PM Formalisation of

Micro Food Processing Enterprises (PM-FME)

MODEL DETAILED PROJECT REPORT

PRODUCTION OF MALT FOOD (FINGER MILLET)

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CHAPTER 1. The Project at a Glance

1.	Name of the proposed project	:	**Finger millet Malt food Processing Unit**
2.	Name of the entrepreneur/ FPO/ SHG/ Cooperative	:	
3.	Nature of proposed project	:	Proprietorship/ Company/ Partnership
4.	Registered office	:	
5.	Project site/location	:	
6.	Names of Partners (if partnership)	:	
7.	No. of shareholders (if company/FPC)	:	
8.	Technical advisor	:	
9.	Marketing advisor/partners	:	
10.	Proposed project capacity	:	**100 MT/ annum** (70, 80 & 90% capacity utilization in the 2nd, 3rd and 4th year onwards respectively)
11.	Raw materials	:	**Finger millet**
12.	Major product outputs	:	**Malt flour from finger millet**
13.	Total Project Cost	:	Rs. 30.50 Lakhs
	• Land development, building & civil construction (only for expansion of existing built-up area)	:	Rs. 2.00 Lakhs
	• Machinery and equipments	:	Rs. 18.00 Lakhs
	• Utilities (Power & water facilities)	:	Rs. 2.00 Lakhs
	• Miscellaneous fixed assets	:	Rs. 2.00 Lakhs
	• Pre-operative expenses	:	Rs. 0.25 Lakhs
	• Contingencies	:	Rs. 2.00 Lakhs
	• Working capital margin	:	Rs. 4.25 Lakhs
14.	Working capital requirement		
	• 2nd year	:	Rs. 12.76 Lakhs
	• 3rd year	:	Rs. 15.09 Lakhs
	• 4th year	:	Rs. 16.94 Lakhs
15.	Means of Finance		
	• Subsidy grant by MoFPI (max 10 lakhs)	:	Rs. 10.00 Lakhs
	• Promoter's contribution (min 20%)	:	Rs. 6.50 Lakhs
	• Term loan (45%)	:	Rs. 14.00 Lakhs
16.	Debt-equity ratio	:	2.15:1
17.	Profit after Depreciation, Interest & Tax		
	• 2nd year	:	Rs.6.76 Lakhs
	• 3rd year	:	Rs. 15.95 Lakhs
	• 4th year	:	Rs. 20.15 Lakhs
18.	Average DSCR	:	7.80
19.	Benefit-Cost Ratio	:	1.29
20.	Term loan repayment	:	7 Years with 1 year grace period
21.	Payback period for investment	:	4 years

CHAPTER 2

General Overview of Production, Post-Harvest Management and Value Addition of Finger millet in India

2.1 Introduction

Millets are one of the oldest food grains known to mankind and possibly the first cereal grain used for domestic purposes. Millets are the most important cereals of the semi-arid zones of the world. For centuries, millets have been the staple diet for nearly 1/3rd of the world's population. Millet crop primarily constitute a diverse group of small grains. Millets are classified into major millets and minor millets or small millets.

Minor or small millets are categorized under Coarse Cereals in India. India is the leading producer of small millets namely, finger millet (ragi), kodo millet (kodo), foxtail millet (kangni), barnyard millet (sawan), proso millet (cheema) and little millet (kutki). Millets are strategic in terms of their food, nutritional and livelihood security and their role in local agro-ecosystems. Millets are important crops for dry land farmers; they are highly nutritious and climate compliant crops. But due to drudgery in preparation, overall millet consumption in India has declined over the years. In order to revive the demand of millets in India, there is need to bring all the stakeholders in production to consumption system value chain. Food uses of millets have however, been confined only to traditional consumers; limited especially to areas of their cultivation, and still have remained underutilized. Processing them using traditional as well as contemporary methods for preparation of value added and convenience products would certainly diversify their food uses. Utilizing them for preparation of ready-to-use or ready-to cook and eat products would help in increasing the consumption of millets among non-millet consumers.

In India, small millets are cultivated in around 3.0 million hectares, producing around 3.0 million tonnes of food grain. The bulk of small millet production in India is of finger millet (80%) and the remaining from kodo millet, little millet, foxtail millet, barnyard millet and proso millet in that order. Small millets in India are grown in Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu, Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh and Uttarkhand.

Though millets are components of traditional farming system, they are seen to fit well into evolved cropping systems. Mixed cropping (Navadhanya) and intercropping of small millets with legume crops are common even today in several parts of India.

Table 1: Major state-wise area, production and yield of small millets (Average of 2009-14)

State/ UT	Area ('000 ha)	Production ('000 Tonnes)	Yield (Kg/ ha)
Andhra Pradesh	30.00	26.00	866.67
Arunachal Pradesh	22.09	21.54	975.03
Gujarat	49.00	48.60	991.84
Jharkhand	24.95	11.95	478.96
Karnataka	24.21	11.85	489.61
Madhya Pradesh	246.22	88.66	360.09
Maharashtra	63.00	28.72	455.87
Tamil Nadu	30.84	32.58	1056.62
Uttarakhand	71.83	84.38	1174.77
All India	773.13	48.20	553.85

Source: Directorate of Economics and Statistics, Ministry of Agriculture, GoI

Among the minor millets, finger millet has a unique position because of its superior nutritional qualities. Finger millets are most recognized nutritionally for being a good source of minerals like magnesium, manganese and phosphorus. Finger millets are also rich in phytochemicals, including phytic acid, which is believed to lower cholesterol, and phytate, which is associated with reduced cancer risk. Finger millet has higher fibre content, also its protein quality and mineral composition contributes significantly to nutritional security of a large section of population residing in the millet growing areas, who are considered to be the most disadvantaged groups.

Therefore, processing of Finger millet in to various value added products can ensure nutritional and food security, improved profitability and also offers huge scope for entrepreneurship development at micro, small or medium scale levels using effective government schemes such as PM-Formalization of Micro Food Processing Enterprises Scheme of MoFPI, Government of India.

2.2 Origin and Distribution of Finger millet

Finger millet is the fourth millet in terms of worldwide production after sorghum, pearl millet and foxtail millet. Finger millet also known as African finger millet, red millet and ragi, is the oldest food and first cereal grain used for domestic purpose. Finger millet is originally native to the Ethiopian highlands and was introduced into India approximately 4000 years ago. It is an important staple in many parts of eastern and southern Africa, as well as in South Asia.

