

Value Chain Analysis of Minor Millets for improving Economic Status of Farmers in Tumakuru District of Karnataka

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ABSTRACT

The focus of the research study was on value chain analysis of minor millets for improving economic status of farmers in Tumakuru district of Karnataka. Multistage sampling technique was employed in the selection of 80 farmers who were millet growers from different parts of Tumakuru district viz., Tiptur, Chikkanayakanahalli, Sira and Pavagda. For analyzing the data, porter's value chain model (1985) was used and tabular method was employed to compile the cost and returns of minor millets cultivation. The per hectare total cost of cultivation of all the six millets have been calculated and it is observed that, per hectare cost of cultivation of finger millet worked out to be Rs.38,128 which is higher among all the minor millets where the lowest in case of barnyard millet Rs.17,781/ha. The net return for finger millet is Rs.13,475/ha. The return per rupee of investment is highest in foxtail millet and barnyard millet is 1.60 and 1.54, respectively. Personal interviews were also conducted to study the improvements in primary activities of value chain. Improvements suggested under primary activities: procurement of millet through government agency at MSP (80%) and government support to farmers and entrepreneurs to create storage facilities (66%). Whereas, under support activities: more number of processing and value addition units (84%) and Government procurement on MSP (60%). Hence, the study suggested the farmers to go for value addition and get better returns rather than selling it in a raw form.

Keywords : Minor millets, Value chain analysis, Cost of cultivation, Net returns

MILLETS are one of the oldest agronomic group of grasses that serve as a nutritious staple food in Asia. The small millet variants are particularly suited to the Indian climate, due to their resilience and ability to grow under marginal soil fertility and moisture conditions. Therefore, different varieties can be found in several geographic regions of the country as shown in Fig. 1a. Millets plays a crucial role in agriculture and food security, at the same time millet grains can be stored for over 10 years without significant deterioration (FAO, 2020). It has more fiber, essential amino acids and minerals compared to other major cereal grains (National Research Council, 2016). The

main protein fraction has high biological value, with good amounts of tryptophan, cystine, methionine, and total aromatic amino acids, which are all crucial to human health and growth and are deficient in most cereals. For this reason alone, eating millet is an important preventive measure against malnutrition (National Research Council, 2016). Further, the crop has medicinal value and it is used in management of anemia and diabetes. Despite its potential, minor millets has faced declining use in the world over the last 30 years due to changing farming systems and low productivity (FAO, 2018).

