Economic Analysis of Production and Consumption of Finger Millet in India

Article · August 2020

CITATIONS
2

READS
5,137

3 authors:

Ganesh Kumar Balasubramanian
ICAR-National Academy of Agricultural Research Management
94 PUBLICATIONS **635** CITATIONS
SEE PROFILE

N. Sivaramane
National Academy of Agricultural Research Management
70 PUBLICATIONS **293** CITATIONS
SEE PROFILE

Srinivasrao Ch.
National Academy of Agricultural Research Management
607 PUBLICATIONS **8,269** CITATIONS
SEE PROFILE

VOL. X, ISSUE XXXIV, JULY 2020 MULTILOGIC IN SCIENCE ISSN 2277-7601
An International Refereed, Peer Reviewed & Indexed Quarterly Journal in Science, Agriculture & Engineering

ECONOMIC ANALYSIS OF PRODUCTION AND CONSUMPTION OF FINGER MILLET IN INDIA

B. Ganesh Kumar[1*], N. Sivaramane[2] and Ch. Srinivasa Rao[3]

1. Principal Scientist, Agri Business Management Division, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad. ganesh@naarm.org.in

2 Principal Scientist, Agri Business Management Division, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad. sivaramane@naarm.org.in

3 Director, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad. chsrao_director@naarm.org.in

(MS Received: 18.06.2020; MS Revised: 20.07.2020; MS Accepted: 21.07.2020)

MS 2573 (RESEARCH PAPER IN AGRICULTURAL BUSINESS MANAGEMENT)

Abstract

This study has been conducted with the aim of finding reasons why the farmers continue cultivation of finger millet and also the possible future of this important crop for its increasing consuming pattern. The study is based on both primary and secondary data which were collected from the farmers in the state of Karnataka, Tamil Nadu, Maharashtra and Andhra Pradesh and pertained to the year 2015-16. The study has found that finger millet is being replaced by other competing fine cereals and commercial crops. The profitability of ragi is being affected due to its low productivity, absence of an organized seed supply chain, high labour requirement and lack of markets. On the other hand, the study has observed a perceptible increase in demand of ragi among the urban population because of its nutritive value. The Government of Karnataka has included finger millet in its social programmes and study has suggested that other states should also make its reach to the smallholders.

***Key Words**: Finger millet, Cost, perceptible, Production, Consumption*

Introduction

Millets are considered to be one of the oldest foods known to mankind. Millets are hardy crops which comes well under rainfed conditions and in less fertile soils (Michaelraj and Shanmugam, 2013). Millets, grown in resource poor regions under arid and semi-arid conditions serve the purpose of sustainable food supply to the smallholders, as they adapt well in such climates (Dicko *et al.*, 2005). The growth requirements are limited because they withstand severe abiotic stress such as unpredictable climate, poor precipitation and nutrient-depleted soils, and apart from this they are also relatively resistant to biotic stress such as pests and diseases (Sharma and Ortiz, 2000; Maqbool *et al.*, 2001). Minor millets, basically comprises finger millet (*ragi*), kodo millet (*varagu*), and little millet (*panivaragu*). Though they are accorded a relatively lower importance among cereal crops by the Indian farmers, they assume high importance from the food security point of view at household level in certain regions of the country, especially tribal belts as they can be grown even under poor natural resource base. Besides, their cultivation period is short and they can be grown very well in multiple cropping systems under both irrigated and dry farming conditions. Additionally, they supply nutritious green fodder to the livestock kept by the farmers for generating additional farm income regularly. The grain being hardy and dry could be stored for long and hence, could be considered as "famine reserves". Since millet grains are highly nutritious, non-glutinous and not acid forming foods, they are soft, easily digestible and least allergenic. Compared to rice, especially the polished one, millets release sustained and lower percentage of glucose and hence, lower the risk of diabetes among the consumers.