Finger millet cultivation is more widespread in terms of its geographical adaptation compared to other millets. It has the ability to withstand varied conditions of heat, drought, humidity and tropical weather.

Finger millet can be stored for years without insect damage, which makes it a particularly valuable crop for famine-prone areas. The crop provides food grain as well as straw which is a valued animal feed, especially in the rain-fed areas.

Among the major food grains, finger millet is one of the most nutritious crops for protein, minerals (calcium and iron) and amino acids (methionine, an amino acid lacking in the diets of hundreds of millions of the poor living on starchy foods such as cassava, plantain, polished rice, and maize meal); and provides 8-10 times more calcium than wheat or rice. Finger millet carbohydrates are reported to have the unique property of slower digestibility and can be regarded as food for long sustenance. The excellent malting qualities have added to the uniqueness of the grain in expanding its utility range in food processing and value addition.

Finally, the crop is productive in a wide range of environments and growing conditions, from southern Karnataka state in India to the foothills of the Himalayas in Nepal, and throughout the middle-elevation areas of Eastern and Southern Africa.

Bihar consumed 12.02 kg / household/ month of finger millet followed by Karnataka (even though area andproduction of finger millet highest in Karnataka). Maharashtra and Gujarat also consumed significant amount of finger millet.

Table 2: Consumption pattern of finger millet (2011-12)

	kg / household/ month		
State	**Average**	**Rural**	**Urban**
Andhra Pradesh	2.40	2.68	1.64
Bihar	12.02	12.02	-
Chhattisgarh	3.18	3.18	-
Gujarat	8.39	8.39	-
HP	0.50	0.50	0.50
Karnataka	10.03	11.98	7.00
Kerala	0.96	1.02	0.81
Maharashtra	9.48	10.56	3.32
Orissa	3.51	3.62	2.29
Rajasthan	0.56	0.56	-
Tamil Nadu	2.35	2.71	1.63
Uttarakhand	4.61	4.65	2.17
West Bengal	0.80	-	0.80

Source: NSSO, MOSPI, GoI

2.3 Production of Finger millet in India

The global annual planting area of finger millet is estimated at around 4-4.5 million hectares, with a total production of 5 million tons of grains, of which India alone produces about 2.2 million tons and Africa about 2 million tons.

Karnataka has the highest area and production of finger millet followed by Tamil Nadu. Karnataka itself occupied around 66 per cent of total production and other statesare very minimal production in India. But Tamil Nadu has recorded highest productivity (2464 kg/ ha) of finger millet followed by Karnataka (1782 Kg / ha) which is above the national average yield (1580 Kg / ha).

Table 3: State-wise Finger millet Production in India (Average of 2009-14)

State/ UT	Area ('000 ha)	Production ('000 Tonnes)	Yield (Kg/ ha)
Karnataka	709.80	1265.46	1782.84
Tamil Nadu	85.96	211.85	2464.40
Uttarakhand	124.37	166.98	1342.56
Andhra Pradesh	42.80	46.80	1093.46
Odisha	58.80	41.07	698.35
Gujarat	15.60	13.20	846.15
West Bengal	10.40	11.80	1134.69
All India	1210.94	1913.70	1580.34

Source: Directorate of Economics and Statistics, Ministry of Agriculture, GoI

2.4 Nutritional Value of Finger millet

Finger millet has excellent nutritional value. Finger millet is rich in protein, iron, calcium, phosphorus, fiber and vitamin content. It contains 6–8% protein, 1–1.7% fat, 65–75% starch, 2–2.25% minerals and 18–20% dietary fiber. Its proximate composition is superior to wheat, maize, sorghum, and rice with regard to dietary fiber, calcium, and micronutrients. The seed coat of this millet is a rich source of phenolic compounds, minerals, and dietary fiber.

a) Protein

Protein content of finger millet normally ranges between 6 and 8%, although low protein content of 5% and high protein content of 12% in different varieties. Prolamins content is about 35–50%, albumins and globulins constitute 8–15% of total proteins. Amino acid composition of this millet is good as it contains lysine (2.5%), tryptophan (13%), methionine (2.9%), threonine (3.1%), leucine, and isoleucine (4%).

b) Lipids

Finger millet is having a lipid content of 1.5%. Predominant fatty acids present in this millet are oleic (49%), linoleic (25%) and palmitic acids (25%). About 72% of total lipids are present as neutral lipids, 13% as glycolipids, and 6% as phospholipids.

Lipids of finger millet are mostly triglycerides and these are known to reduce the incidence of duodenal ulcer.

c) Carbohydrates

Finger millet is a rich source of carbohydrates and comprises free sugars (1.04%), starch (65.5%), and non-starchy polysaccharides or dietary fiber (11.5%), 59.5 - 61.2% starch, 6.2–7.2% pentosans, 1.4–1.8% cellulose, and 0.04–0.6% lignins. The carbohydrate content of finger millet is 72% while that of wheat is 71.2%. Finger millet starch comprises of amylose and amylopectin in the range of 25–75%.

d) Dietary fiber

Total dietary fiber content of finger millet grain is 22.0% and is relatively higher than most of other cereal grains, e.g. 12.65%in wheat, 4.6%in rice, 13.4% in maize, and 12.8% in sorghum, respectively. Dietary fibers are categorized as water soluble or insoluble. Finger millet grain contained 15.7% insoluble dietary fiber and 1.4% soluble dietary fiber, where 22.0% total dietary fiber, 19.7% insoluble dietary fiber, and 2.5% soluble dietary fiber in finger millet.

e) Vitamins

Finger millet contains water-soluble and lipo-soluble vitamins viz., thiamin, riboflavin, niacin, and vitamin C plus the (tocopherols) vitamin E. Water-soluble B-vitamins of finger millet are concentrated in the aleurone layer and germ, while lipo-soluble vitamins are mainly located in the germ.

2.5 Health benefits of finger millet

- Finger millet, being a mineral rich whole grain with very low natural fat content is usually suggested for weight loss. Tryptophan, an amino acid present in finger millet, helps to check weight gain by lowering the appetite. Since the digestion rate is slow, it

keeps one from ingesting more calories. Also, the high fiber content present in the bran gives a sensation of fullness thereby preventing one from eating more and gaining body weight.