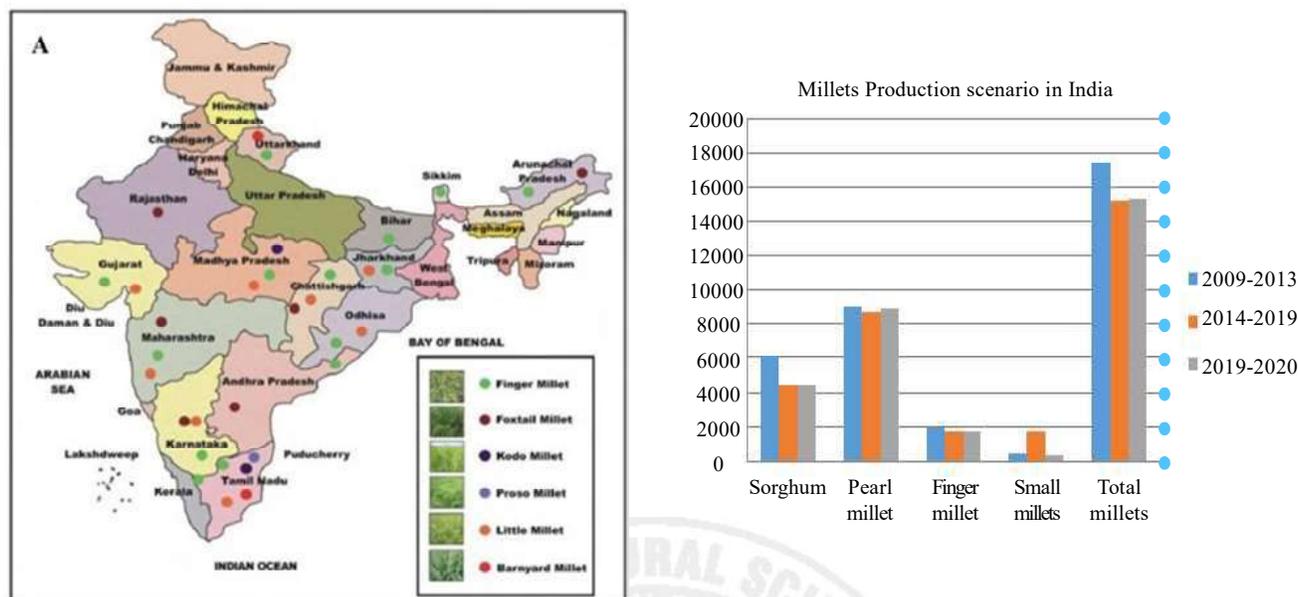


Fig. 1 : India's small millets cultivation facts. The distribution of small millets production in India (A); Millet production scenario in India (B)

Karnataka is one of the major producers of millets such as ragi, jowar, bajra, foxtail with an area of 20,038 ha, production of 10,906 tonnes and a productivity of 573 kg/ha and little millet with an area of 14425 ha, production of 14,132 tonnes and at a productivity of 1031 kg/ha (Anonymous, 2018a). Farmers in Karnataka have doubled acreage to around 40,000 hectares under minor millets especially in foxtail millet because of its high productive yield followed by nutritional value than other millets. (Anonymous, 2018b). Major constraints that have hampered production and utilization of millets include limited improved varieties, poor crop management practices, pests and diseases, poor soil fertility, limited commercial utilization and lack of an organized marketing system for minor millets and its products. Mitigation of these challenges has the potential to increase productivity, food and nutritional security among malnourished poor communities and ultimately alleviate poverty through marketing of millet. Furthermore, country experiencing chronic water stress due to reduced rainfall, improving the small millet industry will translate to increased millet cultivation, which will be a welcome alternative to the water-intensive cultivation of rice that currently dominates the country. This conceptualizes a roadmap

that can be applied for improving the small millets value chain, helping agribusinesses to grow, and improving the livelihood of the population.

Value Chain Analysis (VCA)

Michael E. Porter, introduced the concept of value chain in his book, 'Competitive Advantage : Creating and Sustaining Superior Performance'. Value chain refers to relationship established between actors involved directly and indirectly controlled by other actors with the aim of adding value in each stage of the value chain. It involves connections among producers, processor, distributor, traders and support institutions. Value chain improves a business's efficiency so the business can deliver the most value at least possible cost (Vinod Naik, 2022). The goal of a value chain is to create a competitive advantage for a company by increasing productivity while keeping costs reasonable. This can be achieved through supportive cooperative supplier- buyer relationships (Porter, 1985). Nutrient to nutrient, every millet is superior to rice and wheat, therefore, is the solution for the malnutrition that affects a huge population of India (DHAN, 2012). Nevertheless, cultivation of these millets now face many constraints resulting in decline in area cultivation of these crops, existence

of high yield gaps (Uma Gowri and Prabhu, 2017), low prioritization in research agenda and subsequently less technology breakthrough in millet crops. Also, public and private investments are limited to millet seed production and development (Pray and Latha, 2009). Owing to their nutritional content, any improvements in cultivation, availability, storage, price and processing technology for millets could significantly contribute to the food and nutritional security of India's population (Michaelraj and Shanmugam, 2013a). Further, millets contribute in diversifying our food basket, at present is very narrow because of excessive dependence on major cereals like rice and wheat. This research analyzes the relative economics, value chain, technology adoption and constraints of millets and suggests suitable future strategies to revive by considering their economic value. In this context, the study has been conducted on the topic entitled 'Value chain analysis of minor millets in Tumakuru district of Karnataka'. To analyze the value chain of minor millets.

