Millet Industry Scenario

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Abstract

Millets are one of the important cereal grains superior in protective nutrients and are easily digestible. They have high content of calcium and low glycaemic index. Foxtail, little, kodo, proso, barnyard, and brown top millets are among the most commonly cultivated millets that have hard cellulosic husk outer layer. Processing of millets for human consumption essentially involves cleaning, grading and dehusking of the grains. The processing of millets involves the removal of outer husk in the process of millet grain processing. The modern millet processing technique involves different equipment and machines to process large quantities with an intention to reduce drudgery and improve the quality and quantity of output. Improved millet dehusking machines, namely rubber roll sheller and single-stage and double-stage centrifugal dehuskers, with various capacities have been developed. Millets have been utilised since prehistoric times for culinary, medicinal, livestock etc. The various value-added products have been developed to utilise the nutritional components of these important healthy foods. Products such as flaked millet; puffed millet; extruded and roller-dried millet products; fermented, malted and composite millet flours; and weaning foods have been developed for the utilisation of this important health food.

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Keywords

Millets · Processing and value addition of millets · Millet business model

15.1 Introduction

Millets are a group of small grains belonging to grass family and grown widely around the world. They are considered cereal crop used as both human food and fodder. Millets are considered to be the sixth-most important cereal crop in the world, providing food to about a third of the population. Generally millets are small in size with round shape and can have varied colours like white, grey, yellow and red. It is a tiny seed having a nutty flavour and is considered to be the least allergic and most digestible grain available among the food grains. Millets play a very important role in food and nutrition security particularly during drought as it can be grown well even in the substantial low rains (Umanath et al. 2018).

Millets are classified into two categories based on the seed size, namely major millets and minor millets. Sorghum (*Sorghum bicolor*) and pearl millet (*Pennisetum glaucum*) are considered as major millets and little (*Panicum miliare*), kodo (*Paspalum Scrobiculatum*), proso (*Panicum miliaceum*), barnyard (*Echinochloa frumantacea*), finger (*Eleusine coracana*) and Italian (*Setaria italica*) millets are minor millets. Further, the minor millets are considered to be higher in protective nutrients such as proteins, vitamins, minerals, fibre and phytochemicals. Because of their biochemical composition, millets are considered as highly nutritious and are also the major source of energy contributing 70–80% of energy intake of Indian diet. Millets are considered as diabetic food due to higher amount of minerals and lower glycaemic index. Millets do not contain gluten, hence safe for consumption by people with gluten sensitivity and suffering from Celiac disease (Kulkarni et al. 2018).

A total of 28.82 million tonnes of millets is produced globally every year in an area of 36.79 million ha, with India having the largest market share with 41.0%. In India, 18 million tonnes of millets is produced annually by cultivating in 18–19 million hectares of area (FAO 2018). Millets, specifically small millets, are observed to be in crisis situation. The intense decrease was observed in cultivation area under millets during 1961–2009 (Small millets—80%, Sorghum—59%, finger millet—46% and pearl millet—23%). The total production of small millets was decreased by 76%, which led to a steep fall in overall consumption and per capita availability of all millets. The detailed global production data from different countries are depicted in Fig. 15.1.

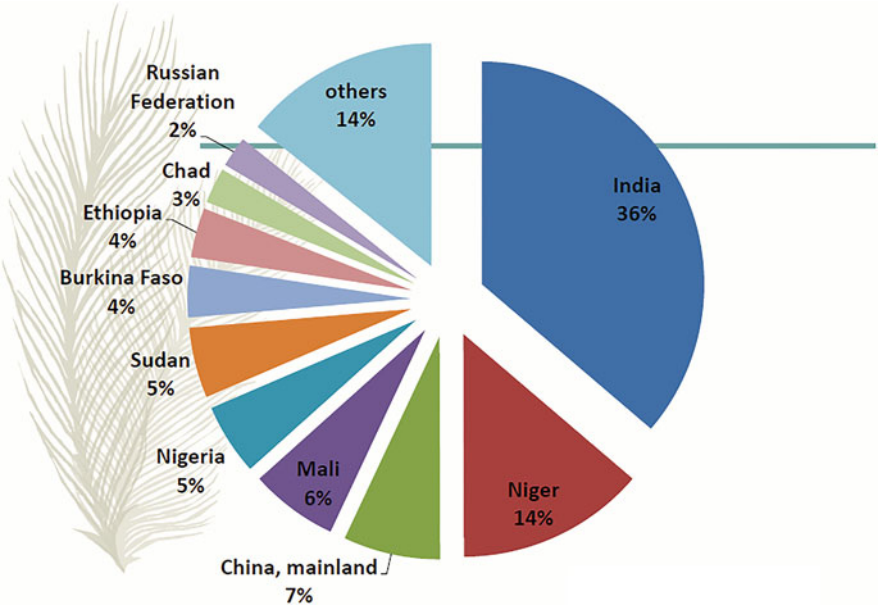


Fig. 15.1 Global millet production statistics (FAO 2018)

15.2 Millets Processing and Utilisation

The millet seeds can be divided into two types as utricles and caryopses. In the utricle, the seed is surrounded by pericarp like a case/cover and attached to the seed at only one point. Finger millet, proso millet and foxtail millets are utricles. In these types of utricle millets, the pericarp usually breaks away from the seed coat or testa, which is well developed, thick and forms a strong barrier over the endosperm. In a caryopsis, the pericarp is completely fused to the seeds. (iasri.res.in). The endosperm comprises the majority of the kernel weight for all millets. There are four structural parts of the endosperm. The aleurone layer and the peripheral, corneous and floury endosperm areas (Fig. 15.2).

