BUSINESS OPPORTUNITIES IN MINOR MILLETS IN NORTH KARNATAKA- AN ECONOMIC ANALYSIS

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INTRODUCTION

Millets occupy an important place in the world food and nutrition economy. They are dependable food crops for small farmers and can adapt themselves to marginal soil conditions. Millets are staple diet for nearly 1/3rd of the world's population (Mamoni Das *et al.,* 2010). So, there is increasing demand in their better utilization through processing. Millets have unique traits like they are fast maturing and therefore fit into intensive cropping system. They store well for long periods and assure food supply during dry season or crop failure.

Millets are recognized as important substitute for major cereal crop to cope up with worldwide food storage and to meet the demands of increasing population of both the developing and developed countries. However, they can be well exploited as special purpose food in view of their better nutritional and functional qualities by using appropriate processing technologies. The acceptability of these grains can be improved by adopting relevant processing technologies which would result in value addition and increased utilization.

The transformation of agriculture to more productive systems has often been accompanied by increased production in a fewer crop species. Concurrently, the area and production of a great diversity of traditional crops have declined. Yet in many parts of the world, these traditional crops play an important role in maintaining stable and sustainable forms of agriculture.

Minor millets are generally consumed by the people of low socio economic status. The reasons for limited utilization of millets are poor grain quality characteristics, such as rough texture, high fibre content, lack of gluten and typical flavour (Srivastava and Batra, 1998).

Millets being small seeded contain large proportions of husk and bran hence requires dehusking and debraning prior to consumption (Hulse *et al,* 1980). Despite, their nutritional superiority utilization of millets is restricted due to non-availability of refined and processed millets in ready to eat form. Hence, millets are confined to traditional consumers and to the people of lower strata. Millets some times are mixed with rice and fermented to make beer. A majority of the millet production (80%) although is used for human food, it is also used for feeding cage birds especially in developed countries.

The term millet is used for several small seeded annual grasses that are of minor importance in developed countries but a staple in the diets of African and Asian people. Minor millets are fair sources of protein and are limiting in lysine. In India, millets are used in many forms. Millet flour can be replaced for rice flour in the preparation of chakkali, dosa and idli (D.Surekha.N and Rohini Devi).

Millets are commonly used in the preparation of malt in many special ethnic foods. Millets may also be used to substitute other cereals in breakfast food, convenience foods, and snack foods and also in various food preparations. The nutritive value of millets is comparable to other cereals with regard to protein, fat and mineral content but their utilization is limited due to the presence of various anti nutrients, poor digestibility of proteins and carbohydrates, low palatability, colour pigments, characteristic astringent flavour and poor keeping quality of processed products. Pearling of millets overcomes some of their constraints and improves its nutritional quality as well as consumer acceptability.

The minor millets includes Finger millet (ragi, *Eleusine coracana*), Foxtail millet (Navane, Italian millet, *Etaria italica*), Little millet (Savi/Samai /Kutki *Panicum miliare*), Barnyard millet (Oodahe/Banti, *Echinocloa frumantacea*), Proso millet (baragu / Cheena French millet, *Panivum miliacium*) and Kodo millet (Haraka, Varagu, *Paspalum scrobiculatum*). Presently, small millets are cultivated in areas where they produce a more dependable harvest compared to any other crop. This has been largely responsible for their continued presence and cultivation in many parts of the world. These crops provide good nutrition and compare very well with rice or wheat. Further, small millets are superior in protective nutrients such as vitamins, minerals, dietary fibre and phytochemicals. In recognition of this, these grains are now considered as nutritious grains.

Millets are traditional and staple food for majority of poor people in India. Millets are extensively grown in extreme conditions because of their wider adaptability to all types of climate.These are grown in diverse soils, varying rainfall regimes and in area widely differing in thermo and photoperiods. The resilience exhibited by these crops is helpful in adopting themselves to different ecological niches. All these have made quite indispensable to rainfed, tribal and hill agriculture, where crop substitution is difficult.

Therefore it is important to enhance production and productivity of these crops to ensure food and nutritional security not only to people living in harsh and difficult terrains, but also in other areas.

The cultivation of foxtail millet and little millet is more seen in Madhya Pradesh, Tamil Nadu, Karnataka and Orissa. Utilization of these crops is mainly as food for human consumption. The straw is often a precious fodder for bovines. The grain is consumed in traditional way and almost the entire produce is sold in the assured markets and transported to Maharashtra for further processing and utilization, as processing facilities are available only in Maharashtra.

In spite of superior nutritive value of grains, their use is limited, largely confined to rural markets and very little finds its way to urban market. The problem of pests and diseases in small millets is negligible. Being eco-friendly crops, they are suitable for fragile and vulnerable eco-systems and regarded as preferred crops for sustainable and green agriculture. Hence the promotion of these crops can lead to efficient management of natural resources and holistic approach in sustaining precious agro-biodiversity. Common millets and foxtail millets are used in indigenous medicine; foxtail millet is specially used in snake poisoning.

India has shown unprecedented food grain production in the last three years. According to fourth advance estimates the total food grain production during 2011-12 was 257.44 million tones which is an all time record in itself. Of the total food grain production, rice and wheat play a dominant share. But the percentage of coarse cereals to the total food grain production is sliding down. In 1960-61 the coarse grains contributed nearly 29 percent of the total food grains which has come down to about 12.5 percent during 2011-12.

This happened for various reasons like change in food habits, changing cropping system over the years and policies of the Government to incentivize the farmers of wheat and rice through Minimum Support Price and Public Distribution System. As a result the coarse cereals have been further pushed to marginal soils with poor overall profit to farmers. However, for an ever growing population like ours there is a need to expand the food basket through diversification of food products and better awareness about nutritional qualities of coarse cereals.

In line with the 1996 World Food Summit, Plan of Action, the special program for food security aims to help those living in low income and food deficit countries to improve their food security through rapid increase in food production and productivity on an economically and environmentally sustainable basis and by improving people's access to food. Under the project enhancing the contribution of nutritious food, neglected millet crops to food security and to income of the rural poor supported by IFAD, IPGRI and South Asia one of the major strategies to promote household consumption of nutritious millets and increasing income from millet farming through increased production and marketing of value added products.

Indigenous products of small millets *viz,* mudde, ambali, rice and halva possesses unique inherent nutritional processing and the therapeutic qualities. Products of millets have an bland taste and crispy texture, light and fluffy characters, superior textural quality of cooked starch and blends well with milk and milk products. Tradition and culture have preserved the significance of millet use in special occasions

Processing technologies of indigenous products are simple, less expensive and easy to adopt. Millets can be easily incorporated at 25 ,50 and 100 percent level in major cereals like wheat and rice and most of the pulse based recipes *viz ,* snacks , fermented foods, ready to eat foods, varieties of sweets and health beverages/foods . Primary processing of millet by hand pounding, a laborious technique still exists in rural communities. Large scale refining of millet processing units are found only in few places of Maharashtra state. Lack of improved milling technologies and less knowledge of farmers about market potentiality is the major constraint for insignificant consumption of millet. For a baker, adding whole grains/fibers can create challenges in the baking process. Fifty percent of incorporation of millet flour is found to be ideal for preparation of varieties of cookies, biscuits, muffins, bun and bread. Sensory quality scores of Ragi and Foxtail millet are on par with standard muffins. They are highly acceptable for taste and texture. Thus millet based bakery products are nutritionally superior with respect to protein, trace elements, dietary fibre and important component of phytonutrients.

Promotion of indigenous and value added millet products through demonstrations, training, exhibition, cooking competitions and message through radio, magazines and daily newspaper have enhanced the knowledge and readiness to incorporate millets in the daily diet to improve nutritional security, awareness campaigns have improved the market structure with respect to availability of millets in

retail shops, other than in weekly mandis. Majority of diabetic, cardio vascular disease and obese persons are accepting as healthy food in the management of diseases. Millet snacks, health foods, bakery products have potential for cottage industry at local and national market. Value added products of millets are eco friendly and viable technologies for income generation to rural community. Thus production, marketing and promotion of value added millet products may play a pro active role in creating awareness among consumers and to combat non communicable diseases and also helps in protecting a global resource.

The dehusked grains are readily infested with insects. So husked grains are stored and dehusked just before processing. Dehusking can be done easily with the help of a stoneroller or any rice milling machinery or by a dehuller. The millet bran obtained is rich in oil (about 9%) and may be used as feed or for extracting oil. The proportion of dehusked grains to raw whole grain is 70-80 percent. Dehusked foxtail millet is called Shio-mi (small millet) to distinguish it from large millet (dami or rice). Small milllet is cooked as rice or boiled with water to make porridge or gruel. Because of the small size of the grain, the time taken for cooking is only 6-7 minutes. Foxtail millet porridge is probably the most preferred form of food. Small millet is also mixed with legumes or rice to make porridge. Millet is mixed with soybean or other grain legumes to make a mixed flour cake, is also made either by steaming or toasting.

If at all, the sustained break-through in agricultural sector has to be achieved, the farmers are to be relieved of the risks and uncertainties involved in agricultural production and processing. Considering the importance of millets, Bellary the leading district for foxtail millets, Haveri the leading district for little millet and Bijapur the leading district for Bajra in North Karnataka were selected for the study.

The main objective of the study is to assess the production and processing of selected underutilized millets with specific objectives as given below.

Specific objectives of the study

1. To study the district wise growth of area, production and productivity of minor millets in North Karnataka.
2. To study the costs and returns in the production of minor millets and on their value added products.
3. To study the extent of value addition in selected products of minor millets.
4. To study the socio economic characteristics of minor millets consumers and their preference for processed products of minor millets.

Hypothesis of the Study

1. There is decreased growth rate in minor millets production in North Karnataka.
2. Minor millets production is a profitable enterprise.
3. There is good amount of value addition in minor millets.
4. The socio-economic conditions of minor millets consumers are good and their

   preferences for processed products of minor millet are different.

Limitations of the study

Since data were collected by survey method, the inherent lacunae associated with this type of enquiry might have crept in to the study. Even though, the estimates were provided by the recall memory because of the non-maintenance of the farm records, sincere efforts have been bestowed to elicit accurate and reliable information as possible by cross questioning.

However, the degree of discrepancy if any would be negligible as the estimates presented are in averages. It may however, be recognized that the findings of the study need not be generalized beyond the boundaries of the area under investigation and applicable to such other areas having similar agro-climatic and socio-economic conditions.

REVIEW OF LITERATURE

In this chapter, with a view to evaluate the objectives of the study, the findings of some of the earlier research studies and the methodology adopted have been reviewed. It is hoped that such a review of literature connected with the production and marketing performance of crops in India and abroad would provide a basis either for confirming or contradicting the earlier results and there by suggesting the points for further improvement.

Looking to the objectives of the study, the review of literature is presented under the following sub heads.

2.1 Growth in Area, Production and Productivity of crops

Ananth (2000) analyzed the growth of area, production, productivity and export of Indian non-basmati and basmati rice. The growth rates were calculated by sub-dividing the study period into 1949-50 to 1969-70 as first period and 1970-71 and 1997-98 as second period. The area, production and productivity showed positive trend. For the export the study period considered was 1980-81 to 1998-99 for Basmati and non-Basmati rice. The growth rates were also positive and significant.

Ashalatha (2000) analyzed the growth rate of area, production, productivity and export of cashew kernel, cashew nut shell liquid, imports of raw cashew nuts and unit value of exports of cashew. The study covered the period from 1956-57 to 1998-99. The growth rate was studied in 2 Periods, Period-1 covering 1956-57 to 1970-71 and period 2 covering 1970-71 to 1998-99. It was observed that the growth rate of area, production, productivity of kernel export, raw cashew import, cashew nut shell liquid value and cashew nut shell liquid- unit value of exports were showing positive trend but the cashew nut shell liquid quantity exported showed negative growth and was non-significant.

Legesse (2000) found that during eighties wheat area in Karnataka showed a declining growth rate *i.e.,* 3.94 per cent per annum but production and productivity showed a negative growth rate. During nineties the Karnataka state recorded a significant positive growth rate of 3.47 per cent in area while in production the state recorded a mild growth and productivity showed a negative growth rate.

Pervez (2001) analyzed the growth in area, production and yield in the major crops of Pakistan for a period 1970-71 (Period I) to 1984-85 (Period II). The study revealed that the increase in crop production was contributed largely by area than by productivity in Punjab and Sindh during Period I. Sindh region recorded a higher growth in area, production and yield as compared to Punjab in Period II. It was also observed that Punjab recorded a low degree of instability in growth rates in most of the crops as compared to Sindh region in Period II.

Navadkar (2003) revealed that the area, production and productivity of cotton in India during 2001-02 were increased by 48.81, 2271.71 and 150 per cent change over 1950-51. It means that the production increased rapidly than once due to increased productivity by 2.5 times over 1950-51.

Veeresh Hiremath (2004) studied the production and marketing of cotton in Karnataka. Author concluded that the area under cotton crop in Dharwad district increased at the rate of 4.9 per cent per annum, which shows significant growth rate, production also shows a significant growth rate 10.6 per cent per annum. Whereas, the productivity shows a non-significant growth rate (3.0%).

Velavan (2004) studied the growth rate in export and import of cashew in India and world. It was observed that import growth by 10.10 per cent per annum and the export grown by 8.88 per cent per annum. The import and export growth rate was lower in post liberalization period than the pre-liberalization period. This trend might be due to the composition from the other nuts and reduction in the yield of cashew in the major exporting countries. The import growth rate (20.89%) of raw nuts in India was higher than the export growth rate of processed nuts (6.31%). This is due to large scale dependence of raw materials to meet the domestic and export demand by India.

Varghese (2004) worked out the trend in area, production and productivity of cardamom in Kerala for a period from 1970-71 to 2002-03 using semi-logarithmic growth equation. The area under cardamom registered a negative percentage annual trend growth rate of 1.216 which is statistically significant. The output grows at an average annual trend growth rate of 4.14 per cent and yield registered an average annual growth rate of 5.51 percent.

Lathika and Ajith Kumar (2005), analysed the Growth trends in area, production and productivity of coconut in India of all the coconut producing states/union territories for which the period has been divided into two sub-periods as Phase I (1951 to 1995) and Phase II (1996 to 2002).

Byresh (2007) studied the growth rate of area, productivity and production of guava in Dharwad district and Karnataka state for the period from 1994-95 to 2003-04. The study revealed negative growth in area (-12.61 %) in Dharwad district. With respect to production also growth rate was negative (-5.00 %). But for productivity the growth rate was positive (8.70 %). The same trend was observed in case of state as a whole also, which registered a negative growth rate of area and production (-6.55 % and -1.57 %) and positive growth rate of productivity (5.33 %) of guava.

Keerthi (2008) studied the Growth rate of area, production and productivity of pineapple in Shimoga district 1994-95 to 2003-04. The study revealed that, the area, production and productivity of pineapple in Shimoga district as well as in Karnataka state has shown a positive growth rates of 3.95 per cent in area, 5.29 per cent in production and 1.31 per cent in productivity of pineapple in Shimoga district. Whereas, in Karnataka state these were found to be 0.43 per cent, 17.76 per cent and 17.27 per cent respectively.

2.2 Costs and Returns in Crop Production and Value Addition

2.2.1 Costs and returns in the production

Chinappa (2002) studied the cost of processing of arecanut at farm level. It was found that total cost of processing on per acre basis worked out to ₹ 5156.27. This was deducted from the gross value of produce to arrive at the net value of processed product (₹ 94, 273.73). Grower can obtain an additional income of ₹ 22,963.73 per acre by processing of areca nut. The opportunity cost of not processing areca nut at the farm level is Rs. 22,963/acre.

Vitonde *et al.* (2002) revealed that cost of processing for cotton seed was ₹ 49.62, ₹ 49.45 and ₹ 45.72 per quintal for small, medium and large sized oil mills. In safflower it was ₹ 48 to ₹ 52 and in groundnut it was ₹ 57 to ₹ 54. The economics of processing per quintal of oilseeds was also found out. Gross return from cotton seed varied from ₹ 843 to ₹ 869 for all sized groups and net return per quintal were ₹ 38, ₹ 49 and ₹ 68 for small, medium and large oil mills. Gross returns from safflower varied from ₹ 1,098 to ₹ 1137/quintal for all sized mills and net return per quintal were ₹66, Rs.90 and ₹ 108/quintal for small, medium and large mills, gross returns from groundnut was ₹ 2107/quintal and net returns was ₹ 2127/quintal and concluded higher net returns in groundnut processing than other crops.

Neelappa Shetty (2002) studied the technical and allocative efficiency in paddy production in Tungabhadra project area. The per hectare cost of paddy cultivation was ₹ 26,192 and ₹ 25,938 in Bellary and Raichur districts, respectively. The variable costs (85%) constituted the major portion of the total cost of cultivation. The expenditure on human labour was found to be the major item of variable cost. The fixed cost per hectare was estimated to be ₹ 33,896 and ₹ 33,746 respectively, for Bellary and Raichur district farmers. Rental value of land formed the major component of fixed cost. The gross returns realized by the farmer in Bellary and Raichur districts for paddy were ₹ 42,842 and ₹ 40,735 per hectare.

Sandeep (2002) in his study on cropping systems in Bidar district of Karnataka revealed that under irrigated conditions the per hectare net profit was found to be the highest in sugarcane cropping system in case of both small (₹ 52016.66) and large farms (₹ 42217.04) with a benefit cost ratio of 3.36 and 3.12, respectively. Under rainfed conditions, the highest net profit was observed in red gram cropping system in case of both small (₹ 12595.00) and large farms (₹ 12491.25) with a benefit cost ratio of 2.40 and 2.34, respectively.

Verma (2002) studied the economics of onion and found that per hectare cost of cultivation over Cost A1, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3 worked out to be ₹ 21790.24, ₹ 22309.05, ₹ 24499.05, ₹ 24949.28, ₹ 27139.28 and ₹ 29853.20, respectively. Per hectare yield on an average was 263.75 quintals. The average yield and gross returns increased with the increase in farm size, as large sized farmers had incurred higher investment per unit area on modern inputs. The average net returns over Cost A1, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3 were calculated at ₹ 50741.01, ₹ 50222.20, ₹ 48032.20, ₹ 47,581.97, ₹ 45391.97 and ₹ 42678.05 per hectare of onion, respectively. The average family labor income and farm business income were calculated at ₹ 45, 318.28 and ₹ 46, 459.66 per hectare, respectively. The average input-output ratio at cost A1 was found to be 1:3.32.

