

Analysis of the processing cost and constraint faced in foxnut (Makhana) processing

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ABSTRACT

Fox-nut (Makhana) is a nutritious, non-cereal edible crop that is organic. Fox-nut is high in protein, carbohydrates, and minerals. The price of fox-nut has risen in recent years due to increased demand from both domestic and international markets. The fox-nut is an important crop in the state of Bihar, and it has the potential to help the economy of the people who work in its cultivation. Approximately 42 percent is the efficiency of processing fox-nut seeds. Total processing cost of fox-nut seed is Rs 1643.55/100Kg. Processing unit cost which was 76.05 percent of the total cost of the processing is major cost involved as it is done manually and it requires skilled labour. Packing cost is 12.77 percent of the total processing cost. Contribution of labour charge while transportation was negligible and about 1.43 percent of total cost of processing. The cost of processing foxnut seeds is Rs 16.43 per kg. The processing cost of popped foxnut is Rs 39.13/Kg. With regards to the constraints faced by processors lack of skill labour as a constraint for processing is expressed by 73 percent of processors. Lack of processing machinery as a constraint is expressed by 57 percent of processors. Among all the constraints, lack of skill labour is the major constraint followed by lack of processing machinery, dependence on climatic conditions and health risk.

Keywords: Processing, constraint, tempering.

I. INTRODUCTION

Processing of Fox-nut

Sun drying, size grading, preheating, popping, polishing, grading, and packing are the steps in the processing of Fox-nut. The flow chart below shows how to properly prepare Fox-nuts.

Cleaning & Washing: The mature fresh Fox-nut seed is first cleaned, with various extraneous materials removed away from the seed, and then washed to remove dirt and dust.

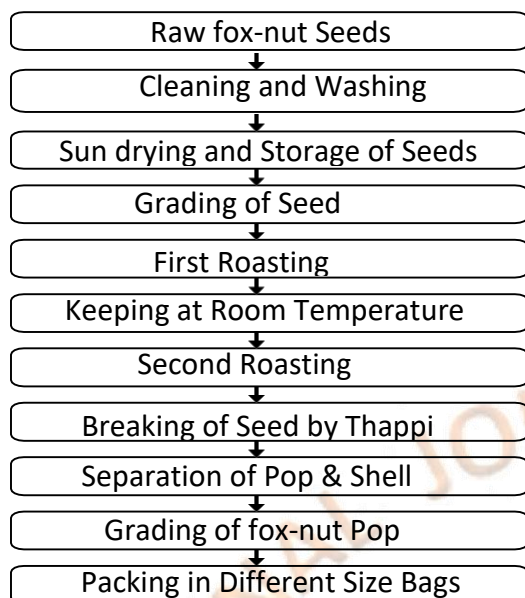
Sun drying and Storage of seeds: The cleaned Fox-nut seeds are next sun-dried for 2-3 hours in bright sunlight on a mat or concrete floor to reduce the moisture content to roughly 31% for temporary storage and transit. The seeds of the Fox-nut are stored at room temperature. Seeds are typically stored for 20-25 days before being processed. Throughout storage, sprinkles of water are applied at regular intervals to keep the seeds fresh and maintain seed quality.

Pre-heating: The sun-dried nuts are usually heated over a fire in an earthen pitcher or forged iron pan that is constantly stirred. The surface temperature of the pan ranges from 250 to 300 degrees Celsius, and cooking time at full capacity is approximately five to six minutes. After pre-heating, the moisture content of the nut drops to around 20%.

Tempering: The process of storing pre-heated seeds at room temperature for 48-72 hours is known as tempering. Tempering seeds loosens the kernels from the tough seed coat.

Roasting and popping: The far more major consideration in the processing of fox nuts is also the most time-consuming and painful step. In a very forged iron pan, 300 grammes of pre-heated and tempered nuts are roasted in a single layer over the fireplace at 290° C to 340° C surface temperatures with constant stirring. The roasted seed makes a cracking sound after 1.5 to 2.2 minutes. Five to seven roasted seeds are scooped quickly by hand and placed on the pavement before being struck with a wooden hammer. The kernel expands and pops out of the

hard shell, which is known as Fox-nut pop or lawa. The yield of Fox-nut varies from 35-40% on a raw seed weight basis, depending on the standard of the staple.