Foxtail, little, kodo, proso, barnyard, and brown top millets are among the most commonly cultivated millets. These millets have hard cellulosic husk as outer layer that humans cannot digest. Processing of millets for human consumption essentially involve cleaning & grading, dehusking and polishing of the grains. The dehusking is the major activity in processing of millets and the husk can be removed by either the process of shear or impact force(https://www.udawat.in/blog/processing-millets). Traditional methods of grinding grains include using a wooden pestle and a wooden or stone mortar to smash dry the moistened or wet grains. By moistening the grain to about 10% water, the grain not only can be removed of its fibrous bran but also separated into its germ and endosperm. In the existing small millets sector, small and

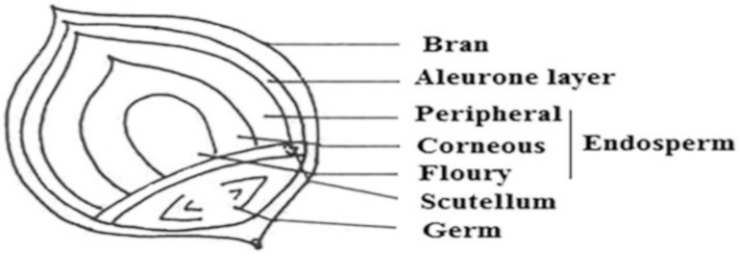


Fig. 15.2 Structure of millet grains

Fig. 15.3 Rubber roll sheller type, single-stage and double-stage centrifugal type millet dehusker (from left to right)

medium enterprises (SMEs) had problems separating hulled and unhulled grains and had lower head-rice recovery rates. For small millets, there were no suitable dehullers that could meet the processing needs in villages and regions.

In modern millet processing techniques different types of equipment and machines are used to process large quantities of millets continuously with an intention to reduce the drudgery and improve the quality and quantity of the output. Recently, improved millet dehusking machines namely rubber roll sheller, single-stage and double-stage centrifugal dehuskers having capacity 100–1000 kg per hour have been developed by different firms and introduced in the local market. The different dehusking machines are shown in Fig. 15.3. The dehusking efficiency of these machines varies from 80 to 95%. The dehusking of remaining grains is accomplished by pearling. The supporting equipment namely cleaner cum grader, destoner and pearler of matching capacities (Fig. 15.4) are used to produce high-quality dehusked millets (Nidoni et al. 2018).

Fig. 15.4 Cleaner cum grader, destoner and pearler (from left to right) for millet processing

Table 15.1 Recommended sieve size for grading of millets before dehusking

Small millets	Top sieve (mm)	Middle sieve (mm)	Bottom sieve (mm)
Little millet	2.20–2.40	1.35–1.46	0.80–1.00
Foxtail millet	2.00–2.40	1.35–1.46	0.80–1.00
Barnyard millet	2.40–2.80	1.46–1.60	0.80–1.00
Proso millet	2.50–2.80	1.70–2.00	0.80–1.00
Browntop millet	2.40–2.80	1.70–1.90	0.80–1.00
Kodo millet	2.50–3.00	1.90–2.10	0.80–1.00

The small millets are graded before removal of husk to enhance the milling efficiency, head rice recovery and reduce the brokens in the milling process. The size of the grading sieves is based on the average size of the millet. The recommended sieve openings for grading of different types of millets before milling are given the Table 15.1.

A wide range of millet processing machinery with different designs and capacities are sold in the market by various manufacturers. The various types of millet processing machinery fabricated by some of the manufacturers in Tamil Nadu and Karnataka are presented in Table 15.2. These processing equipment adopted by small-scale processing units in different parts of the country were found functional.

15.3 Utilisation of Millets

The increasing population has proportionately increased the demand for food while satisfying the total calorie intake mainly from cereals. Despite contributing less than 2% of global cereal utilisation, millet is considered an important staple crop in many semi-arid tropical countries with poor soils and lower precipitation. The millets are nutritionally on par and/or superior to major cereals with additional benefits like gluten-free proteins, low glycaemic index, high fibre and rich bioactive compounds.