Malloy (2003) in his study discussed the economies and scale from the adaptation of tree farming and on-site wood processing in Warkworth, New Zealand. A market research commissioned to examine the responses of manufacturers of furniture and joinery to black wood [Acacia melanoxylon] showed that 73 firms did not use solid wood. The commercial system for logs was likewise examined. Data showed that in the northern part of New Zealand saw millers sold their lumber green. In addition, the on-site wood processing unit designed in Te Awa forest including its capital of establishment, net profit and annual return were discussed.

Tripathi *et al*. (2003) studied the economics of Chawki rearing of 1000 dfls spring and 1000 dfls in autumn to boost quality cocoon production. They found that the total cost incurred was ₹ 4930. The net income earned was ₹ 503.85. They worked out the cost of Chawki rearing for 100 DFLs was ₹ 351.15.

Gupta and Prasant (2004) studied the marketing and processing of cashew nut in Goa state. The total processing cost was divided into variable cost and fixed cost. The variable cost was estimated as 31.30 per cent and 29.57 per cent of total cost of processing on small and large processing units, respectively. The fixed cost includes the expenditure incurred on taxes, insurances, licensing, interest on working capital and depreciation on buildings and plant. It constitutes about 61.61 percent and 62.53 per cent of total marketing and processing cost on small and large categories of plants, respectively showing the importance to influence the economy of the plant.

Nagpure *et al*. (2004) in their study on economics of sugarcane production in Vidarbha region of Maharashtra estimated the per hectare cost of cultivation in Suru crop at cost A, B and C as to ₹ 35,178.86, ₹ 53,207.91 and ₹ 54,011.11 respectively. In the case of ratoon, it was estimated to be ₹ 25, 612.88, ₹ 42, 326.52 and ₹ 43, 162.62, respectively. The net income per hectare of ₹ 15, 766 were found out to be higher in the case of ratoon crop as against ₹ 11,334 from Suru main crop. The efficiency of per rupee investment in the cultivation of ratoon vis-à-vis sole crop of suru at cost C was estimated to be 1.36 and 1.21, respectively.

Rajeshwari (2004) made an attempt to study the cost and returns of coconut based farming systems in Tumkur district of Karnataka. The farmers following Farming System comprising coconut, arecanut, ragi and dairy were getting the highest net farm income of ₹ 85, 600 per farm and the cost of cultivation was ₹ 1,59,645. The major components of cost of production were amortized establishment cost, operational cost, rental value of land and material cost.

Saikumar (2005) studied the cost and returns structure of major farming systems in tank commands of north eastern Karnataka. The study revealed that, of the three major farming systems identified in the study area, dairy enterprise was found to be most common as a complimentary enterprise. The highest net returns realized was ₹ 53, 404.59 per hectare and per hectare cost of cultivation was ₹ 84,414.21 in Farming System comprising Redgram+ *Kharif* Jowar+ Groundnut followed by Bengalgram+ *rabi* Jowar+ Dairy.

Bhullar (2005) studied the trends in production of dry chilies in India and found that Andhra Pradesh, Karnataka, Maharashtra and Orissa put together account for 75 per cent of the total Indian production. Punjab state occupied 3.10 per cent of area and was ranked eighth during 1974-77, which decreased substantially to only 0.46 per cent in 1998-2001. Production-wise, Punjab accounted for 4.61 per cent of production during 1974-77, which fell to 0.74 per cent during 1998-2001. There has been significant improvement in the productivity of chillies at 1945 kg per ha, followed by Punjab (1688 kg per ha) Rajasthan (1064 kg per ha) Arunachal Pradesh (1272.7 kg per ha) and Gujarat (786 kg per ha).

Raghu (2006) studied the economics of production and marketing of patchouli in Northern Karnataka. He found that cost of establishment was ₹ 73,656.06 per ha, the average maintenance cost was ₹ 73,121.955 per ha per year. Gross returns and net returns were ₹ 61,720.81 and Rs. 15,939.17 respectively.

Mittal and Singh (2007) worked out economics of some important aromatic plants such as lemongross, citronella and patchouli. They found that average total cost of herbage cultivation per ha per year at 2003-2006 price were ₹ 40,400, ₹ 39,287 and ₹ 32,919 for lemongross, citronella and patchouli respectively and average total cost of oil production per ha per year were ₹ 57,230, ₹ 56,408, and ₹ 36,101 for lemongross, citronella and patchouli. The respective average net returns per ha per year for herbage cultivation and oil production were ₹ 17,320 and ₹ 48,974, ₹ 608 & ₹ 45699, & ₹ 7296 & ₹ 25,821 respectively.

Aijan *et al*. (2008) studied the economic analysis of cultivation and marketing of gloriosa in Tamil Nadu. They worked out cost of cultivation of gloriosa per ha per year was ₹ 2.38 lakhs. Gross returns and net returns per ha per year were ₹ 4 lakhs and ₹ 1.612 lakhs respectively. The study revealed that cost of cultivation in first year was very high (₹ 6.68 lakhs) and was very low in fifth year (₹ 0.72 lakh) and gross returns in first year were high (₹ 6.69 lakhs) and last year was very low (₹ 0.72 lakh) but net returns in first year were negative (₹ - 0.69 lakh) and high on second year (₹ 3.90 lakhs).

Dhiman (2008) reported that cost of production of Swetia chirayita was ₹ 34,290 per ha. Cost of seedling/planting (₹ 5000) and cost of land rent were two major costs in production. Gross returns and net returns were ₹ 1, 25,000 and ₹ 90,710 respectively with a B-C ratio of 3.64.

Powar and Hange (2008) studied the economics of production and marketing of selected medicinal and aromatic plants in western Maharashtra. They reported that the per ha cost of cultivation of safeda musli, pudina and citronella per ha was ₹ 2, 28,634.32, ₹ 1, 03,567.19 and ₹ 55,879.30 respectively. Further it was observed that cost of seed material was the single largest item of expenditure in safeda musli (₹ 1, 05,260) where as for pudina, it was human labour (₹ 30,288.54) and for citronella it was on amortization cost (₹ 17, 122.26). The net returns per ha of safeda musli, pudina and citronella were ₹35,013, ₹ 5349 and ₹ 6723 respectively with corresponding B-C ratio for of 1.15, 1.05 and 1.12 respectively.

Puran mal *et al.* (2009) studied the economiy of cultivation of safeda musli in Haryana and found that the per ha total cost of cultivation was ₹ 1,82,152.30 of which total variable cost and fixed cost were ₹ 1,40,793.60 and ₹ 41,354.71 respectively. Cost on planting material was maximum (₹ 1,01,101.30) fallowed by harvesting of crop (₹ 15,236.84), inter-culture and hoeing (₹ 7473) and chemical fertilizer (₹ 6442.10). Gross returns and net returns per acre were ₹ 2,47,052 and ₹ 64,900 respectively with B: C ratio of 1.36.

Prodyut Bijoy Gogoi (2009) reported that the per ha cost of establishment of patchouli was ₹ 41, 179.00 per ha, the average operation cost was ₹ 28,447.76 per ha per year and total cost was ₹ 45,500.75. The average gross returns and net returns per ha per year were ₹ 1, 23,421.33 and ₹ 77,920.58 respectively.

2.2.2 Costs and returns in the value addition

Wadkar *et al.* (2001) studied the economics of fruit processing unit of *kokum* in Ratnagiri district of Maharashtra. The study revealed that, in *kokum* processing industry, on an average 317.07 MT of fresh fruits were used to get dried *kokum* rind and Amrit *kokum,* and 685 kg of fresh fruits used to produce *kokum* butter. The per factory total capital investment made towards processing of dried *kokum* rind, Amrit *kokum* and *kokum* butter was ₹ 1,04,418/-, ₹ 3,73,385/- and ₹ 2,73,807/- respectively. The cost of processing of one quintal of dried *kokum* rind was ₹ 2,143.91/- and of 100 bottle of Amrit *kokum* was ₹ 2, 031.68 and cost of processing per tin (10 kg) of *kokum* butter was ₹ 1,482.14. The study had also identified three marketing channels for the distribution of *kokum* products *viz*., (1) Producer- consumer, (2) producer-wholesaler- retailer-consumer and (3) producer-contractor- retailer- consumer. The cost of marketing worked out to ₹ 3.90 per kg of dried *kokum* rind, ₹ 6.30 per ltr. of Amrit *kokum* and ₹ 14.20 per kg of *kokum* butter. Marketing cost items includes octri, transport and sales tax paid on *kokum* products.

Gawas (2002), reported that per quintal cost of processing of dried *kokum* rind was ₹ 2143.91. Out of which, ₹ 1232.50 incurred on the procurement and cost of fresh *kokum* fruits. The other important items of processing cost were labour charges (₹ 362.60), interest on capital (₹ 359.21), container (₹ 65.50) and other charges (₹ 70.42), while the processing cent of *kokum* fruits in to *kokum* was worked out to be ₹ 2031.68 per 100 bottles of 650 ml capacity. The analysis on the process of *kokum* syrup showed that expenditure incurred on the purchase of fruits was maximum (₹ 754.00) followed by sugar (₹ 365.63), interest on fixed and working capital together estimated to ₹ 384.73, whereas, labour charges were ₹ 215.78. The gross added value estimated in dried *kokum* rind was ₹ 911.41 and ₹ 1277.68 in *kokum* syrup per quintal of fresh *kokum* fruits. Whereas net added value was ₹ 1206.09 in dried *kokum* rind and ₹ 968.32 in *kokum* syrup processing, which clearly indicated processing *kokum* fruits with dried *kokum* rind and prepared over *kokum* syrup processing.

Manjunath (2003) compared the private and public sector fruits and vegetable processing units in Bangalore district of Karnataka. He indicated that capital investment was higher on plant & machinery (80.58%) in private sector where as in public sector it was 74.65 percent.

Gungor and Gungor (2004) studied the economics of wine production and marketing by small family producers in northwest Turkey, based on data obtained from 12 holdings during the 2001-02 production periods. The average production cost of quality wines was calculated at 1.026 euro per bottle and the selling price was 2.43 euro per bottle. For table wines, production cost was 0.662 euro per bottle and the selling price was 1.086 euro per bottle. Marketing strategies are discussed in relation to the marketing mix (product, price, promotion.

Rajesh (2006) studied the economic evaluation of vanilla cultivation in Uttar Kannada district of Karnataka. He worked out total cost incurred in processing of vanilla bean was ₹ 6775.94 per quintal. The study revealed that labour cost was the major item ₹ 4680 (69.07%), packing material was ₹ 50 (0.73%) and fuel was ₹ 60 (0.88 per cent). Gross returns and net returns obtained from 20 kg of processed bean were ₹ 30,000 and ₹ 23,224.06 respectively.

Deorukhakar *et al.* (2007) conducted a study in Sindhudurg district of Maharashtra, India, on cost and returns structure in *kokum* (*Garcinia indica*) processing units and to estimate value addition as well as employment potential in *kokum* processing units. The data from 30 *kokum* processing units were collected with the help of specially-designed schedules. The data pertained to the 2003-04 production season. The study revealed that the total cost of processing of one-quintal fruits for *kokum* syrup were ₹ 2440.88/-, that for *kokum* agal was ₹ 867.90/-, and that for *kokum* rind were ₹ 1102.18/-. The gross returns obtained after processing one-quintal *kokum* fruits into *kokum* syrup was ₹ 3780.52/-, whereas gross returns from *kokum* agal and *kokum* rind was ₹ 1344.24 and ₹ 1707.10, respectively. Net returns obtained were ₹ 1339.63/-, ₹476.33/- and ₹604.91/- from *kokum* syrup, *kokum* agal and *kokum* rind, respectively.

Mallar Mathi and Pandey (2007) studied economic evaluation of guava processing units in Allahabad district of Uttar Pradesh. They worked out the total cost of processing and total returns in home scale, cottage scale, small scale and large scale were ₹ 34,360.36, ₹ 65,011.25, ₹ 2,77,661.6 and ₹ 1,59,33,795 respectively and total returns in home scale, cottage scale, small scale and large scale were ₹ 1,64,000,₹ 2,41,120, ₹ 8,26,110 and ₹ 3,42,50,000, respectively with corresponding net returns of ₹ 1,29,639.64, ₹ 1,76,108.75, ₹ 5,48,448.4 and ₹1,83,16,205 respectively. The study revealed that cost per quintal and net return per quintal processed in home scale, cottage scale, small scale and large scale were ₹ 2290.6 and ₹ 8642.64, ₹ 2955.05 and ₹ 8004.94, ₹ 4627.69 and ₹ 9140.80 and ₹ 6373.51 and ₹ 7326.48 respectively.

Sheikh and Ashwini (2010) studied economic appraisal of citronella oil extraction plant in Ballapura District. The study revealed that returns per rupee of investment was 1.38 indicated that production of citronella oil was profitable.

Kusuma *et al.* (2010) studied the value addition of foxtail millet in Bellary district- an economic analysis. For analyzing the data collected in the study, budgeting technique and tabular analysis were employed. In preparation of pappad, the total cost of production worked out to be ₹ 7000, gross returns realized were ₹ 11880 and net returns were ₹ 4880. In preparation of tambittu, net returns were ₹ 5960 after deducting total cost of ₹ 8290 from gross returns ₹ 14250. The study concluded that value added products of foxtail millet brought more returns to the farmers than foxtail millet grains.

2.3 Extent of Value Addition

Mahesh and Nagaraja (2002) reported that the value addition of cashew (*Anacardium occidentale*) kernel baby bits (CKBB) was attempted by coating with cane sugar, honey and salt. Optimum coating occurs at 100 degrees C for 5 min at 70 percent concentration for cane sugar and honey, and five percent for salt. Sweetened (70%) and vanillin (0.1%) flavored CKBB are the most preferred. De-fatting of CKBB enhances the per cent coating. Coating of cashew kernels of different grades with cane sugar at 70 percent is dependent on the surface area. Cashew apple juice could be coated on the CKBB. Acceptability of cashew apple juice coated baby bits (BB) improves with the addition of cane sugar at 70 percent concentration. Permitted colors and cane sugar compete with each other during coating.

Talathi *et al.* (2003) in their study on value addition and employment generation in mango processing factories conducted in Ratnagiri and Sindhudurg districts of Maharashtra state observed that, the gross added value was ₹ 1726.39 (152.41 %) in pulp, ₹ 1522.26 (507.42%) in pickle, ₹ 7782.31 (114.87%) in squash and ₹ 161.25 (53.75%) in case of raw slices in brine. As regards the

net added value it was 65.40 per cent, 16.67 per cent, 203.38 per cent and 12.04 per cent, respectively. Pickle was the most profitable product of mango, followed by pulp, squash and raw slices in brine.

Madhuri and Kamini Devi (2003) found that in watermelon, the rind constituted 33 percent of the whole fruit weight. Value added preserved products like pickles, tutti fruity, vadiyams and cheese were prepared using the white portion of watermelon rind. The quality of products in terms of physical parameters was evaluated. All products were subjected to sensory evaluation test using a panel of 20 judges. Results showed that mean sensory scores for product attributes were high. There was no change in mean scores after one month storage.

Arora et al. (2004) found that vegetable washing is an important primary process unit operation for value addition of the produce at farm level. Washing is used not only to remove field soil, dust, pesticides, but also the surface microbial load. Carrots, potatoes and spinach were washed mechanically in a rotary vegetable washing machine at varying speed and time and then evaluated for their quality. The microbiological washing efficiency, which is calculated by observing the total viable count of the surface of the vegetables before and after washing ranged between 96.5-99.8% as compared to recommended 80% indicating the acceptability of the vegetable washing machine.

Pawar (2005) studied the kokum processing units, and revealed that, though the processing units were more profitable, they do not get sufficient raw material (fruits) from the area. As the kokum plantation was scatter throughout the region, home scale and cottage scale units were best suited for the Konkan region because they provide more employment opportunities to small entrepreneurs.

Rakesh kumar *et al.* (2010) studied the value chain based on local crop (millet) and empowering of rural women. Women groups were trained on value addition, packaging, labeling and product presentation. Implementation of this study has led to increase in income of farmers, women groups and SHG's. The consumption at village level also increased four times as compared to previously. This will make them more independent and encourage them to adopt new technologies and practices.

2.4 Socio Economic Characteristics of Consumers and their Preference for Processed Products

Singh *et al.* (1995) studied factors influencing consumer preferences for milk. The milk quality, convenient pack size, flavor, colour, freshness and mode of payment showed higher levels of consumer satisfaction. About 70 per cent of the respondents preferred milk supplied by city dairies. The least preferred was that sold by dairy factories.

Wandel (1995) used multivariate analysis to study factors influencing the consumption of vegetables and fruits among Norwegian consumers. The factors, which determined consumption, were sex, age, income and household structure. It was interesting to note that consumers who were health conscious consumed more fruits and vegetables.

Hugar and Vijaykumar (1996) carried out a study in Dharwad city to identify various factors influencing the consumption of vegetables. A sample of 90 consumers was chosen at random. It was observed that the personal attributes such as education level and sex had significant influence on the quantity and frequency of purchase. Females purchased more as compared to males, college educated respondents purchased more than primary school educated or illiterate consumers. Income also had significant influence. The higher family income group purchased larger quantity of vegetables. It was observed that the price had a high influence on quantity purchased among the lower income groups, but the effect was not pronounced for high income groups.

Sharma (1997) explained the factors determine the consumer's acceptance and preference for food in general. Many factors interact together and make buying complex process. Though price was identified as an important factor, it had some limitations on the consumer's choice. Factors like sensory attributes, regional preference, age, sex, interest, motivation, discrimination and income were also found to influence food consumption.

Angadi (1999) conducted a study in Bagalkot district of Karnataka state and reported that majority (65%) of the pomogranate growers were middle aged. The respondents below 35 years of age were 18.75 per cent while 16.25 per cent were of old age.

Meeran and Jayaseelan (1999) in their study in south Arcot district of Tamil Nadu state on shrimp farmers found that, majority of the farmers had received education up to high school (42.00%) followed by pre-university (22.00%) and middle school (16.00%) levels of education.

