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Millet processing: A profitable enterprise

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Abstract
The credit of establishing the "Agricultural processing unit" on millet processing at Timmapur village of Shiggaon Taluk, Haveri district in 2012 goes to Mr. Manjunath Bagade. Earlier Mr. Bagade's father had flour mill in 1963. Even though Mr. Bagade studied till SSLC, he has achieved a lot in millet processing and marketing in Karnataka. When he started processing unit, he had only cleaning and grading machines. But through his experience, University intervention, persistent hard work and dedication he fabricated different types of machineries for millet processing. Now he owns a large scale millet processing unit equipped with destoner, grading machine, dehusking machine with blower, semolina making unit and flour mill. Dehusking of millets like little millet, foxtail millet, barnyard millet, proso millet and brown top are taken up. Processing of millet is done up to 30 tons per month. He purchases grains from farmers and has established good value chain to millets and is a premier processor of millets in Karnataka. Preparation of animal feed is another venture he has taken up by using waste and unfilled grains. Net income received by processor is around Rs.1,80,230.00 per month.

Keywords: Macro processor, millet processing, marketing, dehusking

1. Introduction

Primary processing of millets is a vital step for obtaining grain-rice and for further processing of grains for consumption. Processing of millets which are without husk (naked grains) *viz*., sorghum, pearl and finger millet is easy, whereas processing of millets with husk namely little, proso, kodo, barnyard, foxtail and browntop millets is difficult. These have inedible husk which needs to be removed through processing. The major challenges in processing small millets are; small size of the grains, variations in the raw materials due to variation in varieties, cultivation practices, microclimate across production regions, variations across the crops and pest infestation and rancidity (Anonymous, 2016). Small millets are the staple food for millions. Farmers growing these millets also consume it themselves and one of the major bottlenecks is the non -availability of small scale mills. Their slow digestibility and nutritive value makes them one of the most preferred commodities even among health conscious population. Technology used for converting the grain into edible form and thereby enhancing its quality is known as processing. Processing of cereals and millets plays significant role during its utilization as food. Minor millets can be consumed by processing them into rice, flour, sprouts, roasted, popped, salted ready-to-eat grains, porridges and fermented products (Jaybhaye *et al*., 2014) [3].

Millets are most commonly available in pearled and dehulled form. In the absence of specialized processing machineries for millets, it is processed in wheat or rice processing systems. The grain recovery from these machineries is low varying from 63 – 79%, with 16 – 29% husk and 5 – 9% bran. The polished grain is called 'millet rice' and recovery of millet rice is not complete, about 10-15% of grains remains still with husk and needs to be pounded and is laborious. These processing steps add value to these millets three to four-folds and make them acceptable to the elite urban consumers as niche food or health food.

Little millet especially needs to be harvested at right time or else falls to ground and gets damaged which calls for development of machinery for harvesting and threshing. Due to non-availability of proper milling technology the major constraints for wide spread utilization of millet are its coarse fibrous seed coat, coloured pigments, astringent flavour and poor keeping quality of the processed products (Desikachar, 1975) [1]. Hence, the study was taken up to document the millet processing machineries and economics of "Agricultural processing unit" at Timmapur village of Haveri District.

2. Material and methods

The study was conducted during the year 2019 at Timmapur village, Shiggaon taluk, Haveri district of Karnataka. An in-depth interview was conducted to elicit information on millet processing unit using self- structured questionnaire. It Consists of general information of the respondent as well as specific information regarding machineries used for processing, capacity of processing machineries, yield obtained after processing of different millets, expenditure of the processing unit, waste and its utilization, cost incurred for processing and income of the processing unit. Problems and challenges faced by unit were also recorded. Frequent visits were made to record the data.

3. Result and discussion

Earlier Mr. Manjunath's family occupation was flour milling, later they started paddy milling. Some of the farmers were cultivating minor millets in and around Haveri district. So processing of millets i.e., dehusking was done at very small scale in the beginning, where dehusked grains were used for household consumption. With the projects of the Department of Foods and Nutrition millet melas were conducted and simultaneous efforts of Krishi Vigyan Kendras awareness was created among public which increased the demand of processed millets. As the awareness of beneficial effects of millets increased the quantity of millets growing and dehusking also increased. During 2001 Mr. Manjunath earned Rs. 6000 per month. With the intervention of UAS Dharwad and Department of Food Science and Nutrition the equipment like de-stoner, grader and dehuller were installed to improve the quality of the de-husked grains. Earlier 15-20% of grains remained unhusked, whereas with intervention the quality of the grains improved with less than one per cent of unhusked grains. Training of millet vermicelli and other products, packaging, marketing avenues were provided by KVK, Dharwad and KVK Hanumanamatti. With this he got interest in fabrication of machineries and installed large scale machineries.