METHODOLOGY

Study Area

The study was conducted in Tumakuru district of Karnataka state. Tumakuru district was selected purposively, because it is having the highest share in the production of millets in Karnataka. Considering highest area under the crop as criteria in consultation with Department of Agriculture, four taluks *i.e.*, Tiptur, Chikkanayakanahalli, Sira and Pavagada from Tumakuru districts were selected purposively.

Selection of Respondents

Multistage sampling technique was employed in the selection of farmers for the study based on the production of millet in the state during *kharif* season. This method divides the population into groups or clusters for conducting research. It is a complex form of cluster sampling, sometimes also known as multistage cluster sampling. During this sampling method, significant clusters of the selected people are split into sub-groups at various stages to make it

simpler for primary data collection. It reduces the time taken and information collected from the samples is used to draw inferences from the population as a whole. Personal interviews with farmers and group discussion were also conducted with 80 respondents of four taluks and from each taluk, four villages were selected. From each village, five millet growing farmers were selected randomly. Thus the total sample constitutes 80 farmers and from each taluk 10 consumers, 05 retailers and 05 wholesalers were selected. Thus the total sample constitutes 80 farmers, 40 consumers, 20 retailers and 20 wholesalers.

Nature and Sources of Data

The study is based on the primary data. The sample farmers were interviewed personally by using pre-tested interview schedule specially prepared for the purpose. Data on some selected socio-economic characteristics of the farmers, quantity and value of various inputs used and the yield obtained in case of millets were collected. The opinion of the respondents with respect to production, marketing and value addition in minor millets were documented.

Research Design

In the present study Porter's Value Chain Model (1985) was used for analysis and Tabular method was employed to compile the cost and returns of minor millets cultivation. Ex-post facto techniques was also adopted since it is a systematic empirical inquiry for measuring the phenomenon which has already occurred and is continuing.

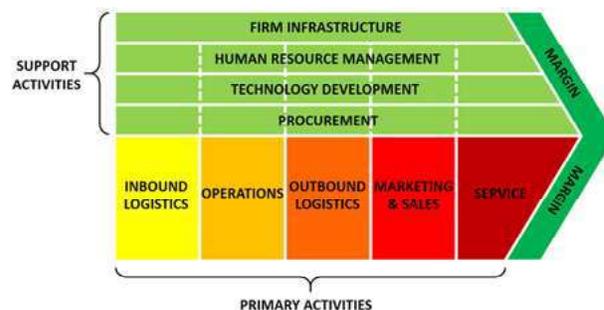


Fig. 2 : Porter's Value Chain

RESULTS AND DISCUSSION

Economic Efficiency in Minor Millets Cultivation in Tumakuru District of Karnataka

The details of per hectare costs and returns from all the six millets *viz.*, finger millet, foxtail millet, little millet, kodo millet, barnyard millet and browntop millet cultivation are given in Table 1. Each millet has different cost of cultivation and different returns. It could be observed from the table that, variable cost of finger millet accounted for around 79.70 per cent of the total cost of cultivation, while fixed costs items like land revenue, depreciation, rental value of land and interest on fixed capital together accounted for just 20.30 per cent of total cost of cultivation. Whereas, variable cost of foxtail millet is 66.23 per cent, whereas, little millet, kodo millet, barnyard millet, browntop millet has 67.47, 66.00, 65.29 and 71.61 per cent, respectively. Among the variable costs, the share of human labour was highest followed by cost of fertilizer and FYM. Among the fixed costs, rental value of land was the highest in all the minor millets (Suman *et al.*, 2019).