Myszczszyn (2000) reported that with the general rise in the average income of Polish households particularly among the non-farming population, since 1994. The demand for food products had been relatively stable although it remained 5 per cent lower than in 1988. The structure of demand was changing with increasing preference for processed foods and greater awareness of health and dietary factors among the consumer population. The study also suggested the producers to face new set of challenges to meet stricter food quality standards.

Rao (2000) analyzed the declining demand for food grains in rural India. He identified the factors influencing the higher per capita consumption of cereals in rural areas. The factors listed were higher prices of non-food grain and non-food items, higher energy requirement due to heavy manual labour, payment of wages in kind by the large farmers in the form of cooked food and the poor state of healthy and environmental resulting in low efficiency of conversion of food into energy.

Karpagam (2000) conducted a study on Erode district of Tamil Nadu state and indicated that; majority (70.83%) of the turmeric growing farmers belonged to middle aged group.

Babanna (2001) in his study on areca nut growers of Shimoga district in Karnataka revealed that 61.60 per cent of the respondents belonged to medium income category while 23.40 percent and 15.00 per cent were under low and high income category, respectively.

Arunkumar (2002) undertook an empirical study of factors responsible for success/failure of contract farming by using linear regression function. The results revealed that 93 per cent of variation in the success/failure was explained by the independent variables included in the function. The regression coefficients of net returns from contract farming, land under contract, education of the contract farmer and experience of the company were statistically significant. The coefficients of age and family size were positive but statistically not significant.

Shashidhara (2003) in his study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere districts of Karnataka revealed that comparatively more number of farmers (46.67%) belonged to semi medium category followed by medium (32.22%) and small land holding categories (18.89%).

Shashidhara (2004) conducted a study on drip irrigation farmers in Bijapur district of Karnataka and reported that, 49.17 per cent of the farmers belonged to medium income category followed by low (26.67 per cent) and high (24.16 per cent) income category, respectively.

Sunil Kumar (2004) conducted a study on tomato growers in Belgaum district of Karnataka and found that, majority of the respondents belonged to medium income category (48.33%), followed by 32.50 per cent and 19.16 per cent were under low and high income category, respectively.

Sridhar (2008) studied contract farming in maize in Davanagere and Haveri districts. The average age of contract farmer was 43 years. In case of non-contract farmers, it was 47 years. The annual income was found to be ₹ 73,823 per family in contract farmer, whereas in case of non-contract farmer, the annual income was ₹ 66,950 per family. 78.39 per cent were literate when compared to non-contract farmers (76.66 %).

Surekha and Rohini (2009) conducted a study on development of value added products from barnyard millet *(Echinochloa Frumentaea Link)* in Marathwada region of Maharasthra. Plain noodles and plain cookies with 100 percent barnyard millet flour were highly acceptable. On the other hand, plain khakra with 60 percent barnyard millet flour and 40 percent wheat flour was highly acceptable. All the developed products were accepted by consumer.

METHODOLOGY

This chapter describes the characteristics of the study area, the sources and nature of data used for the study, the sampling methods adopted for the collection of required data, statistical tools and techniques employed for analyzing the data and concepts used in the study. The details are presented in the following heads.

3.1 Description of the Study Area

3.1.1 Karnataka

The study pertains to northern districts of Karnataka state, India. The state of Karnataka is located between 11.5° and 19° north latitudes and between 74° and 78° east longitudes. It is the eighth largest state in India both in area and population with an area of 191.791 km2 and population of 5.285 crores (2011 census). About 69.08 percent of the population in the state lives in rural areas. The state is bound by Maharashtra, Goa, Andhra Pradesh, Tamil Nadu and Kerala in the North, East, South East and South West, respectively. The state has 27 districts, 176 taluks and inhabited villages.

Karnataka is situated in tropical zone and enjoys warm climate throughout the year. The mean temperature ranges from 21.5℃ to 31.7℃. The maximum and minimum temperatures being 42℃ and 14℃, respectively. Northern Karnataka tends to be hotter than the south.

The normal rainfall of the districts ranges from as low as 569 mm to as high as 4029 mm. Average annual rainfall of the state is 1354 mm. The major part of rainfall in the state is received from the South West monsoon which commences in the first week of June and continues till the end of September

Most part of the state has red soils. Laterite soils are also found in the hilly and coastal region of the western parts. The northern part of the state has black soils with high moisture holding capacity.

In Karnataka state during 20011-12, the total cropped area was 11450.31 thousand hectares of which cereals and millets covered 5007.40 thousand hectares (43.73 %), pulses covered 1874.30 thousand hectares (16.36 %) and others covered 4568.61 thousand hectares (39.91%). The major cereals in the state are sorghum, rice maize, ragi, bajra and wheat. Varieties of minor millet crops are also cultivated in the state which includes Navane, Savi, Haraka, Adivari, Baragu and others. In Karnataka Navane and Savi are the main minor millets, which are grown in *kharif* season. Majority of area under Navane crop is found in the districts of Haveri, Bellary, Bijapur, Belgaum, Raichur, Chitradurga, Davanageri, Gulburga and Koppal. The important districts for savi crop in the state are Haveri, Chitradurga, Dharwad, Belgaum and Tumkur.

3.1.2 Bijapur district

The entire district is situated in the Northern Dry Zone of Karnataka state and is between 15021' and 17028' N latitudes and between 74050' and 76028' E longitudes, with a geographical area of 17.23 lakh ha. It falls on the arid zone of Deccan plateau. The district is bounded on the north by Sholapur district, in the northwest by Sangli district of Maharashtra state and on the northeast Gulbarga, Raichur, Dharwad and Belgaum districts surrounds this district, on the east, south and west, respectively. According to the 2011 census, the population of the district is 18.08 lakhs with literacy rate of 57.46 per cent. A major portion of the district is covered by slightly alkaline deep black soils, which have good moisture retention capacity but are low in organic matter content. The normal annual rainfall of the district is about 578 mm, which is scanty and erratic and mostly received from the south west monsoon. The climate is generally dry with a temperature ranging from 14.8℃ to 43.0℃.

3.1.3 Haveri

Geographically it lies within the interior of Deccan peninsula between 14° 19’ and 14° 48’ North latitude and between 70° 15’ and 75° 50’ East longitude. The area of the district is 4,85,156 ha and it is bound on the North by Dharwad and Gadag districts, on the south by Shimoga and Davanagere districts, on the east by Bellary district and on the west by Uttara Kannada district There are three distinguishable agricultural seasons in the district viz., *kharif* (June- September), *rabi* (October –January) and summer (February-May). The South West monsoon commences at the end of May or early June and it continues intermittently till the end of September.

Table 3.1: Districts-wise Area and Production under Little Millet Crop in Karnataka during 2010-11

Sl.No.	Districts	Area (ha)	% to state area	Production (tonnes)	% to state production
1	Belgaum	1142	10.30	1311	14.77
2	Bidar	57	0.52	42	0.47
3	Chamarajanagar	60	0.54	49	0.55
4	Chickballapur	23	0.20	17	0.19
5	Chikmagalur	940	8.48	640	7.21
6	Chitradurga	3290	29.69	1823	20.54
7	Davanagere	52	0.46	62	0.60
8	Dharwad	1015	9.16	624	7.03
9	Gadag	67	0.60	51	0.57
10	Gulbarga	93	0.83	20	0.22
11	Hassan	58	0.52	48	0.54
12	Haveri	2118	19.11	2468	27.81
13	Kolar	58	0.52	44	0.49
14	Tumkur	2106	19.00	1675	18.87
	State Total	11079	100	8874	100

Source: Directorate of Economics and Statistics, GOK, Bangalore.

Table 3.2: Districts-wise Area and Production under Foxtal Millet Crop in Karnataka during 2010-11

Sl. No.	Districts	Area (ha)	% to state area	Production (tonnes)	% to state production
1	Bagalkot	51	0.35	19	0.49
3	Belgaum	1273	8.95	416	10.78
4	Bellary	3456	24.31	743	19.25
5	Bidar	40	0.28	15	0.38
6	Chamarajanagar	162	1.13	40	1.03
7	Chikmagalur	456	3.20	168	4.35
8	Chitradurga	3456	24.31	1126	29.18
9	Davanagere	673	4.73	325	8.42
10	Dharwad	20	0.14	5	0.12
11	Gadag	256	1.80	64	1.65
12	Gulbarga	79	0.55	19	0.49
13	Haveri	330	2.32	78	2.02
14	Koppal	3472	24.43	702	18.19
15	Raichur	14	0.09	4	0.10
16	Ramanagar	158	1.12	45	1.16
17	Tumkur	316	2.23	89	2.30
	State Total	14212	100	3858	100

Source: Directorate of Economics and Statistics, GOK, Bangalore.

Table 3.3: Districts wise Area and Production under Bajra Crop in Karnataka during 2010-11

Sl.No.	Districts	Area (ha)	% to state area	Production (tonnes)	% to state production
1	Bagalkot	42410	18.34	10124	8.74
2	Belgaum	15523	6.71	4583	3.96
3	Bellary	13012	5.62	7922	6.84
4	Bidar	6853	2.96	3842	3.32
5	Bijapur	61201	26.45	28342	24.49
6	Chamarajanagar	480	0.20	276	0.23
7	Chitradurga	90	0.03	58	0.05
8	Davanagere	603	0.26	274	0.23
9	Gadag	1694	0.73	893	0.77
10	Gulbarga	35230	15.22	20182	17.44
11	Koppal	54231	23.44	18012	15.56
12	Raichur	55432	23.96	21200	18.32
	State Total	231327	100	115708	100

Source: Directorate of Economics and Statistics, GOK, Bangalore.

The average rainfall of the district is 752.8mm with a major portion of the same being received from monsoon only. The average temperature ranges from 16℃ to 36℃.The soil type in the district comes under red loamy soil, which is shallow in depth and well drained. Some patches of black soils are also found in the district and they are highly suitable for vegetable cultivaction.

3.1.4 Bellary district

Bellary district is situated at 14° 30' and 15°40' N and 75°40' and 77 '11'E. The district is bound by Gadag, Haveri, Koppal, Raichur, Dharwad, Davanagere, Chitradurga, Ananthapur and Karnool districts on the North, West, South and East respectively.

The total geographical area of the district is 8450sq.kms amounting to 2.24 per cent of the area of Karnataka state. The district consists of 7 taluks. According to the 2011 census the total population of the district was about 2.42 million constituting 3.91 per cent of the population of the state. Of the total geographical area of 813.20 thousand ha, the net area sown is 4,06,640 thousand ha, out of which 1,47,470 thousand ha constitutes the net irrigated area from different sources of water.

The district falls in the transitional belt of Karnataka and the rainfall is sporadic and ill distributed within the district. Usually, rains are concentrated from August to November with light showers during May, June and July months. The average normal rainfall of the district is 610 mm, which is far below the state's average. The temperature reaches a maximum of 41℃ in summer and a minimum of 20℃ during winter. The major crops grown in the district are sorghum, paddy, maize, ragi, bajra and minor millets like foxtail millet (navane).

3.2 Sampling Design and Data Source

3.2.1 Sampling design

3.2.1.1 Selection of farmers

Multistage random sampling technique was employed for selection of sample respondents. In the first stage one leading district with respect to area was selected for each crop. In the second stage, one taluk each from three districts was selected based on their highest area under the respective crops. In third stage five villages were selected from each of the sample talukas to elicit primary data. In the final stage, six respondents were selected randomly from each selected village. In total 30 respondents from each district, for each crop were selected making the total sample size to 90.

For eliciting the economics of processing of minor millets into value added products, two major processing units were selected. To study the consumer preference for value added products of minor millets and to know the socio economic characteristics of consumers, a total of 60 respondents in major stores in Hubli-Dharwad were interviewed by using questionnaire through personal interview method.

For Little millet (savi) in Haveri district the villages selected were Basapur, Aladakatti, Havanur, Kakol and Chikkalingadahalli. For foxtail millet in Bellary district, Hagaribommanalli, Itagi, Gududur, Jalihal and Uttangi villages were selected. For Bajra crop in Bijapur district, Rodagi, Marinahalli, Kannoli, Moratagi and Nagaral villages were selected (Table-3.4).

3.3 Nature and sources of data

The study was based on both the primary and secondary data. To study the growth rates of millets, time series data on area, yield and production of Little millet, Foxtail millet and Bajra were obtained from the records compiled by the Directorate of Economics and Statistics, Government of Karnataka, Bangalore. The data on these variables were collected for 10 years period from 2001-02 to 2010-11.

The sample farmers were interviewed personally using schedule prepared for the purpose. Data on some selected socioeconomic characteristics of the farmers, land holdings, cropping pattern, inventory of implements and machinery were collected. The data on quantity and value of various inputs used and the yield obtained in case of millets were collected. Similarly, data pertaining to the processing aspect was collected by personal interview method by interviewing the processors/owner of processing units regarding cost of processing and returns from processing units. The primary data from sample farmers and processors of minor millets pertained the agricultural year 2012-13.

Table 3.4: List of selected districts and villages in North Karnataka

Sl. No	Crop	Districts	Blocks	Villages	No of Respondents
1	Bajra	Bijapur	Bijapur	Rodagi	6
				Marinahalli	6
				Kannoli	6
				Moratagi	6
				Nagaral	6
2	Little Millet	Haveri	Haveri	Basapur	6
				Aladakatti	6
				Havanur	6
				Kakol	6
				Chikkalingadahalli	6
3	Foxtail Millet	Bellary	Bellary	Hagaribommanalli	6
				Itagi	6
				Gududur	6
				Jalihal	6
				Uttangi	6
Total					90

Table 3.5: Millet processing units studied

Sl. No	Name	Owners Name	Location	Products Manufacture
1	Manohar Rice Flour Mill	Mr.Vinay Yelavatti	Haveri	Semolina, Polished grains and flour
2	Chandan Food Products Pvt.Ltd	Mr.Anil Mohre	Gadag	Instant energy food, Instant Dosa mix, Diabetic mix.

3.4 Analytical techniques

3.4.1 Tabular analysis

The data collected were presented in tabular form to facilitate easy comparisons. This technique of tabular presentation was employed for estimating the cost and return structure of underutilized millets.

3.4.2 Compound growth analysis

In order to analyze the growth in area, yield and production of Foxtail millet, Little millet and Bajra in the sampled districts as well as other districts of North Karnataka. Compound growth rates were computed using the following exponential function.

$$Y = ab^t$$

Where

Y = Parameter/Variable
t = Years (time)
a = Intercept/Constant
b = Regression Coefficient
= (1 - r/100)
= rate of change in Y per unit change in time

Hence, Annual Average Growth Rate (percentage) is = r = (b - 1) x 100

Growth rates of area, production and yield of selected millets were computed for a period of 10 years (2001-02 to 2010-11) for 12 districts of North Karnataka.

3.4.3 Garrett's ranking technique

Constraints faced by farmers in minor millets production were prioritized by using Garrett's ranking technique in the following manner:

$$\text{Percentage position} = \frac{100 \times (R_{ij} - 0.50)}{N_j}$$

Where,

R_{ij} = Rank given for the i^{th} item by the j^{th} individual, and
N_j = Number of items ranked by the j^{th} individual.

The percentage position of each rank was converted into scores using Garrett table. For each product, scores of individual respondents were added together and were divided by total number of respondents for whom scores were added. Thus, mean score for each constraint was ranked by arranging them in the descending order.

3.5 Definition of terms and concepts used in the study

a) Interest on fixed capital

The interest on fixed capital assets such as farm buildings, implements, equipment and machinery was charged at the rate at which the bank was advancing term loans for such purchases.

The interest charges were allocated to different crops cultivated during the year in proportion to the area under each crop

b) Depreciation cost

The depreciation was calculated by straight-line method. It was worked out by dividing the purchase value of implement or machinery by its life period. The economic life of the processing machineries was 8 years.

c) Gross income: The values of main product were estimated at the prices at which the product was sold.

d) Cost of cultivation: It is the sum of variable costs and fixed costs including marketing cost expressed on per hectare basis.

e) Gross returns: Gross returns were obtained by multiplying the total product with its unit value.

f) Net returns: Net returns were obtained by deducting the total costs incurred from the gross returns obtained.

g) Hired human labour: Hired human labour was estimated in terms of eight hours of work per day. The woman labour days converted into man days on the criteria that one woman day equal to 0.65 man days on the basis of wage rate equivalent.

h) Bullock labour: It was measured in pair days. Hence one pair means eight hours of work by a pair of bullock and a man required operating this bullock pair.

i) Manure: Manure was according to prevailing market rates during period of study. Manures were charged at Rs. 150 per ton in the study area.

j) Fertilizers

Fertilizers were charged according to prevailing market rates during period of study. Fertilizers were charged at Rs.5/kg, Rs.10/kg and Rs.5 for Urea, DAP and SSP. Biofertilizer (Rhizobium culture) was charged at Rs. 20/200gm packet.

k) Family labour

Family labour cost was calculated on the basis of charges paid to hired labour.

l) Hiring charges of machines works

Hiring charges of machines works was calculated based on actual cost incurred in hiring a machine like tractor.

m) Interest on working capital:

This was calculated on the entire working cost of the enterprise at the prevailing bank interest of 8 per cent per annum and was computed for the cropping period.

n) Fixed cost

The fixed cost is the cost associated with the owning of fixed resources which incurred on the fixed assets. The fixed cost includes rental value of land, land revenue, depreciation.

o) Rental value of land:

The prevailing land rents for agricultural enterprises were imputed for the sample, since all land holdings were observed to be owner operated.

p) Land revenue and other taxes

These were charged according to the actual payment incurred by the cultivators' i.e. Rs 4 per hectare

q) Interest on fixed capital:

Interest on fixed capital is the interest on the fixed cost and is calculated at 15 per cent per annum.

RESULTS

In consonance with the objectives of the study the data collected from primary and secondary sources were analyzed and interpreted. The results of the present study are presented in this chapter under the following headings.