Table 1 shows details of the processing machineries prevailing, their capacity and power required for them in agricultural processing unit. In the unit per day 500 kg vermicelli was prepared but the process is seasonal depending on the customer demand. Grader, destoner, dehuller and rice polisher yield grains up-to 300 kg per hour. 250 kg millets are polished per week and for one day 200 kg flour can be milled. Rice cleaner and chilly pounder gives 150 kg per hour output. 100 kg suji can be prepared for an hour. Preparation of animal feed was another venture he has taken up by using waste and unfilled grains, about 500 kg animal feed was prepared per hour. He has fabricated graders, de-stoners, winnowing and de-husking machineries using available spare parts by which he achieved maximum efficiency and less cost for installation. These findings are parallel with studies of Singh (2010) who tried to mechanize the milling process by developing dehuller for barnyard millet and optimize the machine parameters for maximizing efficiency, minimizing specific energy consumption and broken grains. The actual dehulling efficiency (88.3±2.8%), specific energy consumption (0.078± kW h/kg grain) and broken grain (6.1±1.1%) were obtained with the optimized machine parameters (9 canvas strips and 3 mm over hanging width) and operational parameters (8.6 m/s peripheral speed; 5 passes and 8.4% db moisture content).

Table 1: Processing machineries prevailing in agricultural processing unit

Sl. No.	Particulars of machineries	Output/ Performance	Power requirement (hp)
1	Vermicelli maker	500 kg/day	5
2	Grader	300 kg/hr	1
3	Destoner	300 kg/hr	2
4	Dehuller	300 kg/hr	3
5	Rice polisher	300 kg/hr	3
6	Millet polisher	250 kg/week	5
7	Flour mill	200 kg/day	5
8	Pulveriser	200 kg/hr	5
9	Chilly Pounder	150 kg/hr	1
10	Rice cleaner	150 kg/hr	3
11	Rava making machine with grader	100 kg/hr	10
12	Feed grinder mixer	500 kg/hr	5

The Agriculture Processing Unit runs with overall 60 hp power source. He installed diesel engine generator and modified it with tractor engine parts so that 6 to 8 hours per day the unit can run continuously without power problems during the power cuts.

Figure 1 indicates dehusked millets recovery after processing in unit. Dehusking of the different millets was carried out in the unit and showed that dehusked millet recovery ranged from 55 to 90 kg per 100 kg millet input. After polishing 1 quintal of finger millet it yields about 90 kg grains, little and foxtail millet yields an average 70 kg followed by proso millet 67.5 kg, kodo millet 60 kg, barnyard and brown top millet 55 kg. Yield of the millet rice depends on the crop season, variety, maturity of the grain, moisture content of the grain, cleanliness of the grain and thickness of the pericarp. These findings are parallel with studies of Hadimani *et al*. (1995) who found that yield of pearl millet rice varied according to variety. Thirty eight cultivars of pearl millet were processed in McGill mill for 30 s under 1.4 kg pressure and glumes were separated by aspiration. The yield of pearled grains and brokens varied from 80.0 to 96.8% and 0.9 to 30.3%, respectively. Similar studies on head rice yield and bran of minor millets and pearl millet grains found to vary from 63.2 to 90.0%, and 5.0 to 11.0%, respectively. Lohani and Pandey (2008) [5] also revealed that still lower milling percentage in barnyard millet (70.77) at 10% moisture level and found that the degree of polish increased with increase in time of milling but at the cost of linear decrease in milling yield and exponential decrease in the head yield. Thus, there is significant difference in milling percentage and head rice yields among the milled millet types and this may be attributed to the intact hard seed coat and relative difference in size of grains of particular millet.