- Finger millet aids healthy pregnancy, by aiding in milk production, preventing gestational diabetes, relieving anxiety and stress, and preventing insomnia.
- Finger millet is important for healthy bones and teeth. Loaded with calcium which is essential for healthy bones and dentition in growing children, it helps the elderly by countering the weakness in bones due to osteoporosis.
- Finger millet controls diabetes by helping manage blood sugar levels. Fiber present in the bran of finger millet reduces the rate of digestion and the absorption of carbohydrates, and causes slower gastric emptying. This helps to prevent a spike in blood sugar levels.
- Finger millet's dietary fiber has cholesterol-lowering properties. The amino acids lecithin and methionine remove excess fat from the liver and stabilize cholesterol levels in the blood. This reduces the risk of stroke and hypertension by preventing plaque formation or clogging of arteries.
- The dietary fiber aids greatly in improving digestion and preventing constipation.
- Finger millet is an important source of natural iron and vitamin B1 (thiamine). Finger millet has a positive effect on hemoglobin levels as well as in preventing iron deficiency anemia in adolescents.
- Finger millet flour is free of gluten and hence a good replacement diet for people with intolerance to gluten.
- Finger millet is rich in nutrients and minerals which are essential for maintaining skin vitality, preventing wrinkle formation and sagging, and minimizing acne and scarring. Finger millet's benefits for skin are due to its antioxidant and anti-inflammatory properties which prevent hyper-pigmentation and skin ageing. Methionine and lysine amino acids help in collagen formation which keeps the skin supple and firm. Having a finger millet rich diet can prove beneficial in healing diabetic wounds faster.

- Finger millet prevents malnutrition with its high protein content especially for vegetarians who lack methionine in their staple diet. The essential amino acids present in finger millet are valine, methionine, isoleucine, threonine and tryptophan.

2.6 Varieties of Finger millet in Different Regions of India

Table 4: Finger millet Varieties in India

State/ UT	Varieties popular in the State
Tamil Nadu	GPU 28, CO 13, TNAU 946 (CO 14), CO 9, CO 12, CO 15, Indaf 5, Indaf 7, Indaf 9, PR-202
Andhra Pradesh	Padmawathi, VR 847, PR 202, VR 708, VR 762, VR 900, VR 936
Jharkhand	A 404, BM 2
Orissa	OEB 10, OUAT 2, BM 9-1, OEB 526, OEB-532
Uttarakhand	PRM-2, VL 315, VL 324, VL-352, VL 149, VL 146, VL-348, VL-376, PES 400
Chhattisgarh	Chhattisgarh-2, BR-7, GPU 28, PR 202, VR 708 and VL 149, VL 315, VL 324, VL 352, VL 376
Maharashtra	Dapoli 1, PhuleNachani, KOPN 235, KoPLM 83
Gujarat	GN 4, GN 5, GNN 6
Bihar	RAU 8

2.7 Cultivation, Harvesting, Post Harvest Management and Storage of Finger millet

2.7.1 Cultivation

Finger millet is an agronomically sustainable crop; it can grow on marginal lands, high altitudes and can easily withstand drought and saline conditions, requires little irrigation and other inputs. Finger millet is grown in all the cropping seasons in different parts of the country. More than 90 per cent of the area is under rain-fed conditions, grown during Kharif season, while as Rabi crops in few places. Finger millet is a short duration crop, ready to harvest as little in 65 days.

Generally finger millet is grown in tropical as well as sub-tropical up to an altitude of 2100m. It is a heat loving plant and the minimum temperature required for its germination is 8- 10°C. A mean temperature range of 26-29°C during the growth is optimum for proper development and good crop yield. It is grown where rainfall ranges from 500-900mm.

Finger millet has wide adaptability to different soil from very poor to very fertile. It can be grown on variety of soils ranging from rich loam to poor shallow upland soil with good organic matter. The best soils are alluvial, loamy and sandy soil with good drainage; black soil with good drainage can also be considered as this crop is sustainable to water logging to certain extent. Finger millet grows best in soil having pH 4.5-8. Furthermore, it can tolerate soil salinity to a certain level. Cultivation is done by broadcasting as well as transplanting of seedlings in irrigated conditions.

2.7.2 Harvesting

The harvesting of finger millet crop takes place mainly during October through November. The average yield of rain-fed crop ranges from 1.0 to 1.5 tonnes grain/ha, whereas irrigated crop yields up to 5.0 tonnes/ha. It is possible to harvest 2.5-3.0 tonnes/ ha of grain and 6-7 tonnes/ ha of fodder.

There are two methods of harvesting.

- Harvesting of only panicles

After crop maturity, the panicles (ear heads) of finger millet are collected by cutting with the help of a sickle, leaving the plant stalks as such in the field. The operation is being carried out at one time or at intervals depending on the uniformity of maturity. The harvested panicles are gathered in a container such as bamboo basket before heaping them in a convenient place. The panicles staked in heaps are left for sun drying for a period ranging from one week to more than a month. The heat generated within the heap will help in easy separation of grains during threshing.

- Harvesting of stalks along with panicles

This is the most commonly used method. In this method, harvested stalks are spread in rows in the field for sun drying for a couple of days depending on the weather conditions.

2.7.3 Post harvest operations

After sun drying, the harvested stalks are bundled and staked near the threshing yard. The harvested ears are kept in heaps covered with straw for 2-3 days. During rainy days, a stacking practice involving arranging the bundles in the field in closed lines in slanting position and covering with dried straw to prevent dampening is practiced. After few days, the cover is removed and allowed to dry for one to two days before staking at the yard.

a. Curing and Drying

The harvested ears of finger millet is piled up as a heap in a cloth or gunny bag, tied up and allowed to steam inside for 3-4 days. This process matures the batch and all the ears become a beautiful uniform brown. Care is to be taken to ensure that the ears are dry when harvesting, no water ingress in this process and the harvest must be done only in dry weather conditions. After curing, the finger millet ears are thoroughly dried depending on the time of the year, this could last 1-4 days. This process facilitates easy detachment of grains from spikelets.

b. Threshing

Separation of grains from panicles (ear heads) is done by spreading panicles or stalk in the morning and threshing starts soon after. Threshing of panicles or stalks is usually done using bullocks (4–5 in number) for trampling or by a stone roller drawn by a pair of bullocks. For large-scale operation, in some places, tractors are used by farmers for grain separation. Farmers also use paddy threshers. Bamboo sticks are also used for threshing in small-scale operations.

c. Winnowing

Winnowing of Finger millet involves the separation of undesirable foreign matter or materials such as other crop and weed seeds, straw, chaff, panicle stems, as well as empty, immature and damaged grains, other than grain.