4.1 Growth in Area, Production and Productivity of Minor Millets in North Karnataka

4.2 General Characteristics of Sample Respondents

4.3 Labour Utilization Pattern

4.4 Costs and Returns in the Cultivation of Minor Millets

4.5 Value Addition in Selected Products of Minor Millets

4.6 The Extent of Value Addition in Selected Products of Minor Millets

4.7 Socio Economic Characteristics of Minor Millets Consumers

4.8 Consumers Preference for Processed Products Of Minor Millets

4.1 Growth in Area, Production and Productivity of Minor Millets in North Karnataka

4.1.1 Little Millet Crop

Compound growth rates of area, production and productivity of little millet are computed for the all districts of North Karnataka and for Karnataka State as a whole for the period from 2001-02 to 2010-11 and are depicted in the Table 4.1.

It could be seen from the Table that negative growth in area was observed in all districts of north Karnataka, except Belgaum which showed a significant positive growth rate of nearly 10.29 per cent per annum. A negative and significant growth rate of Little millet in area was observed in Bagalkot, Bellary, Bidar, Gadag, Gulberga and Haveri districts. Dharwad districts showed negative and non significant growth rate.

With respect to production also the same trend was observed. Growth rate were negative in all districts except for Belgaum (13.67 per cent). There were significant negative growth rates in Little millet production in Bellary, Bidar, Gadag, Gulberga and Havery districts. However Dharwad district showed negative and non significant growth rate in production.

The productivity the growth rate of Little millet found to be positive and significant for Belgaum (5.02%) Dharwad (0.56%) and Haveri (0.14%) districts. Bagalkot (-0.83%), Bellary (-6.16%), Bidar (-0.67%) and Gulberga (-11.27%) districts showed negative growth rates and were statistically significant. For the state as a whole, Little millet registered a negative and significant growth rate of both area and production (-6.29 % and -7.94%). However, growth rate of productivity (0.06%) was positive but statistically non significant.

4.1.2 Foxtail Millet Crop

Results on growth in area, production and productivity of Foxtail millet crop during a period of 10 years (2001-02 to 2010-11) are presented in Table 4.2.

It could be seen from the Table that negative growth in area was observed in all districts of North Karnataka, except Belgaum which showed a positive growth rate of 0.70 per cent per annum but statistically non significant. A negative and significant growth rate of foxtail millet area was observed in the case of Bellary, Bidar, Bijapur, Dharwad, Gadag, Gulbarga, Haveri and Raichur districts.

The same trend was observed in case of production also a positive growth rate was observed only in Belgaum district (9.76 per cent) and it was significant. There were significant negative growth rates of Foxtail millet production in Bagalkot, Bellary, Bidar, Bijapur, Gadag, Gulberga, Havery and Raichur districts.

With respect to productivity also the same trend was observed. The growth rate was positive for Belgaum (9.33%) and statistically significant. Bagalkot (-1.99%), Bidar (-1.54%), Dharwad (-3.55%) and Gulbarga (-0.19%) districts showed negative growth rates but were

Table 4.1: Growth in Area, Production and Productivity of Little Millet Crop in North Karnataka during the Period 2001-02 to 2010-11

(Percent per annum)

Sl. No.	Districts	Compound Growth Rate		
		Area	Production	Productivity
1	Bagalkot	-16.78*	-2.49	-0.83*
2	Belgaum	10.29*	13.67*	5.02*
3	Bellary	-40.93**	-38.75**	-6.16**
4	Bidar	-22.27*	-21.53*	-0.67*
5	Dharwad	-3.96	-3.05	0.56*
6	Gadag	-12.88*	-17.33*	-0.62
7	Gulbarga	-13.27*	-24.64**	-11.27*
8	Haveri	-8.58*	-10.99**	0.14*
9	Karnataka state	-6.29*	-7.94**	0.06

Note: ** and * significant at one and five per cent level respectively

Table 4.2: Growth in Area, Production and Productivity of Foxtail Millet Crop in North Karnataka during the Period 2001-02 to 2010-11

(Percent per annum)

Sl. No.	Districts	Compound Growth Rate		
		Area	Production	Productivity
1	Bagalkot	-8.23	-8.53*	-1.99
2	Belgaum	0.70	9.76*	9.33*
3	Bellary	-13.32**	-15.32*	-4.23*
4	Bidar	-11.29**	-14.14*	-1.54
5	Bijapur	-35.33*	-37.25**	-37.32**
6	Dharwad	-19.69*	-27.46	-3.55
7	Gadag	-10.39*	-18.56**	-2.84*
8	Gulbarga	-13.52**	-14.12*	-0.19
9	Haveri	-13.97*	-12.60**	-0.37*
10	Koppal	-9.92	-8.13	-1.59*
11	Raichur	-30.47*	-31.61*	-2.44*
12	Karnataka state	-10.77**	-16.19*	-3.08*

Note: ** and * significant at one and five per cent level respectively

Table 4.3: Growth in Area, Production and Productivity of Bajra Crop in North Karnataka during the Period 2001-02 to 2010-11

(Percent per annum)

Sl. No.	Districts	Compound Growth Rate		
		Area	Production	Productivity
1	Bagalkot	4.97*	12.49*	-0.54
2	Belgaum	8.67*	20.77**	0.14*
3	Bellary	-1.29	-4.38*	-1.67*
4	Bidar	-0.03	-1.39	-2.84*
5	Bijapur	8.58**	16.50**	-1.37*
6	Gadag	-5.88*	-2.52	3.12*
7	Gulbarga	-5.07**	-3.78*	-1.16
8	Haveri	-43.84**	-31.67**	-1.69*
9	Koppal	6.68*	2.89*	1.65*
10	Raichur	0.60	3.30*	4.73**
11	Karnataka state	7.23**	7.67*	1.08*

Note: ** and * significant at one and five per cent level respectively

statistically non significant. In case of Karnataka state as a whole, growth rates in area (-10.77%), production (-16.19%) and productivity (-3.08%) of foxtail millet was negative and statistically significant.

4.1.3 Bajra Crop

Compound growth rates of area, production and productivity of bajra are computed for the all districts of North Karnataka and for Karnataka State as a whole for the period from 2001-02 to 2010-11 and are depicted in the Table 4.3.

It could be seen from results presented in the table that the growth in area of bajra was positive and significant for Bagalkot (4.97%), Belgaum (8.67%), Bijapur (8.58 per cent) and Koppal (6.68%) districts. On the other hand growth in area was negative and non significant for Bellary (-1.29%) and Bidar (-0.03%) districts. A negative and significant growth rate in area of bajra was observed in Gadag, Gulberga and Haveri districts.

With respect to production also the same trend was observed. Growth rate was positive and significant for Bagalkot, Belgaum, Bijapur, Koppal, and Raichur districts. While in Bellary, Gulberga and Haveri districts registered significant negative growth rates in production of Bajra.

The bajra productivity growth rates were positive for Belgaum (0.14%), Gadag (3.12%), Koppal (1.65%) and Raichure (4.73%) districts and were statistically significant. Bellary (-1.67%), Bidar (-2.84%), Bijapur (-1.37%), and Haveri (-1.69%) districts were showed negative growth rates and were statistically non significant but Bagalkote (-0.54 per cent) and Gulbarga (-1.16%) were non significant. In case of state as a whole, this registered a positive growth rate of area (7.23 %%) and production (7.67 %%) and productivity (1.08 %%) which found tobe were statistically significant.

4.2 General Characteristics of Sample Respondents

An understanding of general characteristics of sample farmers is expected to provide a bird's eye view of the general features prevailing in the study area. Therefore, an attempt has been made in the study to analyze some of the important characteristics of sample farmers.

The general characteristics of the respondents are presented in Table 4.4. It could be seen from the table that around 70 percent of little millet growers, 43.34 percent of Foxtail millet growers and 63.34 percent of bajra growers were in the age group of 25 to 45 years. With regard to educational status, relatively higher proportions of Foxtail millet growers (36.67%) were illiterates then followed by little millet growers (20%) and bajra growers (10%). The proportion of growers who have attained primary education was also higher in Foxtail millet growers (43.34%) than Little millet and bajra growers.

The practice of subsidiary occupation was little less among all the growers, as only about 30 percent of the farmers had subsidiary occupations like dairy or grocery merchant. Bajra growers had bigger size of land holdings (3.58 ha) than the little millet growers (2 ha) and Foxtail millet growers. Majority of the little millet growers (40%) had bore well irrigation followed by Foxtail millet (30%) and Bajra (26.67%) growers.

4.3 Labour Utilization Pattern

4.3.1 Little Millet Cultivation

Details on per hectare labour use pattern for different cultivation practices of Little millet cultivation are presented in Table 4.5. It could be observed from the table that farmers used 39.37 man days of men labour and 35.39 man days of women labour and 12.06 pair days of family bullock labour. It is interesting to note that even though farmers owned small sized holding but had their own bullock labour and none of them found to be hired bullock labour. There is no owned machine labour and hence hired 5.75 hours of machine labour in the production of Little millet. Out of the total men labour used (39.37 man days) 36.07 man days were family labour and 3.3 man days were hired, the respective figures for women labour were 24.35 mandays and 11.04 man days.

Table 4.4: General Characteristics of Sample Respondents

Sl. No	Particulars	Little millet growers (30)		Foxtail millet growers (30)		Bajra growers (30)	
		Number	Percent	Number	Percent	Number	Percent
I	Age (years)						
1	25-45	21	70	13	43.33	19	63.33
2	45 and above	9	30	17	56.67	11	36.67
II	Education						
1	Illiterate	6	20	11	36.67	3	10
2	Primary	15	50	13	43.33	18	60
3	Secondary	9	30	6	20	9	30
	Total	30	100.00	30	100.00	30	100.00
III	Main occupation						
	Agriculture	30	100.00	30	100.00	30	100.00
IV	Subsidiary occupation						
1	Dairy	7	23.34	11	36.67	3	10
2	Grocery merchant	2	6.67	0	0	1	3.33
3	No Subsidiary occupation	21	70	19	63.33	26	86.67
V	Land holdings (ha)						
1	Average dry area	1.53	76.5	3.02	94.08	3.42	95.53
2	Average irrigated area	0.47	23.50	0.19	5.92	0.16	4.47
	Total land holdings	2.00	100	3.21	100	3.58	100
VI	Source of irrigation						
1	Bore well	12	40	9	30	8	26.67

Table 4.5: Labour Utilization Pattern in Little Millet Cultivation

(Per hectare)

Sl. N	Labour operations	Frequency of operation	Family labour				Hired labour				Total			
			Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)
1	Ploughing	1	2.49	0	0	0	0	0	0	2.25	2.49	0	0	2.25
2	Harrowing	3	2.00	0	2.00	0	0	0	0	0	2.00	0	2.00	0
3	Transportation of FYM	1	2.68	1.26	1.47	0	0	0	0	3.50	2.68	1.26	1.47	3.50
4	Spreading of FYM	1	3.00	1.86	0	0	1.54	0.50	0	0	4.54	2.36	0	0
5	Fertilizer application	1	1.00	1.00	0	0	0	1.24	0	0	1.00	2.24	0	0
6	Sowing	1	3.25	0	2.76	0	0	0	0	0	3.25	0.00	2.76	0
7	Inter cultivation	3	4.00	0	3.86	0	0.76	0	0	0	4.76	0.00	3.86	0
8	Weeding	1	0	8.50	0	0	0	5.26	0	0	0	13.76	0	0
9	Harvesting	1	7.62	6.40	0	0	3.38	3.54	0	0	11.00	9.94	0	0
10	Threshing	1	4.96	1.08	1.97		1.00	0.50	0	0	5.96	1.58	1.97	0
11	Drying	1	1.83	0.25	0	0	0	0	0	0	1.83	0.25	0	0
12	Winnowing & bagging	1	3.24	4.00	0	0	0	0	0	0	3.24	4.00	0	0
	Total		36.07	24.35	12.06	0.00	3.3	11.04	0.00	5.75	39.37	35.39	12.06	5.75

Table 4.6: Labour Utilization Pattern in Foxtail Millet Cultivation

(Per hectare)

Sl. N	Labour operations	Frequency of operation	Family labour				Hired labour				Total			
			Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)
1	Ploughing	1	2.42	0	2.72	5.36	0	0	0	0	2.42	0	2.72	5.36
2	Harrowing	3	2.36	0	1.52	0	0	0	0	0	2.36	0	1.52	0
3	Transportation of FYM	1	3.50	2.50	2.50	3.20	0	0	0	1.64	3.50	2.50	2.50	4.84
4	Spreading of FYM	1	2.42	2.00	0	0	0	0	0	0	2.42	2.00	0	0
5	Fertilizer application	1	0.63	2.50	0	0	0	0	0	0	0.63	2.50	0	0
6	Sowing	1	3.00	0	2.50	0	0	0	0	0	3.00	0	2.50	0
7	Inter cultivation	3	6.50	0	2.50	0	1.25	0	1.35	0	7.75	0	3.85	0
8	Weeding	1	0	7.25	0	0	0	2.50	0	0	0	9.75	0	0
9	Harvesting	1	6.50	3.28	0	0	0	2.50	0	0	6.50	5.78	0	0
10	Threshing	1	2.58	4.00	1.50	0	0	2.00	0	0	2.58	6.00	1.50	0
11	Drying	1	1.25	0.58	0	0	0	0	0	0	1.25	0.58	0	0
12	Winnowing & bagging	1	1.21	1.25	0	0	0	0	0	0	1.21	1.25	0	0
	Total		32.37	23.36	13.24	8.56	1.25	7.00	1.35	1.64	33.62	30.36	14.59	10.2

Among the different operations in little millet cultivation, harvesting consumed the highest number of man days (11 md) followed by threshing (5.96 md), inter cultivation (4.76 md), spreading of FYM (4.54 md), sowing (3.25 md), winnowing and bagging (3.24 md), FYM transportation (2.68 md), ploughing (2.49 md), harrowing (2.00 md), drying (1.83 md) and fertilizer application (1.00 md). Whereas, woman labour used was the highest for weeding operation (13.76 md), followed by harvesting (9.94 md), winnowing and bagging (4 md), spreading of FYM (2.36 md), Fertilizer application (2.24 md), threshing (1.58 md), transportation of FYM (1.26 md) and drying (0.25 md) operations.

With respect to bullock labour use, inter cultivation operation consumed the highest (3.86 pair days) bullock labour followed by sowing (2.76 pair days), harrowing (2.00 pair days), threshing (1.97 pair days) and most of the farm operations were carried out by the family labour. The hired machine labour was used for the operations like transportation of FYM (3.50 hours) and ploughing (2.25 hours) operations.

4.3.2 Foxtail Millet Cultivation

The per hectare labour utilization pattern in Foxtail millet cultivation is presented in the Table 4.6. The bullock labour was used for the operations like intercultivation (3.85 pair days), ploughing (2.72 pair days), sowing (2.5 pair days), transportation of FYM (2.5 pair days), harrowing (1.52 pair days) and threshing (1.50 pair days). Most of the bullock labour used in Foxtail millet cultivation was family bullock labour. The machine labour was used for the operations like ploughing (5.36 hours) and transportation of FYM (4.84 hours). The selected total machine labour used per hectare was 10.2 hours. The total men labour used per hectare was 33.62 days and that of women labour was 30.36 days.

Among the different operations requiring men labour the use of man days was the highest for intercultivation (7.75 days) followed by harvesting (6.50 days), transportation of FYM (3.50 days), sowing (3.0 days) and threshing (2.58 days), spreading of FYM (2.42 days), ploughing (2.42 days), harrowing (2.36 days), drying (1.25 days), winnowing and bagging (1.21 days) and fertilizer application (0.63 days). On the other hand weeding (9.75 days), threshing (6.00 days), harvesting (5.78 days), transportation of FYM (2.5 days), fertilizer application(2.5 days) were the major operations carried out by women labour.

Even though Foxtail millet crop was cultivated on small and marginal lands, farmers hired men labourers for intercultivation (1.25 days), women labour for weeding (2.50 days), harvesting (2.5 days) and threshing (2 days) operations. Thus it was clear that the use of total men labour (33.62 days) was higher compared to the women labour (30.36 days).

4.3.3 Bajra Cultivation

Details on per hectare labour use pattern for different cultivation practices of bajra cultivation are presented in Table 4.7. It could be observed from the table that farmers used 35.72 men labour and 33.18 women labour and 10.95 pair days of owned bullock labour. So from the table we can notice that none of them found to be hired bullock labour. The machine labour was used for the operations like ploughing (1.86 hours) and transportation of FYM (6.31 hours). The total machine labour used per hectare was 8.17 hours. Out of the total (35.72 md) md used 32.96 md were family labour and 2.76 md were hired, the respective figures for women labour were 22.71 mandays and 10.47 md.

Among the different operations in Bajra cultivation, harvesting consumed the highest number of man days (8.92 md) followed by inter cultivation (4.88 md), threshing (4.08 md), ploughing (3.14 md), spreading of FYM (3.00 md), FYM transportation (2.50 md), sowing (2.50 md), winnowing and bagging (2.47 md), harrowing (1.75 md), drying (1.24 md) and fertilizer application (1.24 md), Whereas, woman labour use was the highest for weeding operation (13.42 md), followed by harvesting (9.12 md), Winnowing & bagging threshing (3.82 md) ,threshing (2.91days) spreading of FYM (1.77 md), transportation of FYM (1.00 md), Fertilizer application (1.00 md) and drying (0.14 md) operations.

With respect to bullock labour use, inter cultivation operation consumed the highest (3.69 pair days) bullock labour followed by ploughing (3.26 pair days), sowing (2.50 pair days), harrowing (2.00 pair days), transportation of FYM (2.00 pair days) and threshing (1.30 pair days). Most of the farm operations were carried out by the family labour. The hired labour use was seen only for operations like weeding, harvesting, spreading of FYM and threshing operations.