Table 15.2 Details of some of the millet processing equipment available in the market

Sl. No.	Processing machines	Capacity (kg/h)	Some of the manufacturers involved
1.	Aspirator cum grader	50–500	AVM Engineering (AVM), VICTOR AGRO SALES (Victor), Perfura Technologies Private Ltd. (Perfura), KMS Industries (KMS) and Vishra Agro Sales in Tamil Nadu, and Bhavani Industries, Vishwa Agro Tech and Bio-tech in Karnataka
2.	Destoners	50–500	
3.	Aspirator cum destoner cum grader	50–500	
4.	Single-chamber centrifugal impact huller	100–200	Improvised by Victor and AVM, and improved by DHAN Foundation (DHAN) and Tamil Nadu Agricultural University (TNAU) under IDRC & GAC supported project
5.	Double-chamber centrifugal impact huller	100–200	Developed by DHAN and TNAU under IDRC & GAC supported project and currently offered by AVM, Victor and Perfura
6.	CIAE model abrasive huller	50–200	Developed by Central Institute of Agricultural Engineering (CIAE) and offered by Perfura
7.	Portable impact huller	200–400	Developed by Small Millet Foundation of DHAN and offered by Kalanjium Thozhilagam Limited (KTL)
8.	Tabletop impact huller	50–80	

Rich nutritional composition and drought-resistant property of the crop has aroused the interest of many research scientists and institutions all over the world. These properties have made it to be utilised for production of many health products (Kannan et al. 2013).

Millets have been utilised for human consumption in the form of culinary and medicinal purposes since prehistoric times. The studies conducted on processing and value addition of millets show encouraging outcomes in utilisation as number of traditional and convenience health foods. Consequently, many researchers have developed various millet products such as flaked millet, popped millet, puffed millet, extrudates and roller-dried millet products, as well as fermented, malted, composite flours and baby food.

Millet rice: Millets generally have mild flavour which makes them get blended with other food products. More often, in order to bring out its flavour, it is combined with different grains and roasted before cooking. The significant increase in the dietary fibre, mineral, protein and antioxidants content was observed in the final developed product by addition of millets (Ronda et al. 2015).

Millet flour: Millets are ground into coarse or fine flour and used for preparation of chapatis and bakery products (Collar 2016). Addition of millet flour to baked foods will enhance texture, flavour and richness of nutritional value. The possibility of

making leavened pancakes called dosa and thinner, unleavened roti has also been reported.

Millets have been used in various food processing industries including biscuits and confectionary, beverages, weaning foods and fermented foods like beer (Laminu et al. 2011). Sorghum, maize and wheat composites are being made into soft biscuits and cookies, while millets are being used to create cakes and non-wheat bread, with encouraging results (Hama 2012; Laminu et al. 2011). Whereas, in spite of unlimited potential the progress in the infant weaning food sector has been slow due to limited installed capacity for industrial malting (Laminu et al. 2011). Various unique and innovative foods are developed by incorporation of millets like Bajra lassi supplemented with healthy lactic acid bacteria (Charalampopoulos et al. 2002). The millets are also used for production of synbiotics (Thakur and Tiwari 2019). A general process flow chart for the production of composite food products from millets is presented in Fig. 15.5.

15.4 Millets Marketing and Trade

Rice and wheat are staple food for the major population in the world. However, they are considered to be unsustainable due to higher water requirements and contribution to greenhouse gases emission (18%). Whereas, millet are the dryland crops grown easily in dry climate, have shorter harvesting period requiring less quantity of water. Hence, they can be sustainable alternative staple food to rice and wheat ensuring food security to large population of the globe. Millets were cultivated instead of rice and wheat due to the increased demand from urban populations in Asia Pacific, particularly in India and China. Thus, from a health, environmental, and economic perspective, improving India's livelihood would be improved by expanding millet agribusinesses.

In India, minor millets are cultivated predominantly by small and marginal farmers in the dry lands and especially by tribal communities leading to declining area under millet cultivation. However, there is a growing need in the country for millets to be assessed due to their ability to withstand climatic changes and provide excellent nutrition. The urban population is inclining more towards healthy foods and increased unsustainable issues in the cultivation of rice and wheat is driving the demand for millets is forecasted. As a result of modern lifestyles and eating habits, there are many diseases like diabetes, obesity, heart attacks, coronary artery disease, and arrhythmias. Millets are packed with minerals and proteins, which can prevent these diseases.

By 2025, the popularity of millet and its associated health benefits will boost the industry's growth. The global millets market is unorganized and fragmented with a large number of medium-sized processors. Most millets are grown by small landowners and farmers' organisations. The supply channels hold more importance in marketing millets, as it give a way for enhanced exposure to the common market. The processing industry should have tie up with growers to procure crops directly