Winnowing is done manually or by using grain winnower. It consists of a feed hopper to hold the grain for cleaning. It discharges the grain over a scalper and removes bigger size impurities. A blower provided at the bottom passes air against the grain falling through the scalper, separating the straw, chaff and other impurities. The dust, chaff and straw are

collected separately and cleaned seeds come out through another outlet near the bottom of the unit.

d. Grading

It helps to ensure that producers get paid maximum value for their grain according to the quality of the grain, also providing consistent quality to customers. Seeds are size graded by passing the grains to British Standard Sieve -BSS 10 x 10 (aperture width 2.4mm) as scalper and BSS 12 x 12 (aperture width 2.0 mm) as grader; processing loss will be 10 to 15%.

2.7.4 Storage

Before storage, grains of finger millet are sun dried to moisture level of 10%. Various types of structures (Bhakari, Kalanjiam, Semiliguda, turjhulla, Dumbriguda, and Chatka) are used by farmers for storage of this millet. Closed structures are commonly used for storage of seeds. In present days, gunny bags or nylon-woven sacs are used by farmers for grain storage. However, storage period for this millet varies from region to region.

CHAPTER 3

MODEL FINGER MILLET MALT FOOD PROCESSING UNIT UNDER PM-FME SCHEME

3.1 Introduction

The Central Sector scheme for Formalization of Micro Enterprises in Food Processing sector under Ministry of Food Processing Industries, Government of India is an important scheme that offers for formalization and mainstreaming the unorganized home based or micro food processing units. The scheme is useful for expansion of the existing units in terms of capacity and technology through installation of new machineries and additional civil infrastructures. Further, the scheme promotes establishment of new micro units on the principle of ODOP (One District One Product).

Establishment or expansion of Finger Millet Malt Food Processing Unit is an attractive option in potential Finger millet growing states in India as Finger millet offers nutritional as well as food security, while being easily cultivable across India. A model generalized DPR is therefore, prepared for expansion of existing unformalized Finger Millet Malt Food Processing Unit. A detailed account of the model DPR prepared on the basis of certain generalized assumptions is discussed in the sequent sections. An entrepreneur can use this model DPR template and modify according to his/her need in terms of capacity, location, raw materials availability etc.

3.2 Form of the Business Enterprise

The entrepreneur concerned must specify about the form of his/her business organization i.e. whether Sole Proprietorship, Cooperative, FPO/FPC, SHG Federation, Partnership Firm or Company and accordingly attach all the required documents. The documents may be registration certificate, share holding pattern, loan approval certificate etc as specified in the FME scheme guidelines.

3.3 Background of the Promoters/Owners and Required Documents

The detailed bio-data of promoter/promoters inter-alia name, fathers name, age, qualification, business experience, training obtained, contact number, email, office address,

permanent address, share holding pattern, definite sources of meeting the commitment of promoters contribution, details of others business along with certified balance sheet and profit loss account for the last 3- 4 years, tax registration, PAN Number, income tax return etc for 3-4 years and other requirements as specified in the FME guidelines must be provided with the DPR.

3.4 Background of the Proposed Project

The entrepreneur must specify whether it is a new project or expansion of the existing project. If new project is proposed then the reason to go in to the project and if expansion of the existing project, the must specify what kind of expansion is proposed in terms of capacity, product, machines, civil infrastructure etc.

3.5 Location of the Proposed Project and Land

The entrepreneur must provide description of the proposed location, site of the project, distance from the targeted local and distant markets; and the reasons/advantages thereof i.e. in terms of raw materials availability, market accessibility, logistics support, basic infrastructure availability etc. The entrepreneur must mention whether project is proposed in self owned land or rented/allotted land in any industrial park or private location. Accordingly, he/she must provide ownership document, allotment letter/ lease deed.

Land clearance certificate must be from village authority/municipality or any other concerned authority. The ideal locations for establishment of exclusive Finger millet Malt Food Processing Units are in the production clusters of the major Finger millet growing states such as Karnataka, Maharashtra, Tamil Nadu, Jharkhand, Andhra Pradesh, Bihar, Rajasthan, Haryana and Madhya Pradesh where adequate quantities of surplus raw materials can be available for processing.

3.6 Installed Capacity

The maximum installed capacity of the Finger millet Processing Unit in the present model project is proposed as 100 tonnes/ annum. The unit is assumed to operate 300 days/annum @ 8-10 hrs/day. The 1st year is assumed to be construction/ expansion period of the project; and in the 2nd year 70 percent capacity, 3rd year 80 percent capacity and 4th year onwards 90 percent capacity utilization is assumed in this model project.

3.7 Raw Material Requirements

A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material inventory. The processor must have linkage with producer organizations preferably FPCs through legal contract to get adequate quantity and quality of raw materials which otherwise get spoiled. In the current model Finger millet processing project, the unit requires 310 kg/day, 355 kg/day and 400 kg/day raw Finger millet at 70, 80 and 90 percent capacity utilization, respectively.

3.8 Product Profile of the Unit

In the present model Finger millet processing unit, the targeted product output is taken as Finger millet malt flour. This product has huge need in view of its nutritional benefits and significance in India. The Finger Millet Malt Flour is significantly used as Infant weaning/ complementary food and Amylase Rich Food.

Weaning/ complementary foods are liquid and semisolid foods introduced to children between the ages of 6 months to 3 years, which are later replaced by solid foods. According to WHO, good quality weaning food must have high nutrient density, low bulk density, low viscosity and appropriate texture along with high energy, protein and micronutrient contents and have a consistency that allows easy consumption.

Most of the weaning foods are incorporated with wheat, which causes food allergies, celiac diseases and other allergies like asthma, stomach cramp, hay fever etc. Current guidelines recommend that cereals given to infants less than six months old should preferably be gluten-free. So, there is need to develop weaning foods by replacing the wheat with some other easily digestible and fiber containing food ingredients.

Millets, especially Finger Millet are nutritionally comparable to major cereals and serve as good source of protein, micronutrients and phytochemicals.