Table 4.7: Labour Utilization Pattern in Bajra Cultivation

(Per hectare)

Sl. N	Labour operations	Frequency of operation	Family labour				Hired labour				Total			
			Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)	Men (Man days)	Women (Man days)	Bullock Pair (pair days)	Machine labour (hours)
1	Ploughing	1	3.14	0	2.26	1.86	0	0	0	0	3.14	0	2.26	1.86
2	Harrowing	3	1.75	0	1.20	0	0	0	0	0	1.75	0	1.20	0
3	Transportation of FYM	1	2.50	1.00	0	2.84	0	0	0	3.47	2.50	1.00	0	6.31
4	Spreading of FYM	1	3.00	1.27	0	0	0	0.50	0	0	3.00	1.77	0	0
5	Fertilizer application	1	1.24	0	0	0	0	1.00	0	0	1.24	1.00	0	0
6	Sowing	1	2.50	0	2.50	0	0	0	0	0	2.50	0	2.50	0
7	Inter cultivation	3	4.12	0	3.69	0	0.76	0	0	0	4.88	0	3.69	0
8	Weeding	1	0	8.00	0	0	0	5.42	0	0	0	13.42	0	0
9	Harvesting	1	7.42	6.00	0	0	1.50	3.12	0	0	8.92	9.12	0	0
10	Threshing	1	3.58	2.48	1.30	0	0.50	0.43	0	0	4.08	2.91	1.30	0
11	Drying	1	1.24	0.14	0	0	0	0	0	0	1.24	0.14	0	0
12	Winnowing & bagging	1	2.47	3.82	0	0	0	0	0	0	2.47	3.82	0	0
	Total		32.96	22.71	10.95	4.7	2.76	10.47	0	3.47	35.72	33.18	10.95	8.17

Table 4.8: Costs and Returns in Little Millet Cultivation

(Per hectare)

Sl.No	Particulars	Amount (₹)	Percentage
I	Fixed costs		
1	Land revenue	30	0.34
2	Depreciation of farm implements	120.10	1.35
3	Rental value of the land	2500	28.29
4	Interest on fixed capital @ 9%	238.50	2.69
	Subtotal (I)	2888.60	32.70
II	Variable costs		
	A. Material Inputs		
1	Farm yard manure	278.34	3.15
2	Fertilizers	421.32	4.77
3	Seeds	120.00	1.36
	Subtotal A	819.66	9.28
	B. Labour costs		
1	Ploughing	593.12	6.71
2	Harrowing	410.67	4.65
3	Transportation of FYM	405.5	4.59
4	Spreading of FYM	250.00	2.82
5	Fertilizer application	65.00	0.73
6	Sowing	475.00	5.37
7	Intercultivation	773.26	8.75
8	Weeding	300.92	3.40
9	Harvesting	503.13	5.69
10	Threshing	550.72	6.24
11	Drying	60.00	0.68
12	Winnowing & bagging	150.29	1.70
13	Interest on working capital @11%	589.30	6.67
	Subtotal B	5126.91	58.02
	Total variable cost	5946.57	67.30
III	Total cost of cultivation	8835.17	100.00
	Cost of production (Rs. Per quintal)	1262.17	
IV	Returns		
	Main product (Qtl) X Price (₹) (7X2400)	16800	
	By product	526.00	
	Gross returns	17326	
	Net returns	8490.83	
V	Returns per rupee invested	1.96	

Table 4.9: Costs and Returns in Foxtail Millet Cultivation

(Per hectare)

Sl.No	Particulars	Amount (₹)	Percentage
I	Fixed costs		
1	Land revenue	30.00	0.32
2	Depreciation of farm implements	137.00	1.45
3	Rental value of the land	2800	29.67
4	Interest on fixed capital @ 9%	267.03	2.83
	Subtotal (I)	3234.03	34.26
II	Variable costs		
	A. Material Inputs		
1	Farm yard manure	312.34	3.30
2	Fertilizers	627.48	6.65
3	Seeds	110.38	1.17
	Subtotal A	1050.2	11.13
	B.Labour costs		
1	Ploughing	542.41	5.75
2	Harrowing	429.25	4.55
3	Transportation of FYM	583.56	6.18
4	Spreading of FYM	192.24	2.04
5	Fertilizer application	80.94	0.86
6	Sowing	420.00	4.45
7	Intercultivation	872.50	9.24
8	Weeding	278.62	2.95
9	Harvesting	493.48	5.23
10	Threshing	506.54	5.37
11	Drying	54.00	0.57
12	Winnowing & bagging	86.24	0.91
13	Interest on working capital @11%	614.89	6.51
	Subtotal B	5154.67	54.61
	Total variable cost	6204.87	65.73
III	Total cost of cultivation	9438.9	100.00
	Cost of production (Rs. Per quintal)	1048.77	
IV	Returns		
	Main product (Qtl) X Price (₹) (7.75X1400)	10850	
	By product	441.45	
	Gross returns	11291.45	
	Net returns	1852.55	
V	Returns per rupee invested	1.19	

4.4 Costs and Returns in the Cultivation of Minor Millets

4.4.1 Little Millet Cultivation

Per hectare costs and returns in little millet cultivation are depicted in Table 4.8. The results present in table revealed that variable costs accounted for major proportion (67.30%) of the total cost. Fixed costs like land revenue (0.34%), depreciation (1.35%), Rental value of the land (28.29%) and interest on fixed capital (2.69%) together accounted for 32.70 percent of the total cost.

Among the variable costs, the major share was accounted by the labour costs (58.02%) and the cost of material inputs (9.28%) accounted for very less proportion. Among the material inputs the highest cost incurred was on fertilizers (4.77%) followed by cost of farm yard manure (3.15%) and seeds (9.28%). Labour cost includes use of labour right from the preparation of land, application of inputs, harvesting, threshing, winnowing and bagging.

From the table it is clear that pre-sowing operations like ploughing, harrowing and FYM application together accounted for nearly 20 per cent of total cost of cultivation. Whereas sowing and post sowing operations like intercultivation, weeding constituted for 17.52 percent of the total cost of cultivation. Harvesting and post harvesting operations accounted for 14.31 per cent of total cost of cultivation. The per hectare total cost of cultivation of Little millet worked out to be Rs. 8,835.17, while the per quintal cost of cultivation worked out to be ₹ 1,262.17. Gross returns realized from one hectare of little millet grown by the sample farmers was ₹ 17326. The return per rupee spent in little millet cultivation was 1.96.

4.4.2 Foxtail Millet Cultivation

The details on per hectare costs and returns from Foxtail millet cultivation are given in the Table 4.9. It could be observed from the table that, variable cost accounted for around 65.73 percent of the total cost of cultivation, while fixed costs items like land revenue, depreciation, rental value of the land and interest on fixed capital together accounted for 34.26 percent of total cost of cultivation.

Variable cost includes two components viz., material input cost and labour cost. The share of material inputs cost was 11.13 percent of the total cost of cultivation. Among the material input costs, the cost of fertilizers (₹.627.48) was the highest followed by cost of farmyard manure (₹.312.34) and seeds (₹.110.38).

On the other hand, labour cost accounted for the lion share in the total cost of cultivation (54.61%). For pre sowing operations like ploughing (5.75%), harrowing (4.55%), transportation of FYM (6.18%) and spreading of FYM (2.04%). Sowing (4.45%) and post sowing operation like intercultivation, fertilizers application and weeding accounted for about 17 percent of the total cost of cultivation. The share of harvesting and post harvesting operations in the total cost of cultivation was nearly 12 percent.

Per hectare total cost of cultivation of Foxtail millet worked out to be ₹. 9,438.9 and per quintal cost of foxtail millet production worked out to be ₹.1,048.77. The gross returns realized from Foxtail millet cultivation was ₹.1,1291.45 per hectare. The return per rupee spent in Little millet cultivation was 1.19.

4.4.3 Bajra Cultivation

Per hectare costs and returns in Little millet cultivation are depicted in Table 4.10. The table revealed that variable costs accounted for major proportion (64.66%) of the total cost. Fixed costs like land revenue (0.30%), depreciation (1.31%), Rental value of the land (30.79%) and interest on fixed capital (2.92%) together accounted for 35.34 percent of the total cost.

Among the variable costs, the major share was accounted by the labour costs (52.66%) and the cost of material inputs (12%) accounted for very less proportion. Among the material inputs the highest cost incurred was on fertilizes (6.01%) followed by cost of farm yard manure (4.55%) and seeds (1.44%). Labour cost includes use of labour right from the preparation of land, application of inputs, harvesting, threshing, winnowing and bagging.

Table 4.10: Costs and Returns in Bajra Cultivation

(Per hectare)

Sl. No.	Particulars	Amount (₹)	Percentage
I	Fixed costs		
1	Land revenue	30.00	0.30
2	Depreciation of farm Implements	128.00	1.31
3	Rental value of the land	3000	30.79
4	Interest on fixed capital @ 9%	284.22	2.92
	Sub total (I)	3442.22	35.34
II	Variable costs		
	A. Material Inputs		
1	Farm yard manure	442.84	4.55
2	Fertilizers	585.62	6.01
3	Seeds	140.54	1.44
	Subtotal A	1169	12.00
	B.Labour costs		
1	Ploughing	675.34	6.93
2	Harrowing	454.25	4.66
3	Transportation of FYM	510.47	5.24
4	Spreading of FYM	196.52	2.01
5	Fertilizer application	82.00	0.84
6	Sowing	380.24	3.90
7	Intercultivation	824.25	8.46
8	Weeding	280.42	2.87
9	Harvesting	458.27	4.70
10	Threshing	493.42	5.06
11	Drying	58.00	0.59
12	Winnowing & bagging	92.23	0.95
13	Interest on working capital @11%	624.18	6.40
	Sub total B	5129.59	52.66
	Total variable cost	6298.59	64.66
III	Total cost of cultivation	9740.81	100.00
	Cost of production (Rs. Per quintal)	1145.98	
IV	Returns		
	Main product (Qtl) X Price (₹) (8.5X1475)	12537.5	
	By product	550.26	
	Gross returns	13087.76	
	Net returns	3346.95	
V	Returns per rupee invested	1.34	

Table 4.11: Structure of Processing Cost of Little Millet into Dehusked Rice and Flour

Sl. No.	Particulars	Amount (₹/year)	Amount (₹/ton)	Percentage (%)
A	Fixed cost			
1	Salaries to permanent employees	25,600	1,706.67	5.40
2	Depreciation cost	1,820	121.34	0.38
3	Others	200	13.34	0.042
4	Interest on fixed capital@ 9 %	2,485.8	165.72	0.52
	Sub Total	30,105.8	2,007.05	6.35
B	Variable Cost			
1	Cost of Raw materials (15 tons) purchased	3,00,000	20,000	63.31
2	Wages for labours	6,000	400	1.27
3	Cost of packing material	1,500	100	0.32
4	Power and fuel charges	15,000	1,000	3.17
5	Transportation cost	2,500	166.67	0.53
6	Office maintenance	500	33.34	0.10
7	Sales tax	11,000	733.34	2.32
8	Amortized value on investment	9,000	600	1.89
9	Interest on working capital at 11 %	38,005	2,533.67	8.02
	Total variable cost	4,43,716.6	29,581.11	93.65
	Total cost	4,73,822.4	31,588.16	100

Table 4.12: Economics of Processing of Little Millet into Dehusked Rice and Flour

Sl. No	Particulars	Unit	Dehusked Rice	Unit	Flour	Total
1	Quantity of little millet processed	Ton	10	Ton	5	15
2	Quantity produced	Ton	7.5	Ton	4	11.5
3	Price	₹/kg	56	₹/kg	60	
4	Total cost	₹/year	-	₹/year	-	4,73,822.4
5	Total cost	₹/ton	-	₹/ton	-	31,588.16
6	Gross return	₹/year	4,20,000	₹/year	2,40,000	6,67,000
7	Gross return per ton of little millet processed	₹/ton	42,000	₹/ton	60,000	44,466.67
8	Net return	₹/year	-	₹/year	-	1,93,177.6
9	Net return per ton of little millet processed	₹/ton	-	₹/ton	-	12,878.51
10	BC Ratio					1.40

From the table it is clear that pre-sowing operations like ploughing, harrowing and FYM application together accounted for nearly 20 percent of total cost of cultivation. Whereas sowing and post sowing operations like fertilizer application, intercultivation, weeding constituted for about 16 percent of the total cost of cultivation. Harvesting and post harvesting operations accounted for remaining 11 percent of total cost of cultivation. Per hectare total cost of cultivation of bajra worked out to be ₹. 9,740.81, while the per quintal cost of production worked out to be₹. 1,145.98.

Gross returns realized from one hectare of Bajra grown by the sample farmers was ₹ 13087.76. The return per rupee spent in Bajra cultivation was 1.34.

4.5 Value Addition in Selected Products of Minor Millets

The dosa mix, diabetic mix, instant energy food, dehusked rice and flour were the major value added products in the study area. Therefore, an attempt was made to examine the profitability of these products to facilitate in appropriate decision making by farmers on whether to go for value addition of minor millet or not.

4.5.1 Structure of Processing Cost and Returns from Little Millet into Dehusked Rice and Flour

The structure of costs incurred by processors in converting raw little millet into dehusked rice and flour is presented in Table 4.11. The total cost of processing of 15 tons of little millet into dehusked rice and flour worked out to ₹.4,73,822.4 per ton, out of which ₹.4,43,716.6 (93.65%) was towards variable inputs, while ₹.30,105.8 (6.35%) towards fixed inputs. It was worth noting that, among in variable cost, cost of raw material (₹.20000/ton) was more than half (63.31%) the total cost of processing. The other major components were interest on working capital (8.02%) followed by salaries to permanent employees (5.40%) and power and fuel charges (3.17%).

As indicated in Table 4.12, from 15 tons of raw Little millet processed, 7.5 tons of dehusked rice and 4 tons of flour were produced in the processing unit. The gross returns worked out to ₹ 4,20,000/- per year from dehusked rice and ₹.2,40,000/- per year from flour, considering average market price of ₹ 56 per kg of dehusked rice and ₹ 60 per kg of flour. Thus, the net returns per year amounted to ₹. 1,93,177.6/-. In other words, ₹.12,878.51 was obtained as net returns for every ton of Little millet processed into dehusked rice and flour. Further, for every rupee of investment in dehusked rice and flour of Little millet processing, about ₹ 1.40 was obtained as returns, indicating its profitability.

4.5.2 Structure of Processing Cost and Returns of Foxtail Millet into Dehusked Rice and Flour

The structure of costs incurred by processors in converting raw Foxtail millet into dehusked rice and flour presented in Table 4.13. The total cost of processing of 18 tons of foxtail millet into dehusked rice and flour in a year worked out to₹. 2,94,605.8 per ton, out of which ₹. 2,64,500 (89.78%) was towards variable inputs, while ₹.30,105.8 (10.21%) was on fixed inputs. It was worth nothing that, among variable cost, cost of raw material (₹.12000/ton) was more than half (73.32%) the total cost of processing. The other major component formed by interest on working capital (9.88%) followed by salaries to permanent employees (8.69%) and power and fuel charges (6.10).

As indicated in Table 4.14, from 18 tons of raw Foxtail millet processed, 9 tons of dehusked rice and 4.8 tons of flour were produced in the processing unit. The gross returns worked out to ₹. 2,70,000/- per year from dehusked rice and ₹.1,68,000/- per year from flour, considering average market price of ₹30 and 35 per kg of dehusked rice and flour. Thus, the net returns per year amounted to ₹.1,43,394.2/-. In other words, ₹.7,966.34 was obtained as net returns for every ton of foxtail millet processed into dehusked rice and flour. Further, for every rupee of investment in dehusked rice and flour of Foxtail millet processing, about ₹1.48 was obtained as returns, indicating its profitability.

4.5.3 Structure of Processing Cost and Returns of Little Millet into Instant Energy Food

The total cost incurred by processors in converting raw little millet into instant energy food (Table 4.15) was found to be ₹.5,15,249/- in each year. In other words, ₹.1,03,049.9/- was incurred per ton of Little millet into instant energy food, out of which ₹. 96,015 (93.27%) formed by variable cost, while ₹. 7,034.86 (6.72%) formed fixed cost per ton of little millet processed.

Table 4.13: Structure of Processing Cost of Foxtail Millet into Dehusked Rice and Flour

Sl. No.	Particulars	Amount (₹/year)	Amount (₹/ton)	Percentage (%)
A	Fixed cost			
1	Salaries to permanent employees	25,600	1,422.23	8.69
2	Depreciation cost	1,820	101.12	0.62
3	Others	200	11.12	0.07
4	Interest on fixed capital@ 9 %	2,485.8	1,38.1	0.84
	Sub Total	30,105.8	1,672.54	10.21
B	Variable Cost			
1	Cost of Raw materials (18 tons) purchased	2,16,000	1,2000	73.32
2	Wages for labours	6,000	333.34	2.04
3	Power and fuel charges	18,000	1,000	6.10
4	Cost of packing material	1,500	83.34	0.50
5	Transportation cost	2,500	138.89	0.84
6	Office maintenance	500	27.78	0.17
7	Sales tax	11,000	611.12	3.73
8	Amortized value on investment	9,000	500	3.05
9	Interest on working capital at 11 %	29,095	1,616.38	9.88
	Total variable cost	2,64,500	14,694.44	89.78
	Total cost	2,94,605.8	16,366.99	100

Table 4.14: Economics of Processing of Foxtail Millet into Dehusked Rice And Flour

Sl. No	Particulars	Unit	Dehusked Rice	Unit	Flour	Total
1	Quantity of foxtail millet processed	Ton	12	Ton	6	18
2	Quantity produced	Ton	9	Ton	4.8	-
3	Price	₹/kg	30	₹/kg	35	-
4	Total cost	₹/year	-	₹/year	-	2,94,605.8
5	Total cost	₹/ton	-	₹/ton	-	16,366.99
6	Gross return	₹/year	2,70,000	₹/year	1,68,000	4,38,000
7	Gross return per ton of foxtail millet processed	₹/ ton	22,500	₹/ton	28,000	24,333.34
8	Net return	₹/year	-	₹/year	-	1,43,394.2
9	Net return per ton of foxtail millet processed	₹/ton	-	₹/ton	-	7,966.34
10	BC Ratio					1.48

Table 4.15: Structure of Processing Cost of Little Millet into Instant Energy Food

Sl. No.	Particulars	Amount (₹/year)	Amount (₹/ton)	Percentage (%)
A	Fixed cost			
1	Salaries to permanent employees	30,000	6,000	5.73
2	Depreciation cost	2,070	414	0.39
3	Others	200	40	0.04
4	Interest on fixed capital@ 9 %	2,904.3	580.86	0.55
	Sub Total	35,174.3	7,034.86	6.72
B	Variable Cost			
1	Cost of Raw materials (5 tons) purchased	1,00,000	20,000	19.11
2	Wages for labours	7,500	1,500	1.43
3	Cost of packing material	18,000	3,600	3.44
4	Power and fuel charges	5,500	1,100	1.05
5	Transportation cost	9,000	1,800	1.72
6	Office maintenance	500	100	0.09
7	Sales tax	12,400	2,480	2.37
8	Skimmed milk powder	2,31,000	46,200	28.68
9	Soybean flour	32,000	6,400	22.94
10	Sugar	1,020	204	0.19
11	Amortized value on investment	15,580	3,116	2.98
12	Interest on working capital at 11%	47,575	9,515	9.24
	Total variable cost	4,80,075	96,015	93.27
	Total cost	5,15,249	1,03,049.9	100

The cost of skimmed milk powder formed major component of total processing cost (₹. 46200/ton) of instant energy food (28.68%) followed by cost of soybean flour (22.94%), cost of raw materials (19.11%), interest on working capital (9.24%) and salaries to permanent employees (5.73%).