Polishing: Fox-nut pops are rubbed together in bamboo baskets. Polishing the Fox-nut brings out its radiance and shine.

Packaging: To load popping Fox-nut, ordinary gunny bags from local markets and polythene-lined gunny bags from distant markets are used. A bag with a capacity of 1 quintal of sugar can hold 8 to 9 kg of fine quality Fox-nut.

Processing of Fox-nut

Fox-nut processing is a laborious, drawn-out process that takes a lot of time and involves a lot of human drudgeries. Fox-nut (Guri) seeds are sun-dried for convenience in transportation and short-term storage.

To maintain the seed's quality, it is kept in water tanks or frequently misted with water. Generally, Guri is kept in the clusters for 20–25 days. The sun-dried nuts are next separated into 5 to 7 categories

based on their sizes using a set of sieves. The nuts are then cooked over a fire while being regularly stirred in a cast iron pan or an earthen pitcher.

The pre-heated seeds are stored in baskets or pots for 45 to 72 hours to loosen the kernels from the dense seed coat during tempering. The most tedious steps in fox-nut processing are roasting and popping. A cast iron pan is used to roast about 300 g of heated and tempered nuts in a single layer at temperatures between 290 and 340 degrees Celsius while stirring constantly.

After 1.5 to 2 minutes, when a crackling sound is heard, 5-7 toasted seeds are immediately scooped by hand and maintained on before a hard and abrupt impact force is imparted to them using a wooden hammer. The expanded kernel, known as fox-nut, emerges as the hard shell breaks. The polishing and packing in clever bags come next. Based on the weight of the raw nut, the yield of fox-nut varies between 30 and 35%.

II. METHODOLOGY

Selection of fox-nut Processors

Five Processing units were selected from each block of the study area. Hence ten processing units have been surveyed to collect the data.

Method of enquiry

Research work is started by gathering the information about the village from the District Statistical Office, Darbhanga. The information comprised land utilization, crop rotation, demographic features, marketing facilities, etc. The survey method was followed for detailed inquiries into the individual fox-nut growers. Information was collected for the years 2020–2021.

Information regarding various aspects of the production and marketing of Fox-nuts was collected by interviewing them personally with the help of a pre-tested schedule. The schedule was designed in a manner so that it could elicit all the information pertaining to the objectives of the inquiry. First of all, tentative schedules were prepared and tested in the selected area, and when found suitable for providing relevant information pertaining to different objectives of the study, they were finally adopted.

Source of Primary data

Primary data has been collected by the survey method, followed by a personal interview with farmers.

Secondary data

The secondary data with respect to area, production, and productivity of fox-nut at the national, state, district, and block levels will be collected from the concerned government statistical sources like the District Horticulture Development Office and other published sources like reports of the National Horticultural Mission, FAO, etc., journals, bulletins, the internet, and the Directorate of Agriculture of Darbhanga district.

Some other important secondary data collected through various sources like the Fox-nut processor's firm, the internet, other sources, etc.

Garrett Ranking technique

The Garrett ranking technique was used to investigate farmers' perspectives on the constraints they face in Fox-nut cultivation, processing, and marketing. Garrett's ranking was applied to the respondents' rankings of various attributes. Garret's scorecard was used to assign scores to percentage values. For each attribute, the mean of the Garret scores was calculated. Farmers regard the attribute with the highest mean score as a significant constraint. Garrett percentages were calculated by using the following formula

$$\text{Percent position} = \frac{(R_{ij} - 0.5)}{N_j} \times 100$$

Where,

R_{ij} = The jth individual's rank for the ith item.

N_j = The number of items ranked by the jth person.

III. RESULT

While discussing on the processing cost first of all, lets draw attention on what are the steps involved in processing of the fox-nut because without knowing the steps involved in the processing we cannot calculate the cost incurred on it every steps of processing.