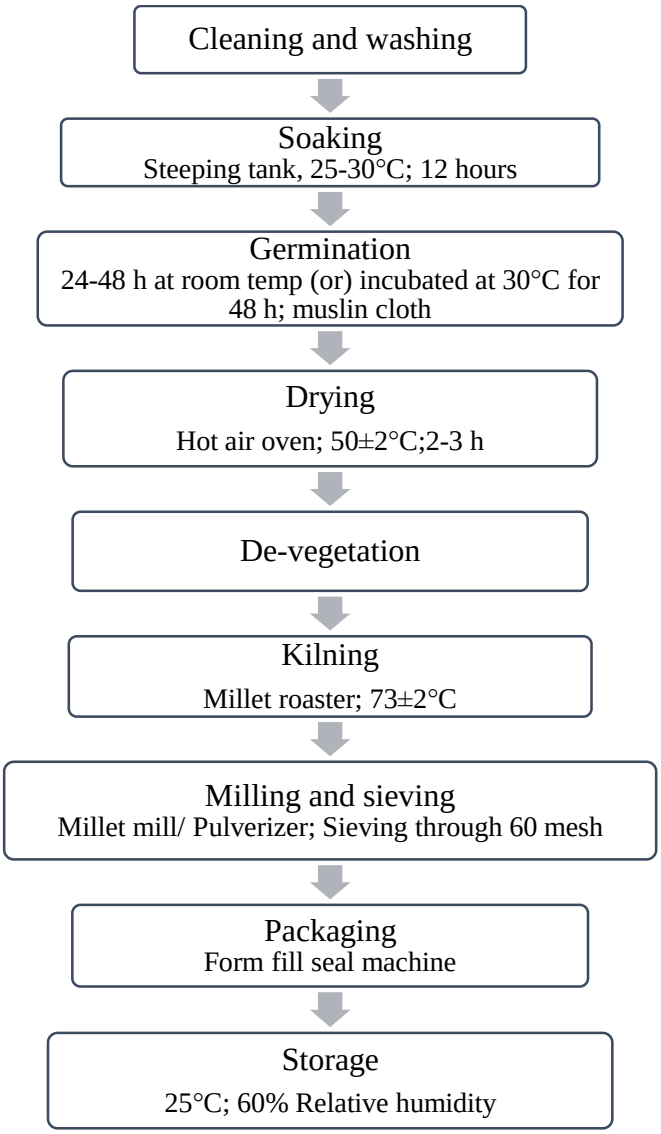
Growth in the first year influences both the well-being of the child and the long-term health of the adult. A nutritionally adequate weaning diet is essential for achieving optimal growth in the first year. But during complementary feeding phase, porridges or gruels are fed to infants. These tend to have a high viscosity and low energy content, which may not meet the daily energy requirements of the child; hence the child will be malnourished. To combat this challenge, Amylase Rich Food is of great significance.

Amylase Rich Food (ARF) is the scientific name given to flours of malted grains and must be utilized in infant foods. The concept of ARF directly addresses the twin problems of dietary bulk and poor energy density of most of the weaning gruels. Tiny or catalytic amounts of ARF can instantly liquefy or reduce the dietary bulk of viscous mixed cereal based gruel, and hence a child can eat more at a time. The flours are rich in α-amylase which can break long carbohydrate chains into shorter dextrins, hence better energy density.

This property of ARF makes it possible to offer the weaning child low viscous yet high energy dense foods prepared from the practical household ingredients, even in economically weaker households. The most unique advantage of ARF is that a mother can add in much more ARF into gruel and consequently make it even more high energy dense, while further lowering viscosity and dietary bulk.

3.9 Manufacturing Process of Finger millet malt flour

Flow chart for manufacturing of malt from finger millet (Dry method)



3.10 Technology Accessibility

IIFPT and its liaison offices at Guwahati and Bhatinda have all the technical knowhow on Finger millet processing. These technologies are available through training, incubation and consultancy. The entrepreneur can first avail training or consultancy and then undergo business incubation before venturing into the business. Other than IIFPT, NIFTEM, CFTRI and other institutes also have the technical knowledge and training facilities.

3.11 Market Demand and Supply

The Finger millet malt flour is an integral part of traditional infant weaning food in India. Weaning food plays a vital role in the all-round growth, development and mental health of children. Commercially available weaning flours have high nutritive value and are easy for instant preparation of gruels. But they are expensive and hence beyond the economic means of the majority of families. This results in use of traditional gruels as complementary foods for infants and hence malnourishment happens. Therefore, composite weaning mixes containing finger millet malt flour in combination with legumes will prove to be of immense benefit especially for young children in underprivileged families, because of their low cost and ease of preparation. The Indian Association for Paediatrics (IAP) also recommends the complementary feeding of finger millet based porridge to children of 4-6 months age, if required.

Alternatively, to improve the nutritional quality and energy density of traditional gruels, ARF can be used. Around 100gm of ARF can suffice one child's gruel feeds for one month. The addition of ARF to the weaning food is done during the preparation of the slurry; alternatively the malt flour can be mixed with dry food (cereal-pulse based) and packed. Addition of ARF to existing standard supplementary food is a simple and effective means to increase the intake of food by changing its consistency, thus making it easier for malnourished children to ingest. Addition of ARF into staple complementary food is also recommended by the IAP.

With the increase in working mothers' population, the time required for making the traditional malt flour and weaning foods is hard to find. The process is very unstandardized and also very laborious at households. Finger millet malt flour if produced with high quality and available at convenience for the mothers can shatter another roadblock to eradicate malnourishment. These entire factors cascade into the fact that the demand for Finger millet malt flour will be prevalent across the country throughout the year.

3.12 Marketing Strategy

The Government's Supplementary Nutrition Programs provide Complementary food containing amylase activity (such as Finger Millet Malt flour) round the year to beneficiaries. Finger millet malt flour is added at the rate of 5% (weight basis) to cereal-pulse combinations and the complementary food mix is provided to different beneficiaries apart from infants, such as pregnant and nursing mothers, adolescent girls, etc. Various State governments have started adding millets to the mid-day meal and experiments are being carried out by NGOs involved in mid-day meal program. Approaching such agencies ensures a vast market, having demand throughout the year.

The increasing urbanization offers huge market for readily available Finger millet malt flour in the form of weaning food by itself as well as a constituent of complementary food for infants and other age groups too. Urban organized platforms such as departmental stores, malls, super markets can be attractive platforms to sell well packaged and branded Finger millet malt flour.

3.13 Detailed Project Assumptions

This model DPR for Finger millet Processing Unit is basically prepared as a template based on certain assumptions that may vary with capacity, location, raw materials availability etc. An entrepreneur can use this model DPR format and modify as per requirement and suitability. The assumptions made in preparation of this particular DPR are given in Table 5. This DPR assumes expansion of existing unit by adding new Finger millet malt flour product lines. Therefore, land and civil infrastructures are assumed as already available with the entrepreneur.

