performance of the equipment under actual field conditions was collected. The rhizomes are boiled under steam in the improved method and hence the rhizomes were cooked uniformly at the end of boiling where in the conventional method, the rhizomes at the bottom get cooked faster than the rhizomes at the top since they are boiled directly in water. In the improved method, about 54 % of fuel, 73 % of water and 69 % of time could be saved. Also it was observed since the rhizomes were boiled uniformly under the improved method; the drying was also faster compared to the conventional method. About 32 % time during drying of turmeric rhizomes could be saved under the improved method. The farm

women were highly satisfied with the performance of the equipment and showed their willingness to adopt the same.

**Fig. 2 Farm women operating the improved turmeric boiler**

TABLE 4: Performance data on turmeric polisher

S.No.	Parameters	Turmeric polisher
1.	Capacity, kg/h	75
2.	Polishing recovery, %	94
3.	Broken rhizomes, %	Nil
4.	Power required, hp	One
5.	Cost of operation, INR /100 kg	43

IV. Field performance of turmeric polisher

The dried turmeric rhizomes are polished to remove the outer scales for the better appeal. Turmeric rhizomes are polished by rubbing the turmeric fingers on hard surface or trampling them under feet wrapped in gunny bags. Hence a power operated turmeric polisher was demonstrated in the farmers' fields in the selected villages.

V. Adoption & impact of technology

A technology may be adopted or not adopted depending on the economic sense it makes and other risk and environmental factors besides awareness and persuasion. Among the various primary processing equipment for groundnut and turmeric, disseminated among the rural women, about 80% of the women expressed their willingness to adopt the sitting type groundnut decorticator (fig.3). This was mainly due to its effectiveness in decorticating the pods without breakage of the nip which was an important criteria for seed purpose. Also the equipment was found to be compact, not requiring any electric power for its working. The equipment was fabricated by a local manufacturer through industrial liasoning and about 50 units were sold during the study period. This showed the success of the technology. The manually operated groundnut stripper was not preferred by the rural women due to the chances of bruising of fingers while operating apart from its low output. Though the power operated groundnut stripper was found to perform well and was accepted by the rural women. But due to the machine cost and electricity requirement were not willing to adopt during the study. In the case of processing equipment for turmeric viz., improved turmeric boiler and turmeric polisher, it was found that the farm women were highly satisfied with the performance of the boiler and was willing to adopt it either by individual holders or through group farming. Though the turmeric polisher also performed well, the rural women did not express their willingness to adopt due to the machine cost.

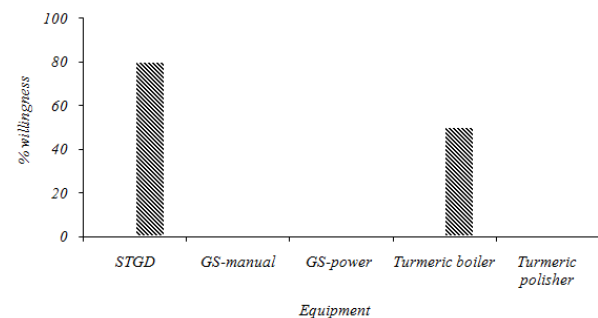


Fig. 3 Extent of willingness to adopt the technology

CONCLUSIONS

The introduction of appropriate technology can overcome time consuming and physically demanding activities of rural women in farming. Among the processing equipment for groundnut and turmeric introduced among the farm women, sitting type groundnut decorticator gained wide popularity and was adopted by the rural women during the study.

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