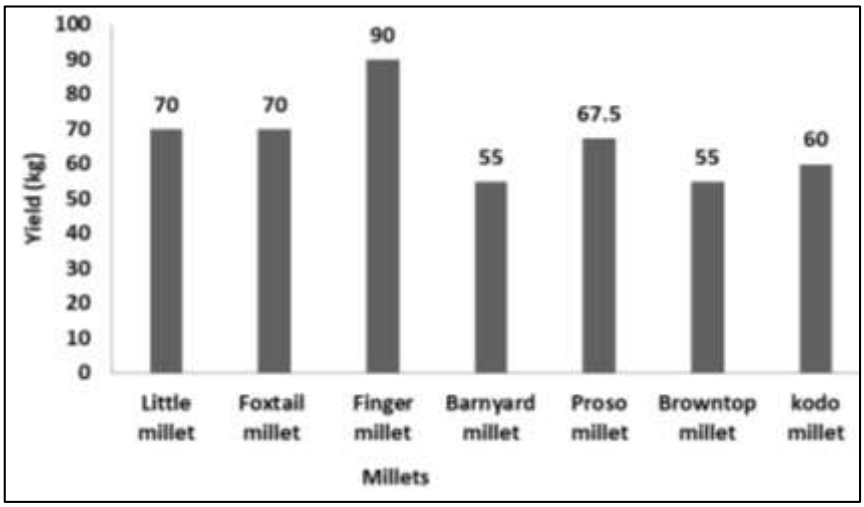

Fig 1: Dehusked millets recovery after processing

Table 2 indicated the cost incurred for processing of millets by "Agriculture Processing Unit". For purchasing of all millets from the farmers he paid Rs.17, 88, 000. Everyday engaging 6 labours it accounted for Rs.54, 000 per month. He spent on an average Rs. 30, 000 per month as electricity bill. The expenditure towards packaging material and spare maintenance was Rs.10, 000 and Grease Rs.1500 per month on an average. For construction of processing unit he spent Rs.15 lakh and Interest on building infrastructure loan is Rs.30,000 per month. Machinery installation he spent Rs.20 lakh and per month the maintenance fee is 1lakh rupees. In this way Mr. Manjunath Bagade getting Rs.20, 25, 500 of monthly expenditure of the processing unit.

Table 2: Cost incurred for processing of millets by Agriculture processing unit of Timmapur

	Particulars	No/Q	Rate(Rs)	Amount (Rs)Per month
Variable cost	Purchasing of all millets	507 quintal	3526.6	1788000.00
	Labour	6 no.	300/day	54000.00
	Electricity	1 month	30000	30000.00
	Packaging material	600 polyethylene bags	20	12000.00
	Spare maintenance	1 month	10,000	10000.00
	Grease	5kg	300	1500.00
Fixed cost	Interest on building infrastructure loan			30000.00
	Interest paid on Machinery loan			100000.00
				20,25,500.00

Gross income obtained from different operations by processor of Agriculture processing unit is presented in Table 3. Little millet rice is the maximum selling millet in the unit and gross income realized by selling 72.42 kg of little millet rice on an average was Rs.4, 70, 730 per month. Similarly by selling browntop millet, foxtail millet, barnyard millet and proso millet his gross income is on an average 3.9 lakhs, 3.75 lakhs, 2.1 and 2.8 lakhs rupees respectively. Mr. Manjunath Bagade is fruitfully utilizing the waste *viz*., preparing animal feed using husk and immature grains by which he earns 4.8 lakhs. Totally his gross income is Rs.22, 05, 730 per month. Excluding his expenditure he is getting Rs.1, 80, 230 profit per month. The unit will run for 6 months per year depending on the availability of the raw materials. In the off season he educates the farmers about the health benefits of millets and cultivation practices by conducting programs in villages. Seasonal deficit and high cost of raw materials has been the most important constraints affecting his processing business.

Table 3: Gross income realized by processor of Agriculture processing unit of Timmapur

Activity	Output per month (q)	Selling price (Rs/quintal)	Amount (Rs)
1. Millet processing			
a)Little millet rice	72.42	6500.00	4,70,730.00
b)Browntop millet rice	30	13,000.00	3,90,000.00
c)Foxtail millet rice	75	5000.00	3,75,000.00
d)Barnyard millet rice	30	7000.00	2,10,000.00
e)Proso millet rice	40	7000.00	2,80,000.00
2. Animal feed preparation	300	1600.00	4,80,000.00
Total			22,05,730.00

4. Conclusion

The above discussion on the economic aspects shows that millet processing has been sustainable agri based enterprise in Haveri district. The availability of millet rice has promoted the consumption of millets. In Karnataka large scale millet processing units are countable, in that Mr. Manjunath Bagade is one of the successful entrepreneurs.

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