Table 4.16 shows; whole of raw little millet (5 ton) was used for preparation of instant energy food (6.25 tons /year). The gross returns worked out to ₹. 9,37,500/- per year from instant energy food, considering average market price of ₹150 per kg of instant energy food. Thus, the net returns per year amounted to ₹. 4,22,251/-. In other words, ₹. 84,450.1 was obtained as net returns for every ton of little millet processed into instant energy food. The benefit cost ratio was high (1.82) showing the profitability of converting little millet into instant energy food.

4.5.4 Processing Cost and Returns of Foxtail Millet into Instant Dosa Mix

The total cost incurred by processors in converting raw Foxtail millet into instant dosa mix (Table 4.17) was found to be ₹. 4,90,243/- in each year. In other words, ₹. 49,024.3/- was incurred per ton of Foxtail millet into dosa mix, out of which ₹. 44,186.88 (90.13%) formed variable cost, while ₹. 4837.42 (9.87%) formed fixed cost per ton of Foxtail millet processed. The cost of raw materials purchased formed major component of total processing cost (₹. 14000/ton) of dosa mix (28.55%) followed by cost of black gram dhal (25.49%), interest on working capital (8.93%), cost of dicoccum wheat flour (8.57%) and salaries to permanent employees (8.57%).

Table 4.18 shows; whole of raw Foxtail millet (10 ton) was used for preparation of dosa mix (11.5 tons /year). The gross returns worked out to₹. 9,77,500/- per year from instant dosa mix, considering average market price of₹ 85 per kg of dosa mix. Thus, the net returns per year amounted to ₹. 4,87,257/-. In other words, ₹. 48,725.7 was obtained as net returns for every ton of Foxtail millet processed into instant dosa mix. The benefit cost ratio was high (1.99) showing the profitability of converting foxtail millet into instant dosa mix.

4.5.5 Structure of Processing Cost and Returns of Foxtail Millet into Diabetic Mix

The total cost incurred by processors in converting raw Foxtail millet into diabetic mix (Table 4.19) was found to be ₹. 8,17,263.4/- in each year. In other words, ₹. 40,863.17/- was incurred per ton of Foxtail millet into diabetic mix, out of which ₹. 39,388.4 (96.39%) formed variable cost, while ₹. 1,474.77 (3.60%) formed fixed cost per ton of Foxtail millet processed. The cost of raw material (₹ 12000/ton) was (29.36%) the total cost of processing. The other major components were of black gram dhal (31.81%), cost of masala powder (24.47%), and salaries to permanent employees (3.05%).

Table 4.20 shows; use of raw Foxtail millet (20 ton) was used for preparation of diabetic mix (20.4 tons /year). The gross returns worked out to ₹. 22,03,200/- per year from diabetic mix, considering average market price of Rs. 108 per kg of diabetic mix. Thus, the net returns per year amounted to ₹. 13,85,936.6/-. In other words, ₹. 69,296.83 were obtained as net returns for every ton of Foxtail millet processed into diabetic mix. Further, for every rupee of investment in diabetic mix of Little millet processing, about ₹.2.69 was obtained as returns, indicating its profitability.

4.6 The Extent of Value Addition in Selected Products of Minor Millets

Table 4.21 reveals the extent of value addition in selected products of minor millets. It could be observed from the table that, in case of dehusked rice and flour of Foxtail millet, the cost of processing, value added due to processing and the net value addition were ₹ 1636.70/Kg, ₹ 1974/Kg and ₹ 337.3/Kg, respectively. For dehusked rice and flour of Little millet, the cost of processing, value added due to processing and the net value addition was ₹ 3158.82/kg, ₹ 3,739/kg and ₹ 580.18/Kg respectively.

In case of instant energy food, the cost of processing, value added due to processing and the net value addition was ₹ 10305, Rs. 13000 per kg and ₹ 2695 per Kg respectively. For instant dosa mix, the cost of processing, value added due to processing and the net value addition was ₹ 4903/kg, ₹ 7100/kg and ₹ 54.12 per kg respectively. In case of diabetic mix, respective figures were ₹ 4087, ₹ 9600 per kg and ₹ 5513 per kg.

Further, it can be seen from the table that, the highest amount of value addition among all selected products of minor millets was in case of diabetic mix (₹.5513) followed by instant energy food (₹ 2695) and instant dosa mix (₹ 2197). The least amount of value addition was in case of dehusked rice and flour of Foxtail millet (₹ 337.3) and also in case of dehusked rice and flour of Little millet (₹ 580.18).

Table 4.16: Economics of Processing of Little Millet into Instant Energy Food

Sl.No	Particulars	Instant Energy Food
1	Quantity of little millet processed (tons)	5
2	Quantity produced (tons)	6.25
3	Price (₹/kg)	150
4	Total cost (₹/year)	5,15,249
5	Total cost (₹/ton)	1,03,049.9
6	Gross return (₹/year)	9,37,500
7	Gross return per ton of little millet processed (₹/ton)	1,87,500
8	Net return (₹/year)	4,22,251
9	Net return per ton of little millet processed (₹/ton)	84,450.1
10	BC Ratio	1.82

Table 4.17: Structure of Processing Cost of Foxtail Millet into Instant Dosa Mix

Sl. No.	Particulars	Amount (₹/year)	Amount (₹/ton)	Percentage (%)
A	Fixed cost			
1	Salaries to permanent employees	42,000	4,200	8.57
2	Depreciation cost	2,180	218	0.44
3	Others	4,200	20	0.04
4	Interest on fixed capital@ 9 %	3,994.2	399.42	0.81
	Sub Total	48,374.2	4,837.42	9.87
B	Variable Cost			
1	Cost of Raw materials (10 tons) purchased	1,40,000	1,4000	28.55
2	Wages for labours	8,000	800	1.63
3	Cost of packing material	18,000	1,800	3.67
4	Power and fuel charges	10,000	1,000	2.04
5	Transportation cost	10,000	1,000	2.04
6	Office maintenance	500	50	0.10
7	Sales tax	10,500	1,050	2.14
8	Black gram dhal	1,25,000	12,500	25.49
9	Rice flour	12,000	1,200	2.44
10	Dicoccum wheat flour	42,000	4,200	8.57
11	Amortized value on investment	22,080	2,208	4.50
12	Interest on working capital at 11 %	43,788.8	4,378.88	8.93
	Total variable cost	4,41,868.8	44,186.88	90.13
	Total cost	4,90,243	49,024.3	100

Table 4.18: Economics of Processing of Foxtail Millet into Instant Dosa Mix

Sl. No	Particulars	Dosa mix
1	Quantity of foxtail millet processed(tons)	10
2	Quantity produced (tons)	11.5
3	Price (₹/kg)	85
4	Total cost (₹/year)	4,90,243
5	Total cost (₹/ton)	49,024.3
6	Gross return (₹/year)	9,77,500
7	Gross return per ton of foxtail millet processed (₹/ton)	97,750
8	Net return (₹/year)	4,87,257
9	Net return per ton of foxtail millet processed (₹/ton)	48,725.7
10	BC Ratio	1.99

Table 4.19: Structure of Processing Cost of Foxtail Millet into Diabetic Mix

Sl. No.	Particulars	Amount (₹/year)	Amount (₹/ton)	Percentage (%)
A	Fixed cost			
1	Salaries to permanent employees	25,000	1,250	3.05
2	Depreciation cost	1,860	93	0.23
3	Others	200	10	0.02
4	Interest on fixed capital@ 9 %	2,435.4	121.77	0.29
	Sub Total	29,495.4	1,474.77	3.60
B	Variable Cost			
1	Cost of Raw materials (20 tons) purchased	2,40,000	12,000	29.36
2	Wages for labours	6,500	325	0.79
3	Cost of packing material	18,000	900	2.20
4	Power and fuel charges	9,500	475	1.16
5	Transportation cost	10,500	525	1.28
6	Office maintenance	500	25	0.06
7	Sales tax	12,000	600	1.47
8	Black gram dhal	2,60,000	13,000	31.81
9	Masala powder	2,00,000	10,000	24.47
10	Amortized value on investment	21,350	1,067.5	2.61
11	Interest on working capital at 11%	9,418.03	470.90	1.15
	Total variable cost	7,87,768	39,388.4	96.39
	Total cost	8,17,263.4	40,863.17	100

Table 4.20: Economics of Processing of Foxtail Millet into Diabetic Mix

Sl. No	Particulars	Diabetic mix
1	Quantity of foxtail millet processed(tons)	20
2	Quantity produced (tons)	20.4
3	Price (₹/kg)	108
4	Total cost (₹/year)	8,17,263.4
5	Total cost (₹/ton)	40,863.17
6	Gross return (₹/year)	22,03,200
7	Gross return per ton of foxtail millet processed (₹/ton)	1,10,160
8	Net return (₹/year)	13,85,936.6
9	Net return per ton of foxtail millet processed (₹/ton)	69,296.83
10	BC Ratio	2.69

Table 4.21: Net Value Addition in Selected Products of Minor Millets

(₹ /quintal)

Sl. No.	Products	Particulars	Values
1	Dehusked rice and flour of Foxtail millet	Sale Price	3,174
		Purchase Price of raw materials	1,200
		Value Added due to processing	1974
		Cost of processing	1,636.70
		Net value Addition	337.3
2	Dehusked rice and flour of Little millet	Sale Price	5,739
		Purchase Price of raw materials	2,000
		Value Added due to processing	3,739
		Cost of processing	3,158.82
		Net value Addition	580.18
3	Instant energy food from Little millet	Sale Price	15,000
		Purchase Price of raw materials	2,000
		Value Added due to processing	13,000
		Cost of processing	10,305
		Net value Addition	2,695
4	Instant dosa mix from Foxtail millet	Sale Price	8,500
		Purchase Price of raw materials	1,400
		Value Added due to processing	7,100
		Cost of processing	4,903
		Net value Addition	2,197
5	Diabetic mix from Foxtail millet	Sale Price	10,800
		Purchase Price of raw materials	1,200
		Value Added due to processing	9,600
		Cost of processing	4,087
		Net value Addition	5,513

4.7 Socio Economic Characteristics of Minor Millets Consumers

The information on socio-economic characteristics of minor millet consumers are presented in Table 4.22 which clearly indicated that majority of the sample farmers were belong to the age group above 45 years (58.34%). It is interesting to note that nearly 5 percent of the sample respondents were illiterates. However, the High school educated consumers (31.67%) were the highest followed by primary school (23.34%), college level (21.67%) and secondary school educated (18.34%). Most of the consumers were from urban area (70%) than rural area (30%). Among all sample respondents majority of people are government employees (31.67%) followed by private employees (23.34%), business people (18.34%) and retired employees (15%).

Most of the consumers were belong to middle income group (60%) followed by low income group and high income groups. Nuclear type of family (78.34%) was generally observed as compared to joint type of family (21.67%). Among all the consumers vegetarians (80%) were more than non vegetarians (20%).

4.8 Consumers Preference for Processed Products Of Minor Millets

The preferences for processed products of minor millets among the sample consumers are provided in the Table 4.23.

Garret test is applied by giving ranks for the minor millet products; hurakki holige was the major product preferred by the most of the consumers, so this product got assigned first rank followed by chakli (II), pappad (III), roti (IV), dosa mix (V), laddu (VI), khakra (VII), malt (VIII),noodles/vermicelli (IX), diabetic mix (X), instant energy food (XI), flour (XII), milled grains (XIII).

Table 4.22: Socio-economic Characteristics of Minor Millet Consumers

N=60

Sl.No	Particulars	Number	Percent
I	Age (years)		
1	25-45	25	41.67
2	45 and above	35	58.34
II	Education		
1	Illiterate	3	5
2	Primary	14	23.34
3	Secondary	11	18.34
4	High school	19	31.67
5	College	13	21.67
	Total	60	100
III	Location		
1	City	42	70
2	Village	18	30
IV	Occupation		
	Agriculture	7	11.67
	Govt. employee	19	31.67
	Private employee	14	23.34
	Retired employee	9	15
	Business	11	18.34
	Labourer	0	0
V	Monthly Income (Rs)		
A	Low income group (less than 11,375)	15	25
B	Middle income group (11,375-23,125)	36	60
C	High income group (more than 23,125)	9	15
VI	Type of Family		
1	Joint	13	21.67
2	Nuclear	47	78.34
VII	Food habit		
1	Vegetarian	48	80
2	Non- Vegetarian	12	20

Table 4.23: Consumers preference for processed products of minor millets

Sl.No	Products	Mean	Rank
1	Hurakki Holige	81.17	I
2	Chakli	80.13	II
3	Pappad	79.83	III
4	Roti	79.17	IV
5	Dosa mix	78.52	V
6	Laddu	78.17	VI
7	Khakra	78.08	VII
8	Malt	77.55	VIII
9	Noodles/Vermicelli	76.85	IX
10	Diabetic mix	75.17	X
11	Instant Energy food	74.83	XI
12	Flour	73.44	XII
13	Milled grains	68.12	XIII

DISCUSSION

In the present chapter the results of the study are discussed under the following headings.

5.1 District wise growth of area, production and productivity of minor millets in North Karnataka

5.2 General characteristics of sample respondents

5.3 Labour utilization pattern

5.4 Costs and returns in the production of minor millets

5.5 Cost of value addition of different products of minor millets

5.6 The extent of value addition in selected products of minor millets

5.7 Socio economic characteristics of minor millets consumers

5.8 Consumers preference for processed products of minor millets

5.1 District Wise Growth of Area, Production and Productivity of Minor Millets in North Karnataka

5.1 Growth in Area, Production and Productivity

Compound growth rate is a useful tool in assessing the growth performance of any crop, industry or firm under consideration. Accordingly, in the present study compound growth rates were used to study the growth pattern of Little millet, Foxtail millet and Bajra cultivation for the all districts of North Karnataka and also for the Karnataka state as a whole.

5.1.1 Little Millet

The growth in little millet area was found to be negative and significant for Bagalkot, Bellary, Bidar, Gadag, Gulberga and Haveri districts as well as state as a whole. This decline in area may be attributable to recent shift in cultivation from little millet to soybean especially in Haveri district. It was also observed from the raw data that there was continuous decline in the area of Little millet in all districts of North Karnataka as well as for the state as a whole. The decline in growth of Little millet area resulted in negative growth in production also.

Compound growth rate of productivity was negative and statistically non-significant for Gadag district and for the state as a whole, there was positive growth rate and statistically non significant. However from the growth rates it is clear that decline in area had significant effect on production. But positive growth in productivity had offset by the negative growth in production to same extent.

5.1.2 Foxtail Millet

With regard to Foxtail millet crop, the growth in area, production and productivity was negative for all the districts of North Karnataka except Belgaum. This indicated decline in the production was due to decline in both area and productivity. Further, from the raw data it was observed that there was a continuous declining trend in area. However in Bagalkot and Koppal districts the declining trend of yield was non-significant. For the state as a whole there was a significant declining trend of area and production and productivity. The decline in Foxtail millet production was more attributed to decline in area than the decline in its productivity.

5.1.3 Bajra

The growth in bajra area was found to be negative and significant for Gadag, Gulberga and Haveri districts. This decline in area may be attributable to recent shift in cultivation from Bajra to soybean. The decline in growth of Bajra area resulted in negative growth in production also.

Compound growth rate of productivity was negative and statistically non-significant for Bagalkot and Gulbarga districts. However from the growth rates it is clear that decline in area had significant effect on production. Even with positive growth in productivity was offset by negative growth in area resulted in decline in production.

5.2 General Characteristics of Sample Respondents

The general characteristics of the sample farmers presented in Table 4.4 indicated that the around 70 per cent of Little millet growers, 43.34 per cent of Foxtail millet growers and 63.34 per cent of Bajra growers were in the middle age group (25 to 45 years). It is clear from that Little millet growers were found to be little younger than Bajra and Foxtail millet growers. With regard to educational status, the higher proportions of Foxtail millet growers were illiterate followed by Bajra growers and Little millet growers. It was noticed that majority of the farmers were literates. Literacy level of sample respondents ranged from primary to secondary school level. The practice of subsidiary occupation was little less among both the growers may be due to their lower economic status and more over even for dairy enterprise these crops may not provide succulent fodder to the milch animals.

Minor millet crops have relatively higher resistance to drought condition and hence they were grown under rain fed conditions during *kharif* season. Among all the growers higher proportion was noticed t for Bajra growers (95.53 %), followed by Foxtail millet growers (94.08 %) and Little millet growers (76.5 %).

5.3 Labour Utilization Pattern

5.3.1 Little Millet Production

Per hectare labour use pattern for different cultivation practices in Little millet cultivation (Table 4.5) revealed that farmers used 39.37 man days of men labour and 35.39 man days of women labour, 12.06 pair days of bullock labour and 5.75 hours of machine labour. It is interesting to note that even though farmers owned small sized holding but had their own bullock labour and none of them found to be using hired bullock labour.

In the total men labour use (39.37 man days) 36.07 man days were family labour and 3.3 man days were hired, the respective figures for women labour were 24.35 man days and 11.04 labour days. Among the different operations in Little millet production, harvesting operation consumed the highest man days (11 man days) followed by threshing, inter cultivation, spreading of FYM, sowing, winnowing and bagging, FYM transportation, ploughing, harrowing, drying and fertilizer application. Woman labour used was the highest for weeding operation followed by harvesting, winnowing and bagging, spreading of FYM, fertilizer application, threshing, transportation of FYM and drying operations.