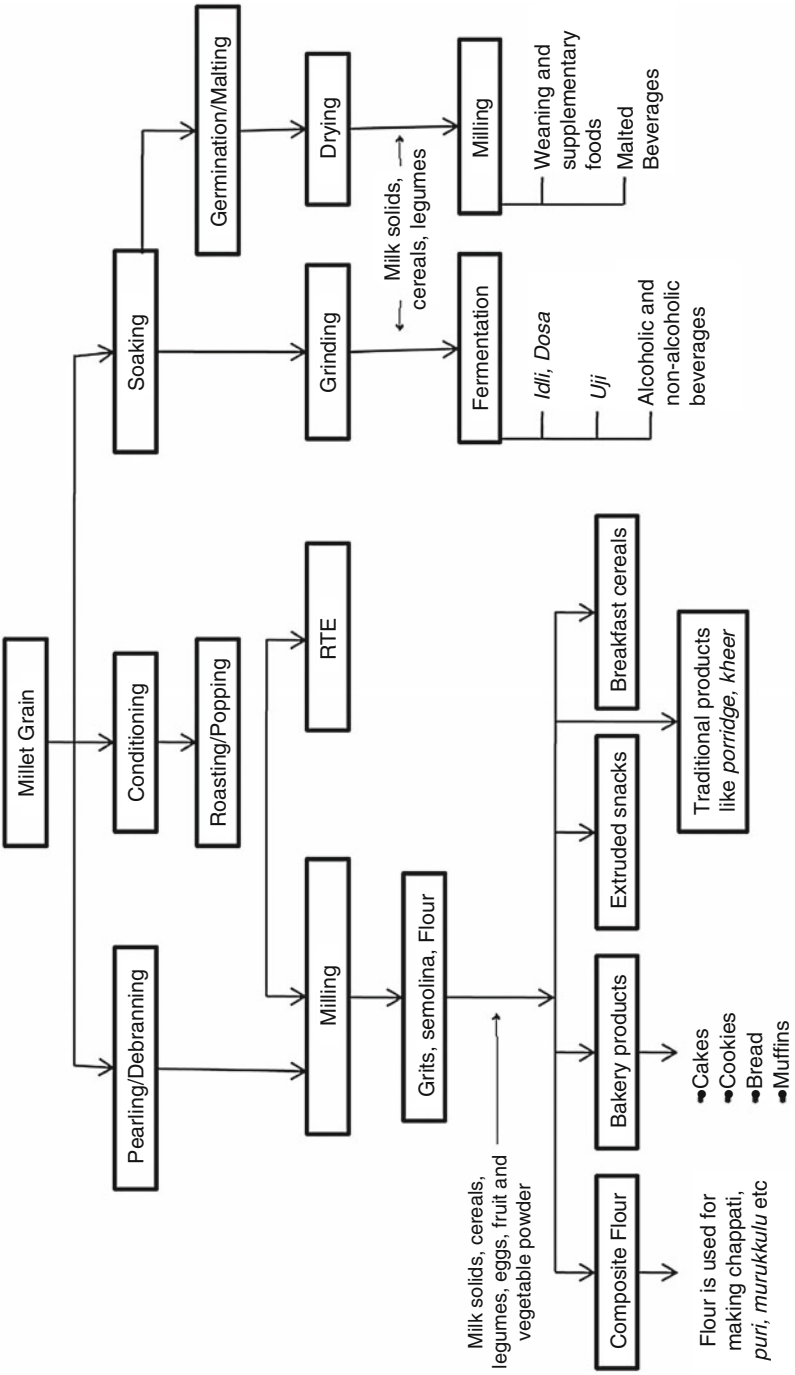


Fig. 15.5 Schematic diagram for developing millet-based food products. (Source: Kumar et al. 2018)

from farmers. Farmer producer organisations (FPOs) are also playing vital role in procurement and distribution of product. Grocery stores are important part of open market where consumers directly purchase the processed and value added products like bakery products and cereals. E-commerce sites and online stores are becoming easy and quick distribution channels for processors and consumers with a growth rate of more than 3% CAGR by 2025. Online marketing is one of the prominent channels for packed millet brands and help industries to create their own supply chain with doorstep delivery services. Thereby reducing their dependence on godowns, retailers and grocery stores. Participation of various distribution channels like trade associations, will strengthen millets business in the future years. Value addition and value added products like beer, infant and breakfast foods will increase demand over the forecast period (Vetter et al. 2017).

Numerous initiatives are being taken by various agencies to enhance millet cultivation and marketing. Integrating approaches among key players and fostering networking have been shown to have a significant impact on impact. Growing nutrition, health, and resilience factors are driving the revival of millet farming in this country. In dry and hot climates, these cereals do well and have supported millions of poor and marginal farmers struggling to overcome poor soil conditions, low moisture levels and the lack of external inputs. Due to their hardiness and good nutritional profile, they are effective at coping with climate change.

15.5 Challenges and Opportunities

Increasing urbanisation and disposable incomes are contributing to the growth of pre-processed and convenience foods. This has enhanced the preferred market for commercially milled wheat and maize flour. Whereas, millets are comparatively cheaper, but are unprocessed and therefore not convenient for use. This has caused markets for locally grown millets to shrink, incentives for local production to deteriorate, and foreign exchange reserves to diminish in order to meet the increasing demand for pre-processed flour.

The various challenges that need to be addressed for the popularisation of millets in India are discussed here:

Poor Supply Chain: In contrast to rice and wheat, there has been stagnant/declining growth in the supply chain, including support for farmers, traders, markets, subsidiaries and processing units to ensure speedy and smoothness. Accordingly, the cost components are on the rise. The manufacturers claim that the cost of middlemen can be increased by up to 40%.

Awareness of Customers: The nutritional value of millets and the quality evaluation of millets are not properly understood by customers. Many people are aware of millets from word-of-mouth or through informal discussions about its potential nutritional benefits. However, when a survey was conducted on customer

preferences, more than half of non-consumers indicated that they were interested in buying millets.