The total cost of cultivation of foxtail millet worked out to be Rs.20055 per hectare. Farmers got about 12.05 quintals of main product and 4.22 tonnes of byproduct. The gross return from main product worked out to Rs.2619 per quintal. Thus, gross returns realized from both main product and byproduct were Rs.32171.00 per hectare. The total cost of cultivation of little millet worked out to be Rs.22278 per hectare. Farmers got about 10.65 quintals of main product and 2.44 quintals of byproduct. Thus, gross returns realized from both main product and byproduct were Rs.33784.00 per hectare. The total cost of cultivation of finger millet worked out to be Rs.38128 per hectare. Farmers receive 14.05 quintals of main product and 7.50 quintals of byproduct. In turn, gross returns obtained from both main product and byproduct were Rs.51603.50 per hectare, respectively. The net return realized from millet cultivation after deducting cost of cultivation came to foxtail millet was Rs.12116 per hectare, little millet was Rs.11506 per hectare, kodo millet was Rs.5391 per hectare, barnyard millet was

Rs.9728 per hectare, browntop millet was Rs.7352 per hectare and in case of finger millet was Rs.13475.50 per hectare.

The costs incurred in the cultivation of minor millets and returns obtained are presented in (Table 1 & 2). The findings of the study clearly showed that, per hectare variable cost of finger millet was Rs.30388/ha and it is highest when compare to all other minor millets whereas lowest variable cost was found in barnyard millet Rs.11,610/ha. The major variable cost constituted for labour followed by fertilizers and FYM. Further, it was revealed that, among all the minor millets cost of cultivation was maximum in case of finger millet (Rs.38,128/ha) followed by little millet (Rs.22,278/ha) and Browntop millet (Rs.22,094/ha) whereas cost of cultivation was minimum in case of Kodo and Barnyard millet (Rs.19417/ha) & (Rs.17,781/ha). Variable cost in foxtail millet cultivation was 66.23 per cent of total cost, little millet as 67.47 per cent, Kodo millet as 66.00 per cent and variable cost in finger millet was 79.70 per cent of total cost and which is highest among all the minor millets.

Economic Efficiency of Millet Based Cropping Sequences followed in Tumakuru District of Karnataka

It was revealed that the input cost was minimum in case of practicing millet-Fallow crop rotation being Rs.17,781 per ha and net returns expected to be Rs.11353 with an benefit cost ratio of 0.64 as millet requires less seed rate, minimum usage of fertilizers and labor. Whereas, in case of Kodo millet-maize (two year rotation) (Rs.26,504 per ha) though the cost of cultivation was little higher compare to millet fallow but, returns are quite high. Input-output budget shows that lowest returns were received from Millet-Fallow being (Rs. 11,353 per ha) and Kodo Millet-Fallow-Maize (two year rotation) (Rs.15,680 per ha). Whereas, crop rotations of little millet with redgram gives higher returns because cultivation of pigeon pea before little millet improves the soil leads to reduction in fertilizer application and improves yield. In the mean time, practicing improved technologies in

TABLE 1
Cost and returns structure of minor millet cultivation (Rs. / ha)