Table 5: Detailed Project Assumptions		
Parameter	Value	
Assumed Capacity of the Finger millet processing unit :	100 MT/ annum Finger millet malt flour	
Utilization of capacity :	Year 1	Implementation
	Year 2	70%
	Year 3	80%
	Year 4 onwards	90%
Working days per year:	300 days	
Working hours per day:	8-10 hours	
Interest on term loan Interest on working capital loan	12.00% 10.00%	
Repayment period	Seven years with one year grace period is considered.	
Average price of raw material:	Rs. 30/ kg	
Average sale price of product	Rs. 120/ kg	
Recovery rate of product	75% of finger millet malt flour	

3.14 Fixed Capital Investment

3.14. A. Land & Building

This DPR is for FME scheme to upgrade/ formalize existing micro enterprises which already has land & built-up area. However, they can invest to expand the built-up area (Table 5) as required.

Table 6: Land and Civil Infrastructures	
i. Land 1000 Sq ft	Assumed land already developed and has 6000 sq ft built in area. So additional 1000 sq ft can be built in @ Rs. 200/sq ft Rs. 2.00 Lakhs
ii. Built-up processing area 6000 sq ft	
iii. Storage area 1000 sq ft	
Total	Rs. 2.00 Lakhs

3.14. B. Machinery & Equipment: Rs. 18.00 Lakhs

Table 7: Machineries & Equipments						
S.No	**Description**	**Power required**	**Area required (Sq.ft)**	**Unit Price, (Rs. in lakhs)**	**Qty**	**Amount (Rs. in lakhs)**
1.	Cleaner Capacity: 150 kg/ h	1 HP	50	1.50	1	1.50
2.	Washer Capacity: 300 kg/ hr	1 HP	50	1.50	1	1.50
3.	Incubator capacity: 500 litres	2 kW	100	1.40	2	2.80
4.	Tray dryer Capacity: 100 kg	8 HP	50	2.00	1	2.00
5.	Fruit pulper for De-vegetation	1.5 HP	50	0.70	1	0.70
6.	Millet Roaster Capacity: 150-200 kg/hr	1 HP	50	2.00	1	2.00
7.	Pulveriser cum sieving machine Capacity: 100 kg/ hr	5 HP	50	2.50	1	2.50
8.	Form Fill Seal machine Capacity: 100 kg/ hr	1 HP	50	3.00	1	3.00
9.	Compressor Working pressure: 11 bar	10 HP	20	2.00	1	2.00
	Total					18.00

3.14. C. Utilities and Fittings

Table 8: Utilities and Fittings	
Power	Rs. 1.20 Lakhs
Water	Rs. 0.8 Lakhs
Total	Rs. 2.00 lakhs

3.14. D. Other Fixed Assets

Table 9: Other Fixed Assets	
Soaking Tanks (2 Nos)	Rs. 1.00 Lakh
Furniture and fixtures	Rs. 1.00 Lakh
Utensils, trays, etc	
Electrical fittings	
Total	Rs. 2.00 Lakh

3.14. E. Pre-operative Expenses

Table 10: Pre-operative Expenses	
Legal expenses, start-up expenses, establishment cost, consultancy fee, trial runs, & others	Rs. 25,000.00
Total Pre-operative Expenses	Rs. 25,000.00

3.14. F. Total Fixed Capital Investment

Total Fixed Capital Investment = (Land & Building + Machinery & Equipment+ Utilities and Fittings + Other Fixed Assets + Pre-operative Expenses)

= Rs. (2+18+2+2+0.25) Lakhs = **Rs. 24.25 Lakhs**

3.15. Working Capital Requirement

Table 11: Working Capital Requirement (Rs. in Lakh)				
Particulars	Period	year 2 (70% - 70 MT)	year 3 (80% - 80 MT)	year 4 (90% - 90 MT)
Raw material stock	90 days	7.02	8.02	9.02
Work in progress	15 days	2.07	2.42	2.69
Packing material	30 days	0.58	0.67	0.75
Finished goods' stock	15 days	1.99	2.40	2.68
Receivables	30 days	5.36	6.61	7.45
Total current assets		17.02	20.12	22.59
Trade creditors		0	0	0
Working capital gap		17.02	20.12	22.59
Margin money (25%)		4.26	5.03	5.65
Bank finance		12.76	15.09	16.94

3.16. Total Project Cost and Means of Finance

Table 12: Total Project Cost and Means of Finance (Rs. in Lakhs)	
Particulars	Amount
i. Land and building	2.00
ii. Plant and machinery	18.00
iii. Utilities & Fittings	2.00
iv. Other Fixed assets	2.00
v. Pre-operative expenses	0.25
vi. Contingencies	2.00
vii. Working capital margin	4.25
Total project cost (i to vii)	**30.5**
Means of finance	
i. Subsidy	10.00
ii. Promoter's contribution	6.50
iii. Term loan	14.00

3.17. Manpower Requirement

Table 13: Manpower Requirement			
Particulars	No. of persons	Monthly Wage (Rs.)	Total Monthly Salary (Rs.)
i. Manager (can be the owner)	1	20000	20000
ii. Skilled worker	2	10000	20000
iii. Semi skilled	3	7500	22500
iv. Helper	3	5000	15000
v. Salesman	1	7500	7500
Total	10		85000

Note: Only the manager and two skilled workers are permanent staffs (Salary Rs. 40000/ month). Others are causal staffs.

3.18. Expenditure, Revenue and Profitability Analysis

Table 14: Expenditure, Revenue and Profitability Analysis									
	Particulars	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**	**8th year**
A	**Total Installed Capacity**	100 MT/Year Finger millet malt flour							
	Capacity utilization (%)	Under const. (0%)	70 MT (70 %)	80 MT (80 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)
B	**Expenditure (Rs. in Lakh)**								
	Raw finger millet (Av. Price @ Rs. 30/ Kg)	0	28.06	32.06	36.07	36.07	36.07	36.07	36.07
	Packaging materials @ Rs. 10/ Unit	0	7.01	8.02	9.02	9.02	9.02	9.02	9.02
	Utilities (Electricity, Fuel)	0	4.77	5.24	5.70	5.70	5.70	5.70	5.70
	Salaries (1st yr only manager's salary)	2.4	7.91	8.67	9.44	9.44	9.44	9.44	9.44
	Repair & maintenance	0	0.63	0.63	0.63	0.63	0.63	0.63	0.63
	Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Miscellaneous expenses	0.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Total Expenditure	**3.2**	**63.36**	**70.83**	**78.30**	**78.30**	**78.30**	**78.30**	**78.30**
C	**Total Sales Revenue (Rs. in Lakh)**								
	Sale of Finger millet Malt flour @ Rs. 120/Kg	0.00	77.16	95.19	107.22	108.22	108.22	108.22	108.22
D	**PBDIT** (Total expenditure-Total sales revenue) (Rs. in Lakh)	-3.20	13.80	24.36	28.92	29.92	29.92	29.92	29.92
	Depreciation on civil works @ 5% per annum	0.1	0.10	0.10	0.09	0.09	0.08	0.08	0.07