Lower Yields: The annual average yields of millets is relatively lower with 4–5 quintals as compared to rice with 20–25 quintals, wheat with 18–20 quintals and maize with 25–30 quintals (Adekunle et al. 2018). However, small millets have higher yield potential if other factors are taken into account, since they require less land than rice and able to grow in less fertile soils.

Inadequate or Inefficient Processing Facilities: It was also observed from the study reports that the processing facilities are very less. The feedback loop required to improve the innovation and development, while reducing drudgery is missing. The recovery is also one of the important parameters and it was observed to be only 60–65%. Apart from the recovery, the utilisation of by-products of processing are also contributing to the higher selling price.

Policy Issues: Following the green revolution, policymakers in India have promoted the cultivation of intensive crops in more suitable resource areas, contributing to the reduction of area under millets (despite the fact that millets require less land to cultivate). Another example is that India's Public Distribution System (PDS) did not include millets in 2017.

The other challenges in processing of small millets are: (1) variations in raw materials and (2) lower shelf-life of processed millets and grits due to rancidity and infestation. The grains of different small millet crops vary in terms of shape, nature of grain surface, hardness, husk-grain bonding and expected rice recovery. Furthermore, the variations are also observed for varieties, cultivation practices and microclimate across production regions.

Millets provide similar health benefits and nutrition like other major cereals such as rice, wheat and maize, but by processing them properly can enhance the nutrition and other properties that are suitable for household consumption. Presently, the average selling price of small millets is Rs. 70 per kg compared to Rs. 40 per kg for rice, creating problems of affordability. Fortunately, there exists a favourable economic environment for the growth of small millets value chain agribusinesses. This is due to advancement in post-harvest and value addition technologies, increased average disposable income and consumer awareness about the nutritional importance of millets.

15.6 Millet Processing Business Models

Millets are rich sources of minerals, fibres, polyphenols and antioxidants required for proper functioning of human body. They are also considered to be gluten free and have lower glycaemic index compared to rice and wheat. Despite these benefits, small millet industries are declining, due to several factors attributed to reduced

demand, decreasing/stagnant area under cultivation and limited access to markets by small producers. Several attempts have been made to overcome the failure in marketing have resulted in the innovative business models. These business models emphasise on collective marketing and negotiating forward contracts thereby earning better prices for growers and reducing the transactional costs. The warehouse receipt systems (WRS) is another opportunity for the growers, which allows them to store commodities until prices rise and contract farming that provides buyers with a reliable supply of high-quality products.

The business model essentially explains how a company generates, distributes and captures value. "Business models that do not leave small-scale farmers behind and in which the views and demands of those players in developing nations are respected", according to the definition of an inclusive business model. As a result, these business models are meant to benefit both producers and low-income areas (creating jobs and increasing incomes).

15.6.1 Business Model-I

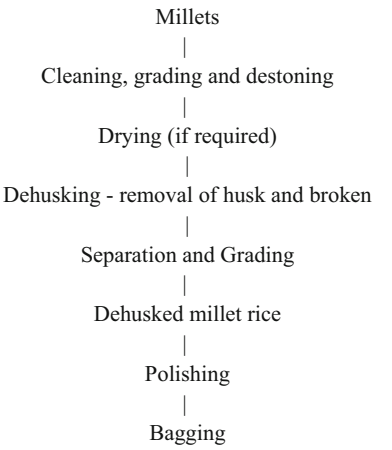
15.6.1.1 Millet Rice Processing Unit

Millets are consumed in dehusked form, and dehusking is the process of removal of the outer husk of the grains. The husk is not edible by humans. Traditionally, millets are dehulled manually using pestle and mortar mechanisms or wooden or stoner grinders due to lack of availability of local processing infrastructure in the production catchments. The production and consumption of millets has drastically declined in the recent due to drudgery and time involved in the traditional milling process. Hence, the processing of millets became important step in the enhancement of the consumption and thereby production of millets.

The processing of millets is undertaken in three different levels.

1. Primary Processing:
   The activities consist of cleaning, grading and packaging of millets without changing its physical structure.
2. Secondary Processing:
   The secondary processing involves dehusking, polishing, coating and powdering activities involving little change in the physical structure of millets.
3. Tertiary Processing:
   Tertiary processing is value addition of the millet into various products.

Flow diagram for millet dehusking



15.6.1.2 Capital Inputs

15.6.1.2.1 Land and Building

The processing plant can be established in a land measuring totally 1200 sq. ft. with a capital cost of approx. Rs. 2.0 lacs. The required processing shed can be constructed at the said land and the cost estimate for construction of building as per the valuation will be approx.Rs. 5.00 lacs.

15.6.1.2.2 Plant and Machinery

The plant and machinery will be finalised based on viable capacity being processed per year on one working shift considering 200 working days per year. The processing machinery required are listed below with the capacity and price:

Millet processing machines

Sl. No.	Name of machinery	Installed capacity	Quantity	Price/unit, Rs in lacs	Total amount, Rs in lacs
1.	Cleaner cum grader	1.0 QPH	1 No.	0.75	0.75
2.	De-stoner	1.0 QPH	1 No.	0.90	0.90
3.	Mini millet dehusker (centrifugal type)	1.0 QPH	1 No.	2.25	2.25
4.	Mini millet dehusker (rubber roll type)	1.0 QPH	1 No.	1.00	1.00
5.	Polisher	1.0 QPH	1 No.	0.35	0.35
6.	Weighing machine	100 kg	1 No.	0.25	0.25
7.	Packaging machine		1 No.	0.35	0.35
Total (X)					*5.85*
Installation, testing and commissioning of machines					0.15
Grand Total = 6.00					

15.6.1.2.3 Miscellaneous Assets

The essential miscellaneous assets including furniture and fixtures, storage facilities and electrification are to be covered by making a provision of Rs.0.30 lakh.