Particulars	Foxtail millet		Little millet		Kodo millet		Barnyard millet		Brown top millet		Finger millet	
	Value (Rs)	Per cent	Value (Rs)	Per cent	Value (Rs)	Per cent	Value (Rs)	Per cent	Value (Rs)	Per cent	Value (Rs)	Per cent
I. Variable cost												
1) <i>Material input cost</i>												
Seed	522	2.60	703	3.16	508	2.62	480	2.70	600	2.72	3000	7.87
FYM	1977	9.86	2162	9.70	1788	9.21	1925	10.83	1750	7.92	5000	13.11
Chemical fertilizer	2107	10.51	2340	10.50	1915	9.86	1875	10.54	2000	9.05	3375	8.85
Plant protection chemicals	487	2.43	600	2.69	385	1.98	250	1.41	-	-	650	1.70
2) <i>Labour cost</i>												
Men labour	1953	9.74	1940	8.71	1815	9.35	1795	10.10	4000	18.10	4312.5	11.31
Women labour	1226	6.11	1156	5.19	1110	5.72	1125	6.33	2500	11.32	3937.5	10.33
Bullock labour	2545	12.69	3427	15.38	2235	11.51	2050	11.53	2000	9.05	3700	9.70
Machine labour	1480	7.38	1590	7.14	1265	6.51	1250	7.03	1800	8.15	4162	10.92
3) <i>Interest on working capital @ 8%</i>	984	4.91	1113	5.0	949	4.89	860	4.84	1172	5.30	2251	5.90
Total variable cost	13281	66.23	15031	67.47	12815	66.00	11610	65.29	15822	71.61	30388.5	79.70
II. Fixed cost												
Land revenue	21	0.10	26	0.12	20	0.10	28	0.16	32	0.14	36	0.09
Depreciation	1568	7.82	1662	7.46	1486	7.65	1632	9.18	1440	6.52	1850	4.85
Rental value of land	4569	22.79	4900	21.99	4496	23.15	3950	22.21	4230	19.15	5150	13.51
Interest on fixed capital @10%	616	3.07	659	2.96	600	3.09	561	3.16	570	2.58	704	1.85
Total fixed cost	6774	33.78	7247	32.53	6602	34.00	6171	34.71	6272	28.39	7740	20.30
III. Total cost of cultivation (I+II)	20055	100.00	22278	100.00	19417	100.00	17781	100.00	22094	100.00	38128	100.00
IV. Returns												
Main product (q)	12.05		10.65		11.55		10.75		9.65		14.05	
By product (tonne)	4.22		2.4		3.50		3.50		2.0		7.50	
Price of main product (Rs./q)	2619		3107		2100		2515		2995		3470	
Price of by product (Rs./tonne)	145		289		158		135		272		380	
Gross returns	32171		33784		24808		27509		29446		51603.5	
Net returns	12116		11506		5391		9728		7352		13475.5	
Cost of production per quintal	1664		2092		1681		1654		2289		2714	
Returns per rupee of investment	1.60		1.52		1.28		1.54		1.33		1.35	

redgram *i.e.*, nipping at 40 DAS, application of pulse magic, installing traps helps in reduce the incidence of pests and diseases and improve the productivity with good and quality grain.

The minor millets value chain is highly under developed. At the production level, farmers grow minor millets and other crops in cropping sequence. Minor millets is grown mostly as food crop. Farmers sell millets as a grain at the local markets to both

TABLE 2
Millet based cropping sequences followed in Tumakuru district of Karnataka

Crop rotations	Cost of cultivation per year	Net Returns (Rs.) Per year	B : C Ratio
Little millet – Redgram	28737	21009	0.73
Kodo millet – maize (two year rotation)	26504	15680	0.59
Millet – Fallow	17781	11353	0.64

TABLE 3

Suggestions of various stakeholders to improve the various stages of value chain

Primary Activities	Adding value	Response (n=80)	%
Inbound Logistics (Receiving, storing and distributing inputs)	Procurement of millets through government agency at MSP	64	80.00
	Govt. support to farmers and entrepreneurs to create storage facilities	53	66.25
	Training of entrepreneurs, SHGs and FPO's on improved crop production practices, processing and storage.	46	57.50
Operations (Activities that change inputs to outputs)	Ensuring supply of quality seeds and other inputs.	43	53.75
	Providing millet processing machine to farmers	37	46.25
	Imparting training on value addition to entrepreneurs engaged in millet processing.	27	33.75
Outbound logistics (Activities that deliver product to customers)	Improving market information system	46	57.50
	Improved transport Facilities	37	46.25
	Opening of outlets for processed food.	24	30.00
Marketing & sales	Development of products as per the requirement of the customers	40	50.00
	Highlighting the nutritional and medicinal properties of millets	29	36.25
	Good quality branding & packaging for better presentation.	19	23.75
Procurement and purchasing	More number of processing and value addition units.	67	83.75
	Government procurement on MSP.	48	60.00
	“Indira Amma Restaurant” like outlets in every town	40	50.00
Human Resource Management	Connecting local cooks for people who want home made food	45	56.25
	Hotel Management Institute of the state to train the entrepreneurs to make high value products from millets	32	40.00
	Training of farmers in handling improved implements	21	26.25
Technological Development	New farm machinery should be introduced to reduce drudgery.	35	43.75
	Regular skill development programs for farmers	27	33.75
	The innovations available with R&D institutes should be shared with farmers and entrepreneurs	27	33.75
Infrastructure	Development of godowns & warehouses	43	53.75
	Creating new markets through easy transport through legal reforms	32	40.00
	Responsible role of Dept. of Agri. in providing support to farmers	16	20.00