Processing cost of fox-nut seeds

In fox-nut cultivation, the important operation is processing to get the final marketable & consumable product. It is a highly skillful operation that is mainly done with self-made equipment. Maximum fox-nut cultivator gets processed their fox-nut seeds at the processing unit. The cost incurred by cultivators on the 100 kg of fox-nut was discussed in the below table 1:

S.N.	Items / Particulars	Amount/Quintal	Percentage to total processing cost (%)
1	Processing unit charge	1250	76.05488
2	Transportation charge	55	3.346415
3	Labour charge (Loading-unloading)	23.55	1.432874
4	Packing	210	12.77722
4	Bagging & tagging	105	6.38861
	Total processing cost per 100kg of fox-nut seed	1643.55	100

The costs incurred on various activities involved in the processing of fox-nut are discussed in the above table. From the table, it is clear that the total processing cost for 100 kg of fox-nut seed was Rs. 1643.55. Among the total processing costs, Rs 1250 was paid to the processing unit per 100 kilogram of fox-nut seeds which was 76.05 percent of the total cost. Hence cost paid to the processing unit was the maximum. The cost incurred on transportation was Rs.55 which accounted for 3.34 percent. The labour charge incurred on loading and unloading of seeds in transportation was Rs.23.55. The packing cost was Rs. 210 which accounted for 12.77 percent of the total processing cost. In a standard-size gunny bag an average of 10 kg of the fox-nut can be filled (all grades considered). The cost of one gunny bag had been taken as Rs 60. About 35 kg of fox-nut pop was obtained from 100 kg of seeds. The result was as per the study conducted by Jha and Prasad (2003) in which they stated in post-harvest technology of fox-nut that the yield of fox-nut varies from 35% to 42% on the raw fox-nut weight basis.

Constraints in processing of fox-nut

It observed from the table 2 that among all constraints in processing of Fox-nut, lack of skilled labour got first position. Processing of Fox-nut is an art and only can be performed by highly skilled labour. There were a few people in the study area who were skilled to perform these tasks. Therefore, shortage of skilled labour was witnessed during peak period of Fox-nut processing.

Table 2 further revealed that among all constraints, the constraint, lack of processing machine occupied second position faced by processors in processing of Fox-nut in the study area. Because of no machine used, processing of Fox-nut still practiced old traditional technique which was tedious, painful and time consuming. Because it involves manually handling hot roasted nuts, it can result in burns and injuries to the processor's hand. The popping efficiency of fox-nut seed was very low, ranging from 35 to 40%. As a result, a processing machine is required to overcome this constraint in the research area. The third major constraint that faced by processors was, high dependence on climate. Before taking further step of popping the seeds are required to dry in open place on the floor for 2 to 3 days for the purpose of reducing seed moisture up to 31 percent. For it, good sunny day with dry atmosphere required. Drying procedure of processing makes seed easier to storage and for further processing. Generally processing of Fox-nut performed in the month of September - October and month is well famous for frequent rain, so it affects the processing.

The fourth constraint that the processors faced was health risk. During the processing, especially when popping, it is necessary to sit in a squatting posture, which causes backaches and spine problems, and continuously inhaling smoke from the filthy kitchen causes breathing problems. These constraints are believed to affect approximately 45.00 percent of processors.

S. No.	Particulars	Percent position	Garrett score	Garrett Mean score	Rank
1	Unavailability of processing machinery	37.5	57	16.01	II
2	Lack of skilled labour	2.5	73	56.64	I
3	High dependence on climate for drying	62.5	44	0.98	III
4	Health risk	87.5	28	0.24	IV

IV. CONCLUSION

The efficiency of fox-nut seed processing is 42 percent. Total processing cost per 100 kg of fox-nut seed is Rs 1643.55. Major cost item is processing unit cost which was 76.05 percent of the total cost of the processing, as it is done manually and it requires skilled labour. Cost on packing is 12.77 percent of the total cost of processing. Contribution of labour charge while transportation was negligible and about 1.43 percent of total cost of processing. The processing cost per kg of fox-nut seeds is Rs 16.43. The processing cost per kg of popped foxnut is Rs 39.13.

With regards to the constraints faced by processors lack of skill labour as a constraint for processing is expressed by 73 percent of processors. Lack of processing machinery as a constraint is expressed by 57 percent of processors. Among all the constraints, lack of skill labour is the major constraint followed by lack of processing machinery, dependence on climatic conditions and health risk.

V. AUTHOR'S CONTRIBUTION

Conceptualization and designing of the research work (P. Kumari, Dr. A.S. Noel); Execution of Field/Lab experiments and data collection (P. Kumari); Analysis of data and interpretation (A. Rai, P. Kumari); Preparation of manuscript (A. Rai)

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