15.6.1.2.4 Raw Material

The major raw material required for running the unit is millet grains. The total raw materials required for 1 month cost Rs.25 lakh.

15.6.1.2.5 Utilities

Power

The total power requirement estimated based on the machinery would be 10 kW or 13–15 HP. The suitable standby generator provision is also made for uninterrupted operation. The approximate total annual expenditure could be around Rs.1.10 lakh.

Water

Water is one of the essential utility required for processing, cleaning and domestic consumption purpose. Arrangements for regular and continuous supply of water is ensured.

15.6.1.3 Manpower Requirements/Organisational Setup

The unit also requires manpower for running and managing operations and other activities of the unit. Depending upon the capacity of the unit, the required manpower is presented below.

Particulars	Nos.	Monthly salary (Rs.)	Total monthly salary (Rs.)
Manager	1	10,000	10,000
Supervisor cum operator	1	7000	7000
Cleaner	1	3000	3000
Total			*20,000*

15.6.1.4 Implementation Schedule (Tentative)

Activity	Period (in months)
1. Application and sanction of the loan	2
2. Civil work	1
3. Placement of orders for machinery and procurement	2
4. Installation, commissioning and trials	1

15.6.1.5 Insurance

The processing unit will be covered for adequate insurance for fixed assets and stocks.

15.6.1.6 Project Cost and Means of Financing (Rs. in Lacs)

Item	Amount
Land	2.00
Building/civil works	5.00
Plant and machinery	6.00
Miscellaneous assets	0.50
Total term loan	13.50
Raw materials	25.00
Labour	2.40
Utilities	1.45
Total working capital loan	28.85
Means of finance as term loan	
Promoters contribution	4.0
Loan from bank	9.5
Subsidy from GOK @ 50%	

15.6.1.7 Profitability Analysis

15.6.1.7.1 Production and Sales

The monthly production and sales of unit is as presented below considering foxtail millet as reference material

Items	Quantity in Qtl	Whole sale rate per Qtl	Total profit Rs.
Raw materials			
Millets (foxtail millet)	1000	2500	2,500,000.00
Processed products			
Millet rice	650.0	6500	4,225,000.00
Husk	400.0	1000	400,000.00
			4,625,000.00

The total processing capacity is considered as 1000 qtls per month working on single shift. The sales revenue is totalling to Rs. 46.25 lakh per month.

15.6.1.7.2 Raw Materials Required at 100%

The raw materials required for production will be procured at 100% of the capacity as per the annual production schedule and it shall be 1000 qtls.

15.6.1.7.3 Utilities

The expenditure towards utilities at 100% activity level is estimated to be Rs. 50,000/- per annum.

15.6.1.7.4 Interest

The Interest charged by banks towards the repayment of term loan of Rs. 9.50 lacs is calculated at 14% with repayment schedule of 5 years which includes the moratorium period of 6 months.

15.6.1.7.5 Depreciation

The depreciation of the all the fixed assets will be calculated on WDV basis considering 10% on building, machinery and miscellaneous assets.

15.6.1.8 Projected Profitability (Monthly) (Rs. in Lacs)

No.	Particulars	Cost in Rs.
A	Sales realisation	46.25
B	Cost of production	
Raw materials		25.00
Utilities		0.50
Salaries		2.40
Stores and spares		0.50
Repairs and maintenance		0.50
Administrative expenses		0.50
Total		*29.40*
C	Profit before interest and depreciation	16.85
Interest on term loan		1.33
Depreciation		0.77
Profit before tax		*14.75*
Income-tax @ 20%		2.95
Profit after tax		11.80
Repayment of term loan (5 years)		1.90
Net profit		*9.90*
Cash accruals		10.67

15.6.1.9 Break-Even Analysis (Rs. in Lacs)

No	Particulars	Amount	
A	Sales		46.25
B	Variables		
Raw materials		25.00	
Utilities		0.50	
Salaries		2.40	
Stores and spares		0.50	
Repairs and maintenance		0.50	
Administrative expenses		0.50	29.40
C	Contribution (A–B)		16.85
D	Fixed cost		4.00
Break-even point (D/C)			*23.70%*
B:C ratio			*1.57*

15.6.1.10 [A] Leverages

Financial leverage
= EBIT/EBT
= 16.08 ÷ 14.75 = 1.09

Operating leverage
= Contribution/EBT
= 16.85 ÷ 14.75
= 1.14

Degree of total leverage
= FL/OL
= 1.09 ÷ 1.14
= 0.96

15.6.1.10.1 [B] Debt Service Coverage Ratio (DSCR) (Rs. in Lakhs)