traders as well as consumer. Traders buy minor millets to sell mainly to other traders and directly to consumers and to a small extent, processors. Traders process a significant part of their minor millets to rice using processing machine. In essence traders sell both grains and rice, where some practices adding value to that in some extent. Rice is the main form in which millet is consumed and it is used mainly to prepare millet value added products. Millet processors use grain to process and package millet rice for sale to retailers, wholesalers and to the consumers. Processors tend to acquire grains from brokers and other appointed agents rather than deal with farmers directly. Like traders, they mostly sell directly to consumers. Processors also mill and pack millet products. Products are mostly straight rice though which few are making more sophisticated products like Ready-to-eat products.

Key stakeholders in marketing of Minor millets in Tumakuru district of Karnataka

Input suppliers	Research institutes / KVK's, farmers, NGOs, FPO's and Department of Agriculture
Producers	Millet growing farmers
Middlemen	Rural agents, traders, small scale processors, Brokers
Wholesalers	Bulk buyers from middlemen
Retailers	Mostly domestic customers

High Input Cost-low Margin Operating Environment for Producers

The high input cost-low margin operating environment for producers is presented in Fig. 3. and it shows that each stake holders are operating margins differently. The discussion with the millet producer revealed that, cost of production of minor millets is Rs.7.00 per kg for farmer's but when it reaches to consumer it will

