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## Production, marketing and processing of Fox nut: A case study of Tulsi Mahila self-help group of Dhamtari district of Chhattisgarh

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### Abstract

Fox nut is an aquatic plant belonging to the Nymphaeace family. Commonly known as Gorgon's nut or fox nut. In India fox nut is grown in the state of Bihar, parts of Assam, Chhattisgarh and Manipur. Over 85 percent fox nut is solely produced by Bihar. A decent source of carbohydrates, proteins and minerals is present in fox nut. The research was carried out in Dhamtari District of Chhattisgarh. One SHG which is cultivated fox nut in pond system, 1 processor from the conventional system was chosen as a research sample. The overall cost of cultivation of fox nut which was Rs. 87820.56, the Gross return which was Rs. 248000 per hectare. Yield of fox nut is 2480 kg per hectare and Net return is Rs. 175491.14. The cost of processing per kg of the fox nut seed is Rs. 8.69 while the cost of processing fox nut pop was Rs.

26.07 per kg. The role of human labour in the manufacturing process is essential in the absence of processing machines. Registration of geographical indication (GI) and the value added items for fox nut with sufficient publicity will increase demand for fox nut pop. Lack of scientific knowledge cultivation, no ownership of pond, insufficient enhanced crop diversity, highly skilled operation, lack of credit facility. Constraints in processing of fox nut Issues related to the processing of fox nuts seeds were reported during the survey by processors are lack of equipment for manufacturing, lack of facility for credit, strong environment dependency for drying, health risk. High price volatility, lack of transport infrastructure, inadequate market services are major constraints in faced by fox nut cultivation. Input output ratio of Fox nut is 1:2.83.

**Keywords:** Cost-return, processing cost, marketing pattern, constraints

### Introduction

A self-help group (SHG) is a financial intermediary committee normally consisting of between 10 and 40 local women or individuals. SHG is a holistic programme of micro-enterprises covering all aspects of self employment, organization of the rural poor into self help group and their capacity building, planning of activity clusters, infrastructure build up, technology, credit and marketing. It lays emphasis on activity clusters based on the resources and the occupational skills of the people and availability of markets. Anyone, anywhere and for any social or economic purpose can start a self-help group. The SHG members are responsible for their future as efforts for mutual trust and mutual support are made. Members are also responsible for any group decision, which is why the group works only if each group member is dedicated to the community.

Fox nut is a native of South East Asia and China but is spread to almost every region of the world. Fox nut is a big source of nutrition. Their presence is usually less in South East Asia, though it is considered to occur in Japan, Korea, Russia, North America, Nepal, Bangladesh, as well as parts of India. This commodity is sold in India in Bengal, Bihar, Mainpr, Tripura, Assam, Jammu & Kashmir and Eastern Odisha. The major districts producing Fox nut is the state of Bihar include Darbhanga, Sitamarhi, Madhubani, Saharsa, Supaul, Araria, Kishanganj, Purnia and Katihar districts. Around 80 percent of total processed Fox nut output comes from the districts of Darbhanga, Madhubani, Purnia and Katihar. In view of its economic value, the fox nut area was 13,000 ha. In the Darbhanga district of Bihar, an ICAR Research Complex for the Eastern Region was established to pursue research into the various aspects of fox nut. There are about 100 seeds in a single Fox nut plant and about ten thousand plants per hectare. Fox nut seed yields approximately 1.8-2.0 t/ha of the pond area. Fox nut's edible portion contains 12.8 percent moisture, 9.7 percent protein, 0.1 percent fat, 0.5 percent mineral, 76.9 percent carbohydrates and 1.4 mg/100 g carotene.

Raw Fox nut has 328 kcal/100 grammes and popped Makhana has 362 kcal/100 gm of calorific value. Therefore, Fox nut's calorific value is well associated with staple foods such as wheat, rice etc. In sugar, protein and ascorbic acid and phenol content, Fox nut is considered superior to dry fruits such as almonds, walnut, cocoa and cashew.