With respect to bullock labour use, inter cultivation operation consumed the highest bullock labour followed by sowing, harrowing, threshing and most of the farm operations were carried out by the family labour. The hired machine labour was used for the operations like spreading of FYM and ploughing operations.

5.3.2 Foxtail Millet Cultivation

The per hectare labour utilization pattern in Foxtail millet cultivation depicted in Table 4.6 showed that the operations like intercultivation, ploughing, sowing, transportation of farm yard manure, harvesting and threshing were the major operations using bullock labour. Most of the bullock labour used in foxtail millet production was family bullock labour except 1.35 pair days of hired bullock labour that too used for intercultivation operation. The total machine labour used per hectare was 10.2 hours. The composition of labour use revealed that use of total men labour was higher compared to the women labour. The total men labour used per hectare was 34.62 md and that of women days was 30.36 md.

Among the different operations the use of men days was the highest for intercultivation (7.75 md) followed by harvesting (6.50 md), transportation of FYM (3.50 md), sowing (3.0 md) and threshing (2.58 md), spreading of FYM (2.42 md), ploughing (2.42 md), harrowing (2.36 md), drying (1.25 md), winnowing and bagging (1.21 md) and fertilizer application (2.5 md). On the other hand weeding, threshing, harvesting, transportation of FYM, fertilizer application were the major operations carried out by women labour. Sample farmers hired men labour during pesk crop season like intercultivation (1.25 days), women labour for weeding (2.50 days), harvesting (2.5 days) and threshing (2.0 days) operations, as there is need to carry out the various farm operations well within the stipulated period of time, otherwise delay in any operations, may drastically reduce the yield levels and taking up of crops in succeeding season.

5.3.3 Bajra Cultivation

Per hectare labour use pattern for different cultivation practices in Little millet production (Table 4.7) revealed that farmers used 35.72 man days of men labour and 33.18 man days of women labour, 10.95 pair days of bullock labour and 8.17 hours of machine labour. It is interesting to note that even though farmers owned small sized holding but had their own bullock labour and none of them found to be using hired bullock labour.

In the total men labour use (35.72 (6.50 md)) 32.96 man days were family labour and 2.76 man days were hired, the respective figures for women labour were 22.71 man days and 10.47 man days. Among the different operations in Bajra cultivation, harvesting consumed the highest number of man days (8.92 (6.50 md)) followed by inter cultivation (4.88 md), threshing (4.08 (6.50 md)), ploughing, spreading of FYM, FYM transportation, sowing, winnowing and bagging, harrowing, drying and fertilizer application, Whereas, woman labour use was the highest for weeding operation (13.42 (6.50 md)), followed by harvesting, winnowing & bagging threshing , threshing spreading of FYM, transportation of FYM, fertilizer application and drying operations.

With respect to bullock labour use, inter cultivation operation consumed the highest bullock labour followed by ploughing, sowing, harrowing, transportation of FYM and threshing. Most of the farm operations were carried out by the family labour. The hired labour use was seen only for operations like weeding, harvesting, spreading of FYM and threshing operations during peak crops seasons.

5.4 Costs and Returns in the Cultivation of Minor Millets

5.4.1 Little Millet Cultivation

Per hectare cost of cultivation of Little millet worked out to be Rs. 8,835.17, which included fixed cost and variable costs. Fixed cost worked out to be very meager as this is a dry land crop and doesn't require much of the investment. Among the variable costs, labour cost, this accounted for lion share, as it included number of labour intensive operations like, inter cultivation, weeding, harvesting and post harvesting operations.

The cost of material inputs included only seeds, fertilizer and farm yard manure. None of the farmers incurred the expenditure either on plant protection chemicals or seed treating materials, as little millet is a hardy crop. The cost of material input worked out to be less. The major reasons for this phenomenon are most of the farmers have used their own seeds, and very less application of fertilizer and farmyard manure.

It could be observed from the results presented in previous chapter, farmers used less quantity of fertilizer and manures for Little millet crop, as is purely grown under rain fed condition. Accordingly the cost of production worked out to be modest of ₹ 1,262.17 per quintal. The gross return worked out to be just over the total cost of cultivation. The benefit- cost ratio of 1.96 indicated the profitability of cultivation of Little millet in the study area especially under rain fed condition.

5.4.2 Foxtail Millet Cultivation

The total cost of cultivation of Foxtail millet worked out to be ₹ 9,438.9 per hectare, of which the fixed cost accounted for the meager proportion (34.26 %) as this was grown on almost marginal lands and doesn't require much of fixed cost. The variable cost which accounted for chunk proportion of total cost. However, of the variable cost, major proportion was accounted for the labour cost for various labour intensive operations like weeding, intercultivation, harvesting and post harvesting.

Material input costs included were that on farm yard manure, fertilizer and seeds which together accounted for only 11.13 per cent of the total cost of cultivation. None of the farmers used plant protection measures due to its hardy nature and as none of the farmer, reported the infestation of pests and diseases. Lower amount of material inputs cost was due to usage of farm grown seeds and lower quantity of farm yard manure and also very less quantity of fertilizer application.

Gross returns from foxtail millet cultivation worked out to be ₹ 11,291.45 per hectare, which was just sufficient to cover the cost of cultivation. However, the benefit- cost ratio of 1.19 indicated its feasibility of cultivation in the rainfed areas.

5.4.3 Bajra Cultivation

Per hectare cost of cultivation of bajra worked out to be Rs. 9,740.81, which included fixed cost and variable costs. Fixed cost worked out to be very meager as this is a dryland crop and doesn't require much of the investment. Among the variable costs, labour cost, this accounted for lion share, as it included number of labour intensive operations like intercultivation, weeding, harvesting and post harvesting operations.

The cost of material inputs included only seeds, fertilizer and farm yard manure. None of the farmers incurred the expenditure on plant protection chemicals, as bajra is a hardy crop. In overall, the cost of material input worked out to be less. The major reasons for this phenomenon are most of the farmers have used their own seeds, and very less application of fertilizer and farmyard manure.

It could be observed that farmers used less quantity of fertilizer and manures for Bajra crop, as Bajra is purely grown under rainfed condition. Accordingly the cost of production worked out to be modest of ₹ 1,145.98 per quintal. The gross return worked out to be just over the total cost of cultivation. However, the benefit- cost ratio of 1.34 indicated its feasibility of cultivation in the rain fed areas.

5.5 Cost of Value Addition of Selected Products of Minor Millets

5.5.1 Structure of Processing Cost and Returns of Little Millet into Dehusked Rice and Flour

In case of processing of Little millet into dehusked rice and flour, salaries paid to employees was the major component in the fixed cost though there were only two employees, one was working as technical assistant and the other person as helper. The investment cost on machinery including huller and grinder was found to be moderate with ₹ 30,105.8/-. However, sales tax appears to be higher considering the value added product having nutritional importance. As suggested earlier, it is suggested to rationalize the sales tax on minor millet value added products to encourage this industry.

During the survey, it was noticed that the capacity of processing unit was 30 tons of little millet per year. However, due to lack of demand for millet product in the market, the processing was restricted to 15 tons of Little millet per year for making 7.5 tons of dehusked rice and 4 tons of flour. The conversion ratio in converting Little millet to dehusked rice (1:0.75) indicates that from 1 kg little millet, one can make 750 grams of dehusked rice and then 800 grams of flour (1:0.8). The gross returns worked out to ₹ 4,20,000 per year from dehusked rice and ₹ 2,40,000 per year from flour, considering average market price of ₹ 56 per Kg of dehusked rice and ₹ 60 per kg of flour. The total net returns per year from dehusked rice and flour together amounted to ₹ 1,93,177.6/-, while per ton it worked out to ₹ 12,878.51/-. Since there is not much demand for all the types of millet value added products, the awareness on nutritional importance of them needs and to be carried out to consumers. For every rupee of investment in dehusked rice and flour of little millet processing, about ₹ 1.40 was obtained as returns, indicating its profitability.

5.5.2 Structure of Processing Cost and Returns of Foxtail Millet into Dehusked Rice and Flour

Minor millets processing units does not require huge initial investment when compared to other processing units. More over the gestation period is also less. It requires 2-3 months time to set up the plant and the processing can be initiated immediately once the required quantity of raw material is procured.

In the present study, the existing two minor millets processing units involved in production of products such as dosa mix, diabetic mix, instant energy food, dehusked rice and flour were selected for the detailed study. The processing units were working for 8 hours in a day and 240 days in a year.

The main cost component of fixed costs in processing of Foxtail millet into dehusked rice and flour (Table 4.13) was salaries to permanent employees (₹ 25600/year). In the salaries to permanent employees, three employees were involved, one technical person who operates the machine and two helpers.

The permanent employees of the processing unit are trained to take up the present job and hence need to be paid suitably. The other major cost component of variable cost incurred was the cost of raw material (₹. 216000/year). Sales tax which they use to pay in the form of value added tax (VAT) at the rate of four per cent. The major component of variable cost was on interest on working

capital. As indicated in results chapter, from 18 tons of raw foxtail millet processed, 9 tons of dehusked rice and 4.8 tons of flour were produced. The gross returns worked out to ₹. 2,70,000 per year from dehusked rice and ₹. 1,68,000 per year from flour, considering average market price of ₹. 32.5 per Kg of dehusked rice and flour. The total net returns per year from dehusked rice and flour together amounted to ₹. 1,43,394.2/-, while per ton it worked out to ₹ 7,966.34/-. Thus, for every rupee of investment in dehusked rice and flour of foxtail millet processing, about ₹ 1.48 was obtained as returns, indicating its profitability.

5.5.3 Structure of Processing Cost and Returns of Little Millet into Instant Energy Food

In case of processing of Little millet into instant energy food, salaries paid to employees was the major component in the fixed cost though there were only two employees, one women and men. The investment cost on machinery including huller and grinder was found to be moderate with ₹ 35,174.3/-. However, sales tax appears to be higher considering the value added product having nutritional importance. As suggested earlier, it is suggested to rationalize the sales tax on minor millet value added products to encourage this industry.

During the survey, it was noticed that the capacity of processing unit was 15 tons of Little millet per year. However, due to lack of demand for value added millet products in the market, the processing was restricted to 5 tons of little millet per year for making 6.25 tons of instant energy food. The gross returns worked out to ₹ 9,37,500 per year from instant energy food, considering average market price of ₹ 150 per Kg of instant energy food. The total net returns per year from instant energy food amounted to ₹. 4,22,251/-, while per ton it worked out to ₹. 84,450.1/- with benefit cost ratio (1.82) of more than one indicated processing of little millet into instant energy food is a profitable venture.

5.5.4 Structure of Processing Cost and Returns of Foxtail Millet into Instant Dosa Mix

The main cost component of fixed costs in processing of foxtail millet into instant dosa mix (Table 4.17) was salaries to permanent employees (₹. 42000/year). In the salaries to permanent employees, three employees were involved, one technical person who operates the machine and two helpers.

The permanent employees of the processing unit are trained to take up the present job and hence need to be paid suitably. The other major cost component of variable cost incurred was the cost of raw material (₹. 140000/year). sales tax which they use to pay in the form of value added tax (VAT) at the rate of 4 per cent. As presented in results chapter, from 10 tons of raw Foxtail millet processed, 11.5 tons of instant dosa mix was produced. The gross returns worked out to ₹. 9,77,500 per year from instant dosa mix, considering average market price of ₹. 85 per kg of instant dosa mix. The total net returns per year from instant dosa mix amounted to ₹. 4,87,257/-, while per ton it worked out to ₹. 48,725.7/- with benefit cost ratio (1.99) of more than one indicated processing of Foxtail millet into instant dosa mix is a profitable venture.

5.5.5 Structure of Processing Cost and Returns of Foxtail Millet into Diabetic Mix

The main cost component of fixed costs in processing of Foxtail millet into diabetic mix (Table 4.19) was salaries to permanent employees (₹. 25000/year). In the salaries to permanent employees, three employees were involved, one technical person who operates the machine and two helpers.

The permanent employees of the processing unit are trained to take up the present job and hence need to be paid suitably. The other major cost component of variable cost incurred was the sales tax which they use to pay in the form of value added tax (VAT) at the rate of 4 per cent. The major component of variable cost was on cost of raw materials. As indicated above, from 20 tons of raw Foxtail millet processed, 20.4 tons of diabetic mix was produced. The gross returns worked out to ₹. 22,03,200 per year from diabetic mix, considering average market price of ₹108 per kg of diabetic mix. The total net returns from diabetic mix amounted to ₹. 13,85,936.6/- per year, while it worked out to ₹. 69,296.83/- per ton. Thus, for every rupee of investment in diabetic mix of Foxtail millet processing, about₹. 2.69 was obtained as returns, indicating its profitability.

5.6 Extent of Value Addition in Selected Products of Minor Millets

The value extent of value addition in selected products of minor millets as depicted in Table 4.21. It was observed from the table that, among all selected products of minor millets the highest amount of value addition was in case of diabetic mix (₹.5513) followed by instant energy food (₹ 2695) and instant dosa mix (₹. 2197). The least amount of value addition in case of dehusked rice and flour of Foxtail millet (₹.337.3).

5.7 Socio Economic Characteristics of Minor Millets Consumers

The knowledge of the socio-economic characteristics of minor millet consumers would facilitate in better understanding of the ground realities of the study area. The data were collected from major stores in Hubli-Dharwad city. Revealed that consumers belonging to these twin cities were homogeneous with respect to the socio-economic characteristics. Majority of the consumers were middle aged with an average age of 43.5 years.

It is interesting to note that nearly 95 per cent of the millet consumers were literates, however, majority of them were educated up to middle school only (Table 4.22). Location of consumers was concerned; most of them were from urban area. The major portions of consumers were government employees and followed by private employees. Majority of the sample consumers belonged to nuclear family type advantageous mainly dominated by male member in the family.

5.8 Consumers Preference for Processed Products of Minor Millets

The preferences for processed products of minor millets among the sample consumers were provided in the Table 4.23. Revealed that most of the consumers preferred hurakki holige and it enjoyed the first place followed by chakli, pappad, roti, dosa mix, laddu, khakra, malt, vermicelli, diabetic mix, instant energy food, flour and milled grains. It indicates that majority of the consumers were interested in traditional and more popular products rather new products.

SUMMARY AND POLICY IMPLICATIONS

Transformation of agriculture to more productive systems has been accompanied by increased production of fewer crop species, greatly reducing the area and production of a great diversity of traditional crops. One such traditional group of cereal crops is the small or minor millets comprising crops such as Finger millet, Foxtail millet, Little millet, Barnyard millet, Proso millet and Kodo millet. Small millets are cultivated in areas where they produce a more dependable harvest compared to any other crop. This has been largely responsible for their continued presence and cultivation in many parts of the world.

In India, millets are utilized in many forms. The nutritive value of millets is very high when compare to other cereals with regard to protein, fat and mineral content but their utilization is limited due to the presence of various anti nutrients, poor digestibility of proteins and carbohydrates, low palatability, colour pigments, characteristic astringent flavor and poor keeping quality of processed products. Pearling of millets overcomes some of their constraints and improves nutritional quality as well as consumer acceptability.

On global basis small millets are cultivated on an area of 39.42 million ha. with an annual production of 30.20 million tonnes with productivity of 762 kg/ha. Whereas in India, they are cultivated on an area of 11.30 million ha. Producing 10.26 million tonnes with the productivity of 748 kg/ha (FAO. 2012). These are grown in diverse soils, varying rainfall regimes and in area widely differing in thermo and photoperiods. The cultivation of Foxtail millet and Little millet is more seen in Madhya Pradesh, Tamil Nadu, Karnataka and Orissa.

Utilization of these crops is mainly as food for human consumption. The straw is often a precious fodder for bovines. The grain is consumed in traditional way and almost the entire produce is sold in assured markets and transported to Maharashtra for further processing and utilization. Common millets and Foxtail millets are used in indigenous medicine; Foxtail millet is specially used in snake poisoning.

In Karnataka, small millets are cultivated on an area of 1.32 million ha producing 1.61 million tonnes with a productivity of 1301 kg/ha. In the year 2011-12, foxtail millet (Navane) was cultivated in an area of 24508 ha producing 5470 tonnes with productivity of 235 kg/ha. Foxtail millet is widely grown in Koppal, Bellary, Chitradurga and Belgaum districts of Karnataka.

However, the area under minor millest is fluctuating over the years though Karnataka has all the ideal conditions required for successful cultivation of Foxtail millet, Little millet and Bajra.

The present study is an effort in the direction of having an integrated study of all aspects of production and value addition of underutilized millets and to study the consumer preference for processed products of selected minor millets with an overall view of exploring the possibilities and potentialities for bringing about the required improvement.

SPECIFIC OBJECTIVES

1. To study the district wise growth of area, production and productivity of minor millets in North Karnataka.
2. To study the costs and returns in the production of minor millets and their value added products.
3. To study the extent of value addition in selected products of minor millets.
4. To study the socio economic characteristics of minor millets consumers and their preference for processed products of minor millets.

Major findings of the study

1. The negative growth in Little millet area was observed in all districts of north Karnataka, except Belgaum which showed a significant positive growth rate of nearly 10.29 per cent per annum. For production also the same trend was observed with negative growth rate in all districts except Belgaum (13.67 %). Growth rate of productivity was positive for Belgaum (5.02 %%) and Dharwad (0.56 %) and Haveri (0.14 %) statistically significant.

2. With regard to Foxtail millet crop, the growth in area, production and productivity was negative for all the districts of north Karnataka except Belgaum. The decline in the production was due to decline in both area and productivity.

3. The growth in Bajra area was found to be negative and significant for Gadag, Gulberga and Haveri districts.

4. Bajra growers have bigger size of land holdings (3.58 ha) than the Foxtail millet growers (3.21 ha) and little millet growers (2 ha). Among the Little millet growers 12 of them (40 %) had bore well irrigation whereas only 9 (30 %) of Foxtail millet growers and 8 (26.67 %) of Bajra growers had bore well irrigation. The average area under Bajra, Foxtail millet and Little millet was 0.59 hectares 0.54 hectares and 0.46 hectares, respectively.

5. The per hectare total cost of cultivation of Little millet worked out to be Rs.8835.17, while the per quintal cost of production worked out to be Rs.1262.17. Gross return realized from one hectare of Little millet grown by the sample farmers was Rs.17326. The benefit cost ratio worked out to be 1.96 indicating the profitability of little millet cultivation in the study area.