	Depreciation on machinery @ 10% per annum	2.0	1.82	1.64	1.47	1.33	1.19	1.07	0.97
	Depreciation on other fixed assets @ 15% p.a	0.3	0.91	0.77	0.65	0.56	0.47	0.40	0.34
	Interest on term loan @ 12%	1.67	1.67	1.49	1.20	0.92	0.64	0.36	0.09
	Interest on working capital @ 10%	0	1.35	1.60	1.80	1.80	1.80	1.80	1.80
E	**Profit after Depreciation and Interest** (Rs. in Lakh)	-7.27	7.95	18.76	23.71	25.22	25.74	26.21	26.65
F	Tax (assumed 15%) (Rs. in Lakh)	0.00	1.19	2.81	3.56	3.78	3.86	3.93	4.00
G	**Profit after depreciation, Interest & Tax** (Rs. in Lakh)	-7.27	6.76	15.95	20.15	21.44	21.88	22.28	22.65
H	Surplus available for repayment (PBDIT-Interest on Working Capital -Tax) (Rs. in Lakh)	-3.20	12.52	22.85	27.23	28.22	28.22	28.22	28.22
I	Coverage available (Rs. in Lakh)	-3.20	12.52	22.85	27.23	28.22	28.22	28.22	28.22
J	Total Debt Outgo (Rs. in Lakh)	1.67	3.67	3.49	3.20	2.92	2.64	2.36	2.09
K	**Debt Service Coverage Ratio (DSCR)**	-1.92	3.41	6.55	8.51	9.66	10.69	11.96	13.50
	Average DSCR	7.80							
L	**Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)**	-3.78	9.59	18.46	22.36	23.42	23.62	23.83	24.03
M	**Payback Period** (on Rs. 30 Lakhs initial investment)	4 years							

3.19. Repayment Schedule

Table 15: Repayment Schedule (Rs. in Lakh)									
Year	Outstanding loan at start of yr.	Disbursement	Total outstanding Loan	Surplus for repayment	Interest payment	Repayment of principal	Total outgo	o/s Loan at the end of the yr.	Balance left
1.	0	14	14	-3.20	1.67	0	1.67	14	-4.87
2.	14		14	12.52	1.67	2	3.67	12	8.85
3.	12		12	22.85	1.49	2	3.49	10	19.36
4.	10		10	27.23	1.2	2	3.2	8	24.03
5.	8		8	28.22	0.92	2	2.92	6	25.30
6.	6		6	28.22	0.64	2	2.64	4	25.58
7.	4		4	28.22	0.36	2	2.36	2	25.86
8.	2		2	28.22	0.09	2	2.09	0	26.13

3.20. Assets' Depreciation

Table 16: Assets' Depreciation (Written Down Value Method) (Rs. in Lakh)								
Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
Civil works	2.02	1.92	1.82	1.73	1.64	1.56	1.48	1.41
Depreciation	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07
Depreciated value	1.92	1.82	1.73	1.64	1.56	1.48	1.41	1.34
Plant & Machinery	18.20	16.37	14.73	13.26	11.93	10.74	9.67	8.70
Depreciation	1.82	1.64	1.47	1.33	1.19	1.07	0.97	0.87
Depreciated value	16.37	14.73	13.26	11.93	10.74	9.67	8.70	7.83

Other Fixed Assets	6.04	5.13	4.36	3.71	3.15	2.68	2.28	1.94
Depreciation	0.91	0.77	0.65	0.56	0.47	0.40	0.34	0.29
Depreciated value	5.13	4.36	3.71	3.15	2.68	2.28	1.94	1.65
All Assets	26.26	23.42	20.91	18.70	16.72	14.98	13.43	12.05
Depreciation	2.83	2.51	2.21	1.98	1.74	1.55	1.38	1.23
Depreciated value	23.42	20.91	18.70	16.72	14.98	13.43	12.05	10.82

3.21. Financial Assessment of the Project

Table 17: Benefit Cost Ratio (BCR) and Net Present Worth (NPW)

S. No	Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	
i	Capital cost (Rs. in Lakh)	30.8	0	0	0	0	0	0	0	
ii	Recurring cost (Rs. in Lakh)	3.20	63.36	70.83	78.30	78.30	78.30	78.30	78.30	
iii	Total cost (Rs. in Lakh)	34.00	63.36	70.83	78.30	78.30	78.30	78.30	78.30	559.69
iv	Benefit (Rs. in Lakh)	0.00	77.16	95.19	107.22	108.22	108.22	108.22	108.22	
v	Total Depreciated value of all assets (Rs. in Lakh)								10.82	
vi	Total benefits (Rs. in Lakh)	0.00	77.16	95.19	107.22	108.22	108.22	108.22	119.04	723.27
	Benefit-Cost Ratio (BCR): 1.29 (Profitable Project) Net Present Worth (NPW): 170.65									

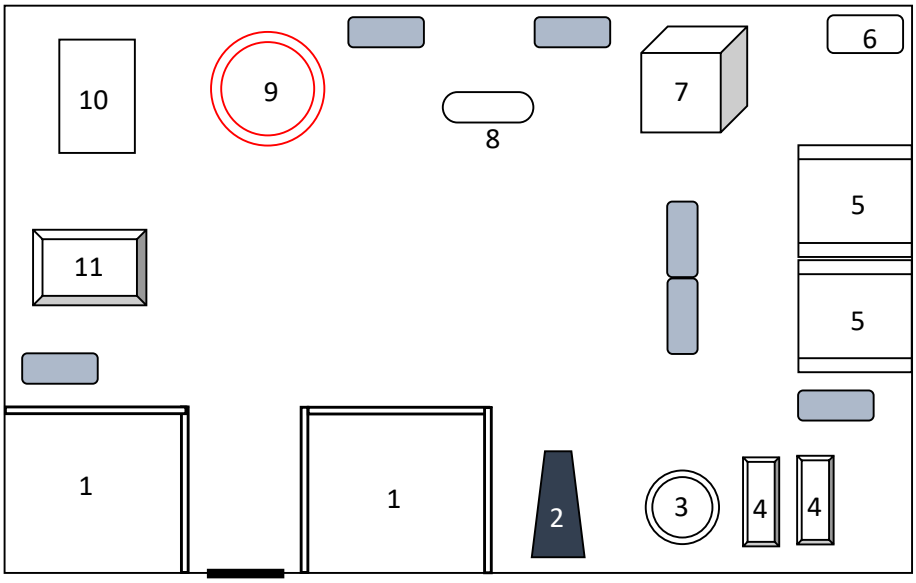
Break Even analysis indicates costs-volume-profit relations in the short run. This is the level at which the firm is in no loss no profit situation.