The seed of fox nut is low in cholesterol, sodium and saturated fat. Manganese, calcium, magnesium, thiamine, phosphate and phosphorus are particularly strong sources of them. The remaining consists of water, sodium, potassium, phosphorus and calcium to keep the excretory tract in order. It helps to remove all of the spleen from the body, and it maintains the removal of excess cholesterol. The potassium level is an significant aid to the heart as the chance of hypertension and heat stroke is minimized. The extra water and salt from the body is good for flushing out. It helps if muscle contractions will lead to cramps. The presence of thiamine in lotus seeds helps the good cognitive control of nerves. The ingestion of lotus seed aids in generating a neuro transmission function of the acetylcholine.

Apart from the nutritional health benefits provided by the lotus seed there are other uses as well. It has been used as an inducing agent in cosmetic products so that the product can promote anti-aging. Additionally, lotus seeds are a common snacking item as it is low in carbohydrates, fat and sugar, which mean binging on it between the meal times, will surely not promote weight gain. Also, it is in demand due to its excellent content of nutrients and phytonutrients.

### Sampling Methodology

The study was conducted in the Dhamtari district of Chhattisgarh. In Dhamtari district one (SHG) Tulsi Mahila Self Help Group was selected purposively for the detailed study. For the present study fox nut seeds and fox nut pop products was selected.

### Data collection

In this chapter the materials and research methodology adopted are presented with respect to the selection of the study, selection of SHG member collection of the data and analytical tools.

To achieve the objective of the study, both primary and secondary data were collected. To arrive at the processing and manufacturing cost of milk products, data on expenditure incurred on raw materials and other input like fuel and energy expenditure on manpower etc. and

depreciation on buildings and equipment's were obtained from the record of the dairy plant. Wherever required, the data was supplemented by interviewing the plant personnel.

### Tools of Analysis

Simple average and percentages statistical techniques were used for analysed the data.

### Input-output ratio

Input-output ratio expressed as the ratio of total output to total input. The ratio was calculated as

$$\text{Input-output ratio} = \frac{\text{Total output}}{\text{Total input}}$$

Value of purchasing raw materials such as fox nut seed and fox nut pop etc., packaging materials, labour cost, and other cost (electricity cost and other maintenance cost) were counted as inputs.

### Total output

The quantity of fox nut seed and fox nut pop product sold by SHGs was treated as the output values.

### Results and Discussion

Tulsi Mahila Self Help Group was established in Dhamtari district of Chhattisgarh. Production, marketing and processing of fox nut the results obtained are presented into the following three sections:-

1. To work out the cost and returns of Fox nut.
2. To workout the cost of processing of Fox nut.
3. To find out the constraints in production, marketing and processing of Fox nut and suggest some suitable measures to overcome them.

### To work out the cost and returns of fox nut

The total yield of fox nut seed was 2480 kg per hectare and price of per kg seed is Rs.100 so the value of total output was Rs. 248000 per hectare. The input output ratio of fox nut was found to be 1:2.83. Net return of fox nut was noticed Rs. 175491.14 per hectare, form the above it was reveals that in fox nut cultivation the average cost was found to be 87820.56 and the net returns was 175491.14 hence the input output ratio was 1:2.83. It was clearly shows that the cultivation of fox nut is a profitable business for Tulsi Mahila Self Help Group (SHG) members.

**Table 1:** Cost of cultivation of fox nut on operational cost

| Operational cost |                                |                  |                          |
|------------------|--------------------------------|------------------|--------------------------|
| S. No.           | Cost items                     | Cost per hectare | Percentage of total cost |
|                  | Human labour                   |                  |                          |
|                  | a) Owned                       | 7627.24          | 10.51                    |
|                  | b) Hired                       | 29950.96         | 41.30                    |
|                  | <b>Total human labour cost</b> | <b>37578.2</b>   | <b>51.82</b>             |
|                  | Material cost                  |                  |                          |
|                  | a) Seedling                    | 6200             | 8.55                     |
|                  | b) Insecticide/ pesticide      | 1331.76          | 1.83                     |
|                  | c) Manure                      | 2976             | 4.10                     |
|                  | <b>Total material cost</b>     | <b>10507.76</b>  | <b>14.49</b>             |
|                  | Irrigation                     | 2356             | 3.24                     |
|                  | Miscellaneous cost             | 2230.76          | 3.07                     |
|                  | Interest on working capital    | 4529.72          | 6.24                     |
|                  | <b>Total operational cost</b>  | <b>57202.44</b>  | <b>78.86</b>             |
|                  | <b>Fixed cost</b>              |                  |                          |