6. Per hectare total cost of cultivation of Foxtail millet worked out to be Rs.9438.9 and per quintal cost of Foxtail millet production worked out to be Rs.1048.77. The gross return realized from Foxtail millet cultivation was Rs.11291.45 per hectare with a benefit cost ratio of 1.19.

7. Per hectare total cost of cultivation of Bajra worked out to be Rs.9740.81and per quintal cost of Bajra cultivation worked out to be Rs.1145.98. The gross return realized from Bajra cultivation was Rs.12537.5 per hectare with a benefit cost ratio of 1.34.

8. The cost of raw material formed major (73.32%) component of total processing cost of dehusked rice and flour of Foxtail millet (Rs.12000 /ton). For every rupee of investment in dehusked rice and flour of Foxtail millet processing, about Rs 1.48 was obtained as returns, indicating its profitability.

9. The cost of raw material (Rs 20000/ton) formed major (63.31%) component of total processing cost of dehusked rice and flour of Little millet. For every rupee of investment in dehusked rice and flour of Little millet processing, about Rs. 1.40 was obtained as returns, indicating its profitability.

10. Cost of skimmed milk powder (Rs 46200/ton) formed the major (28.68%) component of the total cost of processing instant energy food. The benefit cost ratio was high (1.82) showing the profitability of converting Little millet into instant energy food.

11. The cost of raw material (Rs 14000/ton) formed major (28.55%) component of total processing cost of instant dosa mix. For every rupee of investment in instant dosa mix processing, about Rs 1.99 was obtained as returns, indicating its profitability.

12. The cost of raw material (Rs 12000/ton) formed major (29.36%) component of total processing cost of diabetic mix. The benefit cost ratio was high (2.69) showing the profitability of converting Foxtail millet into diabetic mix.

13. It was observed that, the value extent of value addition in selected products of minor millets was the highest in case of diabetic mix (Rs.5513) followed by instant energy food (Rs.2695) and instant dosa mix (Rs. 2197). The least amount of value was added in the case of dehusked rice and flour of Foxtail millet (Rs.413.3).

19. Majority of the consumers were middle aged with an average age of 43.5 years in the study area. It is interesting to note that nearly 95 percent of the millet consumers were literates, however, majority of consumers were educated up to middle school only. Location of consumers was concerned; most of them were from urban area. The major proportions of consumers were government employees. Majority of the sample consumers belonged to nuclear family type mainly dominated by male member in the family. Majority of the millet product consumers were vegetarians in the study area.

20. Hurakki holige was the most preferred product followed by chakli, pappad, roti, dosa mix, laddu, khakra, malt, vermicelli, diabetic mix, instant energy food, flour and milled grains. This indicated that majority of the consumers were interested in traditional and more popular products rather new products.

POLICY IMPLICATIONS

1. The area and production of minor millets in North Karnataka is declining over the years. There is a need to stabilize the production of minor millets by arresting the decline in their area in order to take advantage of their medicinal properties and to restore the culture and traditions of rural communities.
2. The benefit-cost ratio of Little millet, Foxtail millet and Bajra crops indicated the feasibility of their cultivation in the rain fed marginal lands. Thus the study suggests that the farmers can better utilize their marginal lands by cultivating these crops.
3. Since the value addition is profitable over minor millets, farmers may be motivated to take up value addition by giving training to increase efficiency in variety of products.
4. As dehusked grains are costly and seasonally demanded, the value addition is found to be attractive and hence there is a need to establish small processing units in the production areas in order to encourage the production of underutilized millets considering their cultural importance.
5. Research to boost the productivity of these crops.

REFERENCES

Aijan, N., Raveendaram, N., Rajamani, K., Indumathi, V. M. and Vennila, A. R., 2008, An Economic Analysis of Cultivation and Marketing of Glorisa in Tamil Nadu. *J. Med. Arom. Plant Sci.,* **10** (4) : 182-195.

Angadi, S. C., 1999, A Study on Knowledge, Adoption and Marketing Pattern of Pomegranate Growers in Bagalkot District in Karnataka State. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Ananth, G.S., 1984, Performance Appraisal of Bangalore Grape Grower Marketing and Processing Co-operative Society Ltd., Lalbagh, Bangalore, Karnataka – A case study *M.Sc. Thesis,* Univ. Agric. Sci., Bangalore.

Arora, M., Sehgal, V. K., Puneet Singh and Sandhu, A. P. S., 2004, Microbial Load Reduction by Washing Vegetables in a Rotary Washer, *J. Res., Punjab AgriL. Univ.*, **41** (1):102-109.

Arunkumar, M.S., 1984, An Economic Evaluation of investment and problems in Marketing of cocoa in Dakshina Kannada district of Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.

Ashalatha., 2000, Export Trade Performance of Indian Cashew. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore.

Babanna, J., 2002, Information Source Constancy and Training Needs of Farmers in Arecanut Cultivation Under Tungabhadra Command Area in Shimoga District. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.

Balappa Shivaraya, 1997, Production, marketing and processing of red gram in Gulbarga district - An economic analysis. *M.Sc. Thesis*, Univ. Agric. Sci., Dharwad.

Birari, K.S., 1981, Study of Economics of Production and Marketing of Banana in Jalgaon district: *M.Sc. Thesis*, Univ. Agric. Sci., Rahuri.

Bhullar, A. S., 2005, Estimating, Export Competitiveness of Chillies from Punjab state. *Agric. Mktg.*, April-June, 2005, **36** : 43.

Byresh, T., 2007, Comparative Economics of Local and Improved Variety of Guava Orchards in Dharwad district of Karnataka.

Chinnappa, B. and Ramanna, R., 2002, An Economic Analysis of Guava Production. *Agric. Banker*, **21**(3): 29-33.

Deorukhakar, A. C., Nikam, M. B. and Gawas, M. M., 2007, Economic analysis of kokum Fruit Products in Sindhudurg, India. *International J. Agric. Sci.*, **3**(2):120- 123.

Dhiman Mukerjee, 2008, Cultivation of Swetia Chirayita : A High Value Medicinal Herb in High Attitude. *J. Med. Arom. Plant Sci.,* **30** (1) : 350-355.

Gawas, 2002, Economics of Processing of kokum Fruits in the Western Maharashtra. *Indian J.* Agric. Mktg., **10** (1): 45-48.

Gungor, H., and Gungor, G., 2004, The Economic Structures and Marketing Strategies of Small Family Enterprises Engaged with Wine Production in the Northwest of Turkey. *Acta Horticulturae,* **652**: 519-525.

Gupta S.P. and Prashant D.S., 2004, Marketing and Processing of Cashew Nut in Goa state: An Economic analysis. *Agricultural Marketing,* **97**(1): 20-29.

Hugar, L.B. and Vijaykumar, H.S., 1996, Dynamics of Consumption Behaviour in vegetable marketing. *The Bihar J. Agril. Mktg.*, **4**(4): 345-351.

Jin-Hongman And Janssen., 2001, Working Paper Department of Agricultural and Resource Economics, University of California Davis, pp. 30-32.

Karpagam, C., 2000, A Study on Knowledge and Adoption Behaviour of Turmeric Growers in Erode District of Tamil Nadu state. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Keerthi.H.R.,2008, Production and Marketing of Pineapple in Shimoga District – An Economic Analysis, *M.sc.(Agri) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka, India.

Kumar, 1994, Marketing channels, costs and margins of rice: case study, *Indian J. Agric. Mar.*, **5**(4): 148-152.

Kusuma.D.K., J.A.Handigol and Nirmala B. Yenagi., 2010, Studied the Value Addition of Foxtail Millet in Bellary District- An Economic Analysis. *Abstracts*, Promoting Small Millets for Improved Rural Economy and Food Security.

Lathika, M. and Kumar Ajith, C. E., 2005, Growth trends in Area, Production and Productivity of coconut in India. *Indian J. Agric. Econ.,* **60**(4):686-697.

Legesse, D., 2000, Production and marketing of wheat in northern Karnataka – An economic analysis. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.

Lokesh, G. B., Hari, G.R. Shilpa and Chandrakanth, M. G., 2005, an Economic Analysis of Tomato Production, Marketing and Processing in Karnataka, *Agric.Mktg.*,**47**(4): 15-21.

Madhuri, P. and Kamini Devi., 2003, Value Addition to Water Melon Fruit Waste. *J. Food Sci. Tech. Mysore*, **40**(2):222-224.

Mahesh, M. S. and Nagaraja, K.V., 2002, Coating of Cashew Kernel Baby Bits for Value Addition. *J. Food Sci. Tech. Mysore*, **39**(2):124-128.

Mallar Mathi, K. and Pandey, A. P., 2007, An Economic Evaluation Of Guava Processing Units in Allahabad District of Uttar Pradesh. *Agril. Mktg.*, **4 (4): 21-24.**

Mamoni Das, R. K. Saud and N. N. Puzari., 2010, Value Addition of Millets, Science Tech Entrepreneur, 1-3.

Manjunath, P. V., 2003, Performance Evaluation of Fruits and Vegetable Processing Units in Bangalore District : A sectoral analysis. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad.

Meeran, N. and Prince Jayaseelan, M. J., 1999, Socio-Personal, Socio-Economic and Sociopsychological Profile of Shrimp Farmers. *J. Extn. Edun.,* **10** (2) : 2445 – 2448.

Mittal, and Singh. 2007, What Affect Changes in Cereal Consumption ? *Econ. Pol. Weekly*, February 3, pp. 444-447.

Myszczszyn, J., 2000, Factors Influencing the Level and Differentiation of Consumption of Food Products. *Floria Universities Agricultural Stetinensis Oeconomica*, No. 38, Cab Abstract, pp.299-306.

Nagaraj and Prakash., 1989, Economic Analysis Of Karnataka Fruit Processing Incase of Karnataka Agro Fruits Ltd. *Indian J. Mktg.*, **19**(8-10): 9-16.

Nagesh, A. R., 1990, Investment in Production and Marketing of Cashew in Karnataka – An Economic Analysis. *M.Sc. Thesis*, Univ. Agric. Sci., Dharwad (India).

Nagpure, S.C., Jhakare, A.B., Khandare, A.P. and Patil, R.K., 2004, Economics of Sugarcane Production in Vidarbha Region of Maharashtra State. *Rural India*, **67** (6-7): 123-125.

Navadkar, D. S., Mali, B. K. and Biradar, K. S., 2003, Price and Supply Varieties of Cole Vegetables. *Indian J. Agric. Mktg.,* **13**(2) : 40-41.

Neelappa, 2002, Technical and a Alloocative Efficiency of Paddy Production in TBP area- An Economic Analysis, *M.Sc. (Agri) Thesis*, Univ. Agric. Sci., Dharwad .

Pervez, W.M., 2001, Dynamics of Food Grains Production in Pakistan. *The Asian Econ. Rev.,* **2**(3): 438-446.

Pawar. B. P.1996, Economics of Processing of kokum Fruits in South Konkan Region of Maharashtra state. *M.Sc. Thesis*, Univ. Agric. Sci., Dapoli.

Poonam Sharma, 1997, Consumers Quality Preference for Selected Cut Flowers in Bangalore city: An economic analysis, *M. Sc. (Agri.) Thesis*, Uni. Agric. Sci., Bangalore, Karnataka, India.

Powar, B. N and Hange, D. S., 2008, Economics of Production and Marketing of Selected Medicinal and Aromatic Plants in Western Maharashtra. *Indian J. Agric. Mktg.*, **22** (3) : 129-140.

Prodyut Bijoy Gogoi, 2009, Economic Feasibility of Patchouli Cultivation in Assam. *J. Arecanut, Spices and Medicinal Plants,* **2** (3) : 100-106.

Puran Mal, Grover, R. K. and Malik. D. P., 2009, Economic Analysis of Cultivation of Safeda Musli in Haryana. *J. Arecanut, Spices and Medicinal Plants,* **2**(1):1-7.

Raghu, C., 2006, Economics of Production and Marketing of Patchouli in North Karnataka, *M.Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Rajesh, D. B., 2006, Economic Evaluation of Vanilla Cultivation in Uttar Kannada District of Karnataka, *M. Sc.* (Agri.) Thesis, Univ. Agric. Sci., Dharwad, Karnataka (India).

Rajeshwari, Y.G., 2004, An Economic Analysis of Coconut Based Farming System in Tumkur District of Karnataka. *M.Sc. (Agri.) Thesis,* Uni. Agric. Sci. Dharwad.

Rao, C.H., 2000, Declining Demand for Food Grains in rural India : Causes and Implications.*Econ. Pol. Weekly*, January 22, pp.201-206.

Ravishankar, A., 1993, Economics of Production and Processing Davana (*Artemisia pallens*) in Eastern Dry Zone of Karnataka. *M. Sc. (Agri) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Sandeep, 2002, Economic Analysis of Cropping Systems in Bidar District of Karnataka, *M.Sc. (Agri) Thesis*, Univ. Agric. Sci., Dharwad.

Saikumar, B. C., 2005, Farming Systems in the Tank Commands of North Eastern Karnataka – An Economic Analysis of Jala Samvardhane Yojana Sangha managed tanks. *M.Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad.

Sharma, D.K., 1997, Consumption Acceptance Studies. *Indian Dairyman*, **49**(1): 27-31.

Shashidhara, D. N., 2004, A Study on Influencing Factors and Constraints in Drip Irrigation by Horticulture Farmers of Bijapur District. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Sheikh Abdul Kadar and Ashwini Chairbha, 2010, Profit Appraisal of Citronella Oil Extraction Plant in Ballapur District. Paper Presented in *National Seminar on Changing Ethos of Agribusiness Management and Education,* Univ. Mysore, 19-20. p-68.

Sridhar, S., 2008, Contract Farming in Maize –An Economic Analysis. *M.Sc. (Agri) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Shrivastav, A. and Batra., 1998, Identification of Factors Responsible for Declining Status of Millets (A case study in Bilaspur district of Chhattisgarh). *Indian Journal of Agricultural Economics*, **57**(3): 399-403.

Singh, S., Srivastava, D.N. and Kapoor, C.M., 1995, Factors Influencing Consumer Preferences for Type of Milk Supply in Hissar city. *Indian J. Animal Prod. Management*, **11**(4) 226-228.

Singh. R., 1989, Consumer's Perception of the Organized Sector: Dairy Products. *Indian Dairymen*, **41** (2): 89-95.

Sunil Kumar, G. M., 2004, A Study on Farmers Knowledge and Adoption of Production and Post Harvest Technology in Tomato Crop of Belgaum District in Karnataka. *M. Sc.(Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Surekha. N and Rohini Devi., 2009, Development of Value Added Products from Barnyard Millet *(Echinochloa Frumentaea Link).*Abstracts, Promoting Small Millets for Improved Rural Economy and Food Security.

Talathi, J. M., Naik, V. C. and Wadkar, S. S., 2003, Kokum plantation – A Boost to the Konkan Economy. *Proceeding of First National Seminar on Kokum*, 12-13 May 2001, 72-77.

Tripathy, S. and Srinivasagowda, M., 1995, An Analysis of Growth Instability and Area Response of Groundnut in Orissa. *Indian J. Agric. Econ.*, **48**(3): 345-350.

Tripathy, S., Pradhan, P. N. and Mishra, S. N., 1998, An Analysis of Growth and Instability of Pulses Production in Orissa. *Bihar J. Agric. Mktg.,* **6**(2): 211-219.

Varghese, K. A., Sharma, P. M. and Chaturvedi., 1998, Trends in Market Arrivals vis-à-vis Production of Major Agricultural Commodities in Rajastan. *Indian J. Agric. Econ.,* **53**(3): 403.

Varghese, P.R., 2004, Trend Analysis in Area, Production and Productivity and Price Behavior of Cardamom in Kerala. *Indian J. Agril. Econ.,* **59** (4): 758-806.

Verma, R. C. and Jain, S. K., 2007, Nutri-cereals: Value-Addition of Coarse Cereals and Millets. *Post Harvest Management and Value Addition*, pp.272-291.

Vitonde, A.K. and Bhargav, P.N., 2002, Marketing of Mandarin Oranges in Nagpur District. *Indian J. Agric. Mktg.*, **5** (2): 212-215.

Wadkar, S.S., Talathi, J.M., Dalvi, M.B., Pawar, M.B. and Naik, K.V., 2001, Economic analysis of *kokum* fruit processing units. *Proceedings of First National Seminar on Kokum*, 12-13 May 2001, pp.63-71.

Wandel, M., 1995, Dietary Intake of Fruits and Vegetables in Norway : Influence of Life Phase and Socio-Economic Factors. *International J. Food Sci. Nutr.,* **8**(4): 341-352.

BUSINESS OPPORTUNITIES IN MINOR MILLETS IN NORTH KARNATAKA- AN ECONOMIC ANALYSIS

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ABSTRACT

Millets are one among the traditional group of cereal crops and are cultivated in areas where they produce a more dependable harvest compared to any other crops. Millets occupy an important place in the world food and nutrition economy.

The growth on area, production and productivity of minor millets decreased significantly over the study period (2001-02 to 2010-11) both at district level and state level similar trend was observed in all the selected districts. The per hectare total cost of cultivation of Little millet, Foxtail millet and Bajra worked out to be ₹ 8,835.17, ₹. 9,438.9 and ₹. 9,740.81 respectively. Gross returns realized from one hectare of Little millet, Foxtail millet and Bajra grown by the sample farmers were ₹.17326, ₹. 11,291.45 and ₹. 13087.76 respectively.

For every rupee of investment in dehusked rice and flour of Foxtail millet processing, about ₹ 1.48 was obtained as returns, indicating its profitability. For every rupee of investment in dehusked rice and flour of Little millet processing, about ₹. 1.40 was obtained as returns, indicating its profitability. The benefit cost ratio of instant energy food (1.82), instant dosa mix (1.99) and diabetic mix (2.69) was high showing the profitability. In this regard, there is need to understand the profitability of minor millet processed products. Therefore, in the present study, an attempt is made to find out the economics of minor millet production and its value addition in North Karnataka. Since the value addition is profitable over minor millets, farmers may be motivated to take up value addition to millets. Further, small scale entrepreneurs may be encouraged to establish the above enterprises for widening the minor millets industry.