Table 18: Break-Even Analysis

S.No	Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
	Capacity utilization	Under const. (0%)	70 MT (70 %)	80 MT (80 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)	90 MT (90 %)
A	**Fixed Cost (Rs. in Lakh)**								
	Permanent staff salaries	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
	Depreciation on building @ 5% per annum	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07
	Depreciation on machinery @ 10% per annum	1.82	1.64	1.47	1.33	1.19	1.07	0.97	0.87
	Depreciation on other fixed assets @ 15% per annum	0.91	0.77	0.65	0.56	0.47	0.40	0.34	0.29
	Interest on term loan	1.67	1.67	1.49	1.2	0.92	0.64	0.36	0.09
	Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Total Fixed Cost (Rs. in Lakh)	7.35	7.03	6.55	6.03	5.51	5.04	4.59	4.17
B	**Sales Revenue (Rs. in Lakh)**	0.00	77.16	95.19	107.22	108.22	108.22	108.22	108.22
C	**Variable Cost (Rs. in Lakh)**								
	Raw Finger millet (Average Price @ Rs.30/ kg)	0.00	28.06	32.06	36.07	36.07	36.07	36.07	36.07
	Packaging materials @ Rs.10/ Unit	0.00	7.01	8.02	9.02	9.02	9.02	9.02	9.02
	Casual staff salaries	0.00	5.36	5.36	5.36	5.36	5.36	5.36	5.36
	Utilities (Electricity, Fuel)	0.00	4.77	5.24	5.70	5.70	5.70	5.70	5.70
	Repair & maintenance	0.00	0.63	0.63	0.63	0.63	0.63	0.63	0.63

	Miscellaneous expenses	0.5	2	2	2	2	2	2	2
	Interest on working capital	0	1.35	1.6	1.8	1.8	1.8	1.8	1.8
	Total Variable Cost (Rs. in Lakh)	0.50	49.18	54.91	60.58	60.58	60.58	60.58	60.58
D	**Break Even Point (BEP) as % of sale**	-	25.13%	16.26%	12.93%	11.57 %	10.58%	9.63%	8.75%
	Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	19.39	15.48	13.86	12.52	11.45	10.43	9.47

3.22. Plant Layout



1 Storage area
2 Cleaner
3 Washer
4 Soaking tank
5 Incubator
6 Compressor
7 Tray dryer
8 Devegetation
9 Roaster
10 Pulverizer
11 Packing

3.23. Machinery Suppliers

The entrepreneur must provide tentative supplier list and quotations with respect to his project. However, there are many machinery suppliers available within India for Finger millet processing machineries and equipments. Some of the suppliers are:

i. SS Engineers and Consultants, Rajamundry, Andhra Pradesh

ii. Nexgen Drying Systems Private Limited, Pune, Maharashtra

iii. APS Industries, Ahmedabad, Gujarat

iv. Sri Krishna Industries, Trissur, Kerala

v. Sivan Industrial engineering, Erode, Tamil Nadu

vi. Laxhmi Engineering Products, Coimbatore, Tamil Nadu

vii. Proveg Engineering & Food Processing Pvt. Ltd. Pune, Maharashtra

CHAPTER 4

LIMITATIONS OF THE MODEL DPR AND GUIDELINES FOR ENTREPRENEURS

4.1. Limitations of the Model DPR

i. This model DPR has provided only the basic standard components and methodology to be adopted by an entrepreneur while submitting a proposal under the Formalization of Micro Food Processing Enterprises Scheme of MoFPI.

ii. This is a model DPR made to provide general methodological structure not for specific entrepreneur/crops/location. Therefore, information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of business, background of proposed project, location, raw material base/contract sourcing, entrepreneur's own SWOT analysis, market research, rationale of the project for specific location, community advantage/benefit, employment generation etc are not given in detail.

iii. The present DPR is based on certain assumptions on cost, prices, interest, capacity utilization, output recovery rate and so on. However, these assumptions in reality may vary across places, markets and situations; thus the resultant calculations will also change accordingly.

iv. This particular DPR is made on three components of means of finance i.e. grant, owner's contribution and loan/debt as followed in many central sector schemes.

4.2. Guidelines for the Entrepreneurs

i. The success of any prospective food processing project depends on how closer the assumptions made in the initial stage are with the reality of the targeted market/place/situation. Therefore, the entrepreneurs must do its homework as realistic as possible on the assumed parameters.

ii. This model DPR must be made more comprehensive by the entrepreneur by including information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of entrepreneur's business, project location, raw material base/contract sourcing, entrepreneurs own

SWOT analysis, detailed market research, comprehensive product mix based on demand, rationale of the project for specific location, community advantage/benefit from the project, employment generation, production/availability of the raw materials/crops in the targeted area/clusters and many more relevant aspects for acceptance and approval of the competent authority.

iii. The entrepreneur must be efficient in managing the strategic, financial, operational, material and marketing aspects of a business. In spite of the assumed parameter being closely realistic, a project may become unsustainable if the entrepreneur does not possess the required efficiency in managing different aspects of the business and respond effectively in changing situations.

iv. The machineries should be purchased after thorough market research and satisfactory demonstration.

v. The entrepreneur must ensure uninterrupted quality raw materials' supply and maintain optimum inventory levels for smooth operations management.

vi. The entrepreneur must possess a strategic look to steer the business in upward trajectory.

vii. The entrepreneur must maintain optimum (not more or less) inventory, current assets. Selecting optimum source of finance, not too high debt-equity ratio, proper capital budgeting and judicious utilization of surplus profit for expansion is must.

viii. The entrepreneur must explore prospective markets through extensive research, find innovative marketing strategy, and maintain quality, adjust product mix to demand.

ix. The entrepreneur must provide required documents on land, financial transaction, balance sheet, further project analysis as required by the competent authority for approval.

x. The entrepreneur must be hopeful and remain positive in attitude.

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