|                |                             |                 |            |
|----------------|-----------------------------|-----------------|------------|
|                | Pond revenue                | 116.6           | 0.15       |
|                | Rent for leased /owned pond | 13772.68        | 18.99      |
|                | Depreciation                | 252.96          | 0.34       |
|                | Interest on fixed capital   | 1169.32         | 1.61       |
|                | Total of fixed cost         | 15306.56        | 21.10      |
|                | <b>Total cost</b>           | <b>87820.56</b> | <b>100</b> |
| <b>Returns</b> |                             |                 |            |
|                | Yield(in kg)                | 2480            |            |
|                | Gross returns(in Rs)        | 248000          |            |
|                | Net returns (in Rs)         | 175491.14       |            |
|                | Input output ratio          | 1:2.83          |            |

### Disposable pattern of fox nut

All the fox nut seed produced by the SHG was sold to KVK Dhamtari, @ Rs. 100 per kg.

### Tools and equipments used of fox nut

**Khonghli or Deli:** A tiny cylindrically shaped bamboo stick bucket. It is used for the preservation of raw, popped and polished seeds.

Sieve the sieves are made of wooden foundation sheets of iron. In the classifications of raw fox nut oil, seven to ten

sieves of varying mesh sizes are widely used.

**Mats:** Mats are used before roasting to dry raw fox nut seeds.

Iron pan a frying tray that is used to preheat and to roast the fox nut.

Hollow apparatuses made of hardwood are mostly shisum or mango, Aphara, Batna and Thaapi. It is a platform where a flat wooden hammer called Thaapi strikes roasted seeds.

Chula's (Earthen Pans) to roast the seeds. Sticks of Bamboo used to roast fox'nut nuts.

**Table 2:** Requirements of equipments on fox nut

| S. No. | Equipments          | Cost/in Rs. | Average No. of units required | Total cost In Rs. |
|--------|---------------------|-------------|-------------------------------|-------------------|
| 1      | Khonghli            | 324         | 2                             | 648               |
| 2      | Sieves for seed     | 190         | 8                             | 1520              |
| 3      | Sieves for pop      | 878         | 2                             | 1756              |
| 4      | Mats                | 80          | 14                            | 1120              |
| 5      | Iron pan            | 450         | 2                             | 900               |
| 6      | Aphra, Batna, Thapi | 55          | 2                             | 110               |
| 7      | Bamboo sticks       | 15          | 4                             | 60                |
|        | <b>Total</b>        |             |                               | <b>6114</b>       |

### To workout the cost of processing of fox nut

For fox nut, in order to get the final delicious consumable

good, care is an essential process. It's incredibly skilful. This is a really cheap and self-made activity.

**Table 3:** Processing cost of per 1 quintal of fox nut seed (36 kg of fox nut pop) (In Rs.)

| S. No | Items of cost                                    | Amount | Percentage to total processing cost |
|-------|--|--------|-------------------------------------|
| 1     | Human labour                                     | 410    | 50.80                               |
| 2     | Fuel (wood)                                      | 188.45 | 23.35                               |
| 3     | Packing  | 177.35 | 21.97                               |
| 4     | Equipment  | 31.51  | 3.88                                |
| 5     | Total processing cost per 100 kg of fox nut seed | 806.95 | 100                                 |
| 6     | Total processing cost per 1 kg of fox nut seed   | 8.069  |                                     |
| 7     | Total processing cost per 1 kg of fox nut pop    | 26.07  |                                     |

Cost of total human labour for 100 kg of fox nut seed was found Rs. 410. Total fuel cost of 100 kg of fox nut seed processor number was found to be Rs.188.45. Total equipment cost for 100 kg of fox nut seed Rs.31.51. Total packing cost of 100 kg fox nut seed Rs.177.35. Total processing cost 100 kg of fox nut seed Rs. 806.95. Total processing cost 1kg of fox nut seed Rs.8.069. Total processing cost 1 kg of fox nut pop Rs. 26.07. Producing of 1 kg pop requirement 3.2 -3.5 kg fox nut seed. The table reveals that the gross processing costs per 100 kg of fox nut seed was found Rs. 806.26. Human labour cost was accounted for 50.80 percent of the total processing cost. As a result, the expenses levied on labour were highest. The average cost of fuel was Rs. 188.45, which accounted for 23.35 percent of total processing cost.