Particulars	First year (80%)	Second year (90%)	Third year (100%)	Fourth year (100%)	Fifth year (100%)
Cash accruals	8.53	9.60	10.67	10.67	10.67
Interest on term loan	1.33	1.06	0.80	0.53	0.27
Total [A]	*7.20*	*8.54*	*9.87*	*10.14*	*10.40*
Interest on term loan	1.33	1.06	0.80	0.53	0.27
Repayment of term loan for 5 years	1.90	1.90	1.90	1.90	1.90
Total [B]	*3.23*	*2.96*	*2.70*	*2.43*	*2.17*
DSCR [A] ÷ [B]	*2.23*	*2.88*	*3.65*	*4.17*	*4.79*
Average DSCR	*3.54*				

First and second year only 80 and 90%of plant capacity is utilised

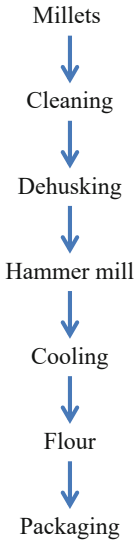
15.6.2 Business Model-II

15.6.2.1 Millet Flour and Semolina (Rawa/Suji)

The flour is one of the basic ingredients used in various product preparation recipes. Millets are processed by the method of dry milling. Process flowchart includes the cleaning of grains followed by milling in hammer mill. The milling separates the endosperm, germ and bran layer grinding it to get fine flour. Semolina is a ready-to-

cook product also processed pulvering millets into various particle sizes. The mesh size will be selected to process semolina of different variants.

15.6.2.2 Procedure for Production of Millet Flour and Semolina: Flow diagram for millet flour

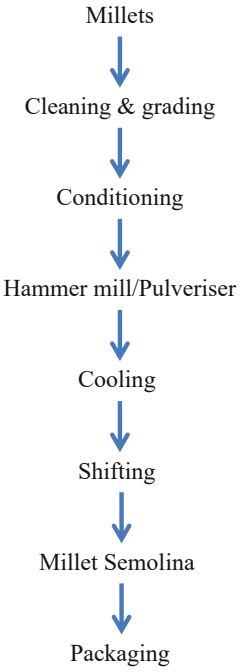


Flour – 89%, by-product – 11% (Bran)

15.6.2.3 Unique Qualities of the Product

The millet flour is rich in protein, dietary fibre and minerals (Mg, Zn, Fe). The flour is utilised for the preparation of rotis and bakery products (cakes and biscuits).

Flow diagram for millet semolina



15.6.2.4 Unique Qualities of the Product

Millet semolina is used for the preparation of upma, kichadi, laddu, idli, dosa, kesari etc. The products are rich sources of protein, fibre, iron, magnesium and zinc. The storage life of semolina is 3–4 months according to the type of packaging.

15.6.2.5 Capital Inputs

15.6.2.5.1 Land and Building

The processing plant can be established in a land measuring totally 1200 sq. ft. with a capital cost of approx. Rs. 2.0 lacs. The required processing shed can be constructed at the said land and the cost estimate for construction of building as per the valuation will be approx. Rs. 5.00 lacs.

15.6.2.5.2 Plant and Machinery

Considering the minimum viable capacity being processed annually on one working shift with 200 working days per year, the machinery and equipment required for installing the processing unit are listed below:

Processing machines required

Sl. No.	Name of machines	Capacity	Qty.	Rate/unit, Rs in lacs	Amount, Rs in lacs
1.	Cleaner cum grader	1.0 QPH	1 No.	0.75	0.75
2.	De-stoner	1.0 QPH	1 No.	0.90	0.90
3.	Mini millet dehusker (centrifugal type)	1.0 QPH	1 No.	2.25	2.25
4.	Hammer mill/pulveriser	0.9–1.0 QPH	1 No.	1.00	1.00
5.	Sifter	1.0 QPH	1 No.	0.50	0.50
6.	Weighing machine	100 kg	1 No.	0.25	0.25
7.	Packaging machine		1 No.	0.35	0.35
Total (X)					*6.00*
Installation, testing, commissioning of machines					0.15
Grand Total = 6.15					

15.6.2.5.3 Miscellaneous Assets

The essential miscellaneous assets including furniture and fixtures, storage facilities, and electrification are to be covered by making a provision of Rs.0.30 lakh.

15.6.2.5.4 Raw Material

The major raw material required for running the unit is millet grains. The total raw materials required for 1 month cost Rs.25 lakh.

15.6.2.5.5 Utilities

Power

The total power requirement estimated based on the machinery would be 10 kW or 13–15 HP. The suitable standby generator provision is also made for uninterrupted operation. The approximate total annual expenditure could be around Rs.1.10 lakh.

Water

Water is one of the essential utility required for processing, cleaning and domestic consumption purpose. The arrangements for regular and continuous supply of water is ensured.

15.6.2.6 Manpower Requirements/Organisational Setup

The unit also requires manpower for running and managing operations and other activities of the unit. Depending upon the capacity of the unit, the required manpower is presented below.