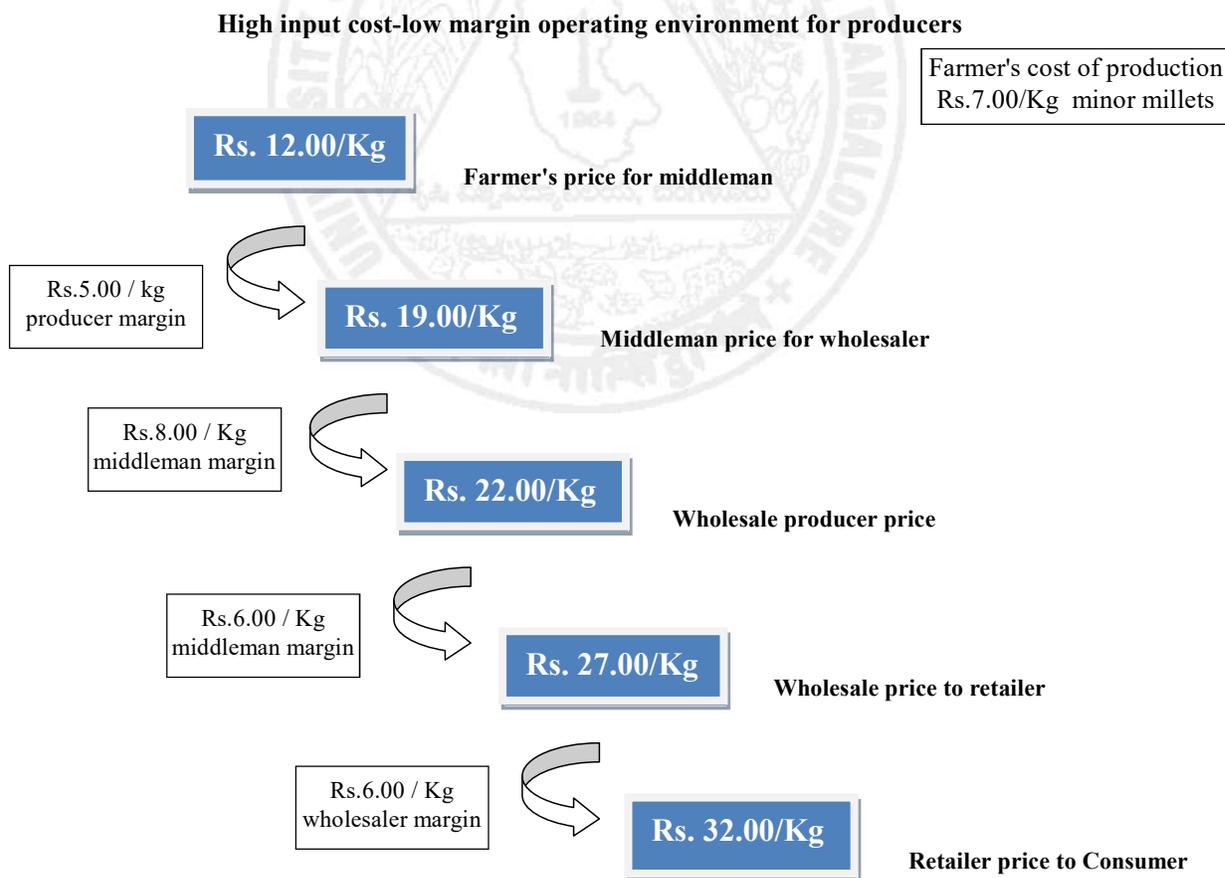


Fig. 3 : Input cost-margin operating environment

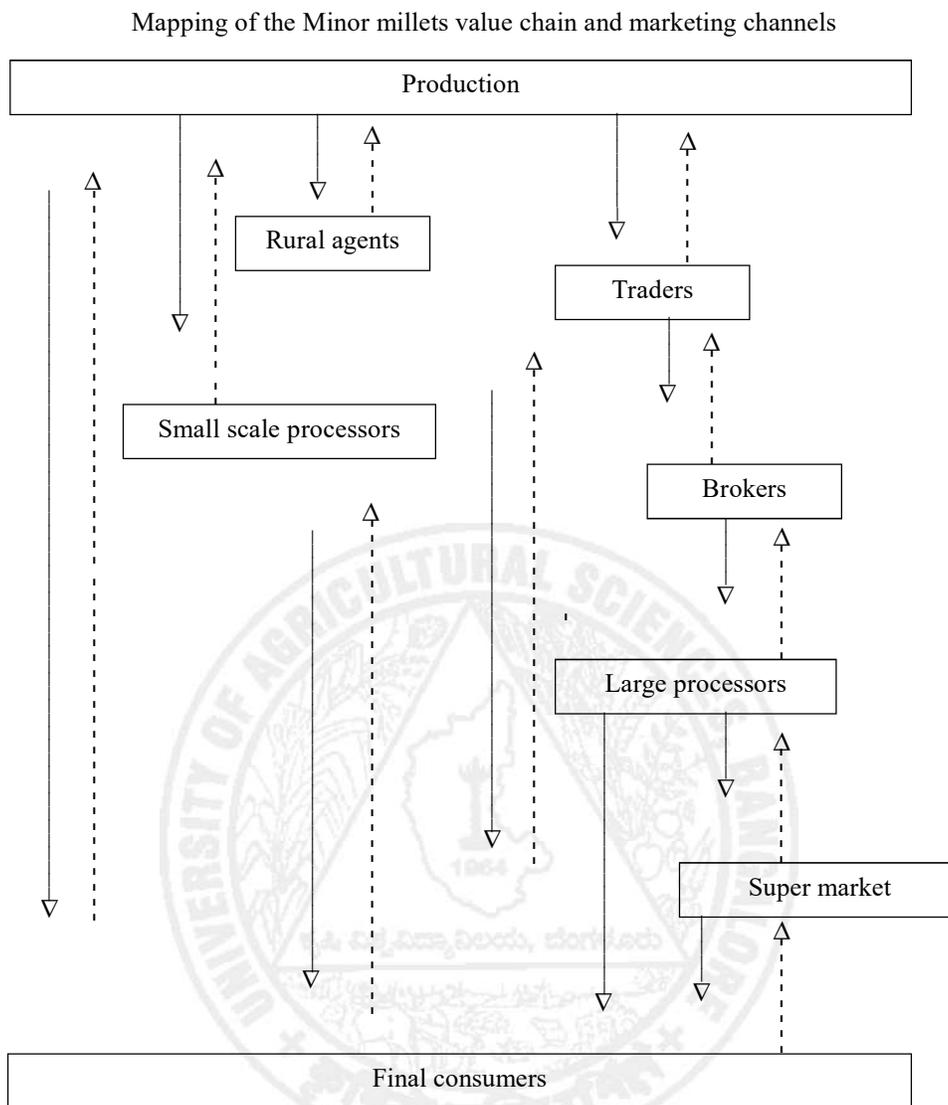


Fig. 4: Value chain mapping of minor millets

- Channel 1 – Producer – Rural agent – Traders – Small processors – Consumers
- Channel 2 - Producer –Traders – Brokers – Large processors – Final Consumers
- Channel 3 – Producer – Rural agents - Traders – Brokers – Large processors – Final Consumers
- Channel 4 – Producer – Rural agents - Traders – Final Consumers
- Channel 5 – Producer – Final consumer

be almost four times higher. The reason for the margin has been attributed to high labour cost and non availability of processing machine to farmers.

Value Chain Mapping of Minor Millets

A Value Chain Map (Fig. 4) provides a diagrammatical representation of a product as it moves from producers

to consumers, passing through different stages. The linkages are shown vertically from top to bottom. The map is organized based on data gathered from value chain participants during interviews as well as information that supplements secondary data. The movement of produce between two actors is depicted in the map by dotted line with an arrow mark. The actors in the channel are designated by rectangular

boxes. The channel shows consumers are the last link of minor millet value chain.

The details of various stages of value chain and suggestions documented from stakeholders are presented in Table 3 and it is revealed that, Value chain is the relationship established between actors involved directly and indirectly and productive activity with the aim of adding value in each stage of the value chain. It involves connections among producers, processor, distributor, traders and support institutions. From the above data, it was suggested to improve the primary activities in the value chain, major improvements suggested under primary activities were a) procurement of millet through government agency at MSP (80%) & b) government support to farmers and entrepreneurs to create storage facilities (66%).