### To find out the constraints in production, marketing and processing of Fox nut and suggest some suitable measures to overcome them

Farmers and processors encountered several difficulties in production, processing and marketing of fox nut. These shortcomings have been enlisted by the survey.

### Constraints in production of fox nut

In fox nut cultivation farmers are facing following constraints

1. Lack of scientific knowledge of cultivation
2. No ownership of pond
3. Insufficient enhanced crop diversity
4. Highly skilled operation
5. Labour intensive cultivation

**Constraints in processing of fox nut**

Issues related to the processing of fox nuts seeds were reported during the survey by processors are:

1. Lack of equipment for manufacturing
2. Non availability of credit facility
3. Strong environment dependency for drying
4. Health risk

**Constraints in marketing of fox nut**

Constraints in marketing of fox nut in Dhamtari district of Chhattisgarh are:

1. High price volatility
2. Lack of transport infrastructure
3. Inadequate market services

**Summary and Conclusions**

- It was found that literacy rate of selected member was 41.66 percent, majority of the respondents in the study area belonged to the age between 31 to 40 years and majority of the respondents were married (83.33 per cent).
- Total human labour cost Rs. 37578.2 (51.82 per cent), human labour owned 7627.24 (10.51 per cent) and hired labour 29950.96 (41.30 per cent).
- Total material cost Rs. 10507.76 (14.49 per cent), seedling Rs. 6200.00 (8.55 per cent), insecticide/pesticide Rs. 1331.76 (1.83 per cent), manure Rs. 2976.00 (4.10 per cent).
- Total operational cost is Rs. 57202.44 (78.86 per cent), irrigation Rs. 2356.00 (3.24 per cent), miscellaneous cost Rs. 2230.76 (3.07 per cent), interest on working capital Rs. 4529.72 (6.24 per cent).
- Total cost of cultivation of fox nut per hectare in Rs. 87820.56.
- The average yield per hectare is 2480 kg of fox seed.
- All the fox nut seed produced by the SHG is sold to KVK Dhamtari @Rs.100 per kg.
- Processing cost per 100 kg of fox nut seed Rs.806.95, Total processing cost per 1 kg of fox nut seed Rs. 8.069., Total processing cost per 1 kg of fox nut pop Rs. 26.07.
- Producing of 1 kg pop required 3.2 -3.5 kg fox nut seed.
- Gross return in Rs. 24800.00.
- Input output ratio of fox nut is 1:2.83.
- Constraints in production of fox nut were lack of scientific knowledge cultivation, no ownership of pond, insufficient enhanced crop diversity, highly skilled operation, lack of credit facility, labour intensive cultivation.
- Constraints in processing of fox nut seeds were reported during the survey by processors are following constraints. Lack of equipment for manufacturing, lack of facility for credit, strong environment dependency for drying, health risk.
- Constraints in marketing of fox nut in Dhamtari district of Chhattisgarh were high price volatility, lack of transport infrastructure, inadequate market services. The unavailability of retail facilities and market knowledge.
- Emphasis should be given to high profit yielding crops like fox nut.
- It is suggested to join up with nearby supermarkets and e-commerce space in order to improve shelf presence

and to set up a self-service kiosk in the colonies of the garden porch.

- Enhance packaging and grading standards to make products attractive to consumers.
- For improved consumer access, the smart phone app may provide a forum for buyers and sellers.
- Training support will be given through demonstration, fox nut crop will include to Agriculture subjects to enhance knowledge among students.

They should involve intermediaries to reach a wide range of consumers. This will solve their narrow coverage problem.

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