Particulars	Nos.	Monthly salary (Rs.)	Total monthly salary (Rs.)
Manager	1	10,000	10,000
Supervisor cum operator	1	7000	7000
Cleaner	1	3000	3000
Total			*20,000*

15.6.2.7 Tentative Implementation Schedule

Activity	Period (in months)
1. Sanction of loan	2
2. Civil work	1
3. Placement of orders for machinery	2
4. Erection, installation and trials	1

15.6.2.8 Insurance

The unit is covered under adequate insurance, covering all fixed assets and stocks.

15.6.2.9 Cost of the Project and Means of Financing (Rs. in Lacs)

Item	Amount
Land	2.00
Building/civil works	5.00
Plant and machinery	6.15
Miscellaneous assets	0.50
Total term loan	*13.65*
Raw materials	25.00
Labour	2.40
Utilities	1.45
Total working capital loan	*28.85*
Means of finance as term loan	
Promoters' contribution	4.15
Loan from bank/FI	9.50
Subsidy from GOK @ 50%	

15.6.2.10 Profitability Analysis

15.6.2.10.1 Production and Sales

The monthly production and the sales of unit are tabulated below considering the foxtail millet as reference material.

Items	Quantity in Qtl	Whole sale rate per Qtl	Total profit Rs.
Raw materials			
Millets (foxtail millet)	1000	2500	2,500,000.00
Processed products			
Millet semolina (55%)	550.0	7500	4,125,000.00
Millet flour (10%)	100.0	8500	850,000.00
Husk	400.0	1000	400,000.00
			5,375,000.00

The processing capacity is taken at 1000 qtls per month considering single working shift. The sales revenue is totalling Rs. 53.75 lakh per month.

15.6.2.10.2 Raw Materials Required at 100%

The raw materials required for production will be procured at 100% of the capacity as per the annual production schedule and it shall be 1000 qtls.

15.6.2.10.3 Utilities

The expenditure towards utilities at 100% activity level is estimated to be Rs. 50,000/- per annum.

15.6.2.10.4 Interest

The interest charged by banks towards the repayment of term loan of Rs. 9.50 lacs is calculated at 14% with repayment schedule of 5 years which includes the moratorium period of 6 months.

15.6.2.10.5 Depreciation

The depreciation of the all the fixed assets will be calculated on WDV basis considering 10% on building, machinery and miscellaneous assets.

15.6.2.11 Projected Profitability (Monthly) (Rs. in lacs) monthly

No.	Particulars	Cost in Rs.
A	Sales realisation	53.75
B	Cost of production	
Raw materials		25.00
Utilities		0.50
Salaries		2.40
Stores and spares		0.50
Repairs and maintenance		0.50
Administrative expenses		0.50
Total		*29.40*
C	Profit before interest and depreciation	24.35
Interest on term loan		1.33
Depreciation		0.80
Profit before tax		*22.22*

(continued)

No.	Particulars	Cost in Rs.
	Income-tax @ 20%	4.45
	Profit after tax	17.77
	Repayment of term loan (5 years)	1.90
	Net profit	*15.87*
	Cash accruals	16.67

15.6.2.12 Break-Even Analysis (Rs. in Lakhs)

No	Particulars	Amount	
A	Sales		53.75
B	Variables		
	Raw materials	25.00	
	Utilities	0.50	
	Salaries	2.40	
	Stores and spares	0.50	
	Repairs and maintenance	0.50	
	Administrative expenses	0.50	29.40
C	Contribution (A–B)		24.35
D	Fixed cost		4.00
	Break-even point (D/C)		*16.43%*
	B:C ratio		*1.83*

15.6.2.13 [A] Leverages

Financial Leverage

= EBIT/EBT

= 23.55 ÷ 22.22 = 1.06

Operating Leverage

= Contribution/EBT

= 24.35 ÷ 22.22

= 1.09

Degree of Total Leverage

= FL/OL

= 1.06 ÷ 1.09

= 0.97

15.6.2.13.1 [B] Debt Service Coverage Ratio (DSCR) (Rs. in Lakhs)

Particulars	First year (80%)	Second year (90%)	Third year (100%)	Fourth year (100%)	Fifth year (100%)
Cash accruals	13.33	15.00	16.67	16.67	16.67
Interest on term loan	1.33	1.06	0.80	0.53	0.27
Total [A]	*14.66*	*16.06*	*17.47*	*17.20*	*16.94*

(continued)

Particulars	First year (80%)	Second year (90%)	Third year (100%)	Fourth year (100%)	Fifth year (100%)
Interest on term loan	1.33	1.06	0.80	0.53	0.27
Repayment of term loan for 5 years	1.90	1.90	1.90	1.90	1.90
Total [B]	*3.23*	*2.96*	*2.70*	*2.43*	*2.17*
DSCR [A] ÷ [B]	*4.54*	*5.42*	*6.47*	*7.08*	*7.80*
Average DSCR	*6.26*				

First and second year only 80 and 90% of plant capacity is utilised

Conclusion: Millets are one of the nutritionally rich cereal grains being utilised since prehistoric times. Processing is an important unit operation for removal of hard undigestible outer husk. Various improved equipment and machineries have been developed by different institutes for processing and value addition of the millets. The properly designed business models show the profitability in the processing and value addition of millets.

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