Whereas, improvement suggested for Support Activities were : a) More number of processing and value addition units (84%) & b) Government procurement on MSP (60%) and connecting local cooks for people who want home cooked food (56%). Hence, the study suggested the farmers to involve in value addition and get better returns rather than selling it in a raw form. Value chains help increase a business's efficiency so the business can deliver the most value for the least possible cost. The end goal of a value chain is to create a competitive advantage for a company by increasing productivity while keeping costs reasonable.

Millet provides an important opportunity to improve food and nutrition security and at the same time opportunities for product development and economic improvement of millets production, value addition and marketing have done in the area pertained for study. However for opportunities to be captured, more attention is needed to improve millets productivity and more importantly improves the perception of farmer about millets from the cereal of the poor to a healthy cereal for modern health conscious consumers. In conclusion, cost of cultivation was less in millets because they were cultivated in dry land and required

minimum inputs like fertilizer and FYM. Accordingly the cost of cultivation worked out for all the minor millets is profitable in the study area with returns per rupee investment ratio of foxtail millet is 1.60 and barnyard millet is 1.52, respectively. Procurement of millets through government agency at MSP, establishment of advanced processing units, storage units and training on value added products of millets etc. will enhance the economic status of farmers. Further, policy on millets is Nutritional Security through Intensive Millets Promotion (INSIMP) introduced in 2011 under NADP or RKVY. This scheme aims to demonstrate the improved production and post-harvest technologies in an integrated manner with visible impact to catalyze increased production of millets in the State. Besides increasing production of millets, the scheme through processing and value addition techniques is expected to generate consumer demand for millet based food products.

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