Finger millet (*Eleusine coracana*), one of the important minor millets is an annual herbaceous plant and a widely grown cereal crop in the arid and semiarid areas in Africa and Asia. It has probably evolved from its wild relative *Eleusine africana* and is basically a tetraploid and self-pollinating species (National Research Council, 1996). Finger millet has its origin in the Ethiopian and Ugandan highlands (D'Andrea *et al.*, 1999). This crop has the ability to withstand cultivation at the altitudes of more than 2000 meters above mean sea level; it is rich in micronutrient contents, especially iron and methionine; it has high drought tolerance and its grains can be stored for very long duration.

In India, finger millet (locally called by various names including *ragi*, *kezhvaragu*, *ragulu*, *nachani*, *mandua*) is mostly grown and consumed in Karnataka, Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra, Garhwal and Kumaon (Uttarakhand), Rajasthan, Dang District (Gujarat) and Goa. Karnataka contributes about 53% of total production of finger millet in the country, followed by Tamil Nadu (15%), Uttarakhand (10%) and Andhra Pradesh (7.5%) during 2013-14. It is a rich source of Ca (300-350 mg/100g), P (283 mg/100g) and Fe (3.9 g/100g) (Gopalan *et al.*, 2000), vitamin B_1, B_2, folic acid and niacin (Vidyavati *et al.*, 2004). Ragi flour is used to make flatbreads, thin, leavened *dosa* and thick, unleavened roti. Its grain is malted and also ground, which is consumed by mixing it with milk, boiled water or yoghurt. In India, ragi recipes are many and it is used to make even common food stuffs such as *dosa*, *idly* and *laddu*. In Southern parts of India, finger-millet-based food porridge is recommended by paediatricians for infants from six months of age because of its high iron and calcium content.

In spite of all the health benefits and the hardy nature of this millet, the area under finger millet is continuously declining in India and so the production. This downward trend was distinctly visible from the 80's when India ushered into green revolution promoting principally rice and wheat, which was due to policy support towards these fine cereals and their high productivity. Besides, this crop suffered further in terms of area under its cultivation from the mid-90's due to diversion of lands especially in the semi-arid tracts towards cotton and maize, which was due to a technological breakthrough. Wheat, paddy and maize are the preferred cereals in semi-arid regions of India over millets in general, finger millet in particular (Shukla *et al.*, 2015). Economics of its cultivation has also not helped its cause for sustenance. On the positive side, this millet is increasingly being consumed as a part of diet among unban population in India, owing to its superior nutritive values.

It is in this background, a study has been conducted on this crop to know the reasons why the farmers still continue cultivating this millet and also the possible future for this very important food crop for the ever increasing consuming urban population in our country and elsewhere.

Methodology

The study used both primary and secondary data on finger millet.

Selection of study area

The study used primary data on finger millet cultivation from the farmers principal ragi growing states of Karnataka, Tamil Nadu, Maharashtra and Andhra Pradesh. About 400 farmers (200 each from irrigated and rainfed cultivation) from Karnataka and 200 farmers each from the other three states were interviewed to collect data on production practices, varieties grown and economics of finger millet cultivation through personal interview using pre-tested

interview schedules during 2015-16. The households were chosen from the districts which are selected on the basis of its, production and productivity in all the states considered in the study.

Finger millet consumption data

The household level data on consumption of ragi available from 50th (1993-94), 55th (1999-2000), 61st (2004-05) and 68th (2011-12) rounds of the National Sample Surveys Organisation (NSSO) were used for this analysis. The NSS consumer expenditure survey is conducted every year. However, a large sample consumption survey is conducted once in 5 years collecting information at more disaggregate level covering all States and Union Territories (UT), all economic classes and rural and urban sectors. States where consumption of ragi was lesser than 0.1 kg of monthly per capita and Union Territories were not shown in the result.

Analytical tools

Tabular and percentage analysis were used to document the production practices and estimate the economics of finger millet cultivation in the study area and the consumption trend of finger millet among rural and urban population in India.

Results and Discussion

Land Holding and Cropping Pattern followed by Ragi Growers in the Study Area

The land holding and cropping pattern followed by the sample farmers in the study states is presented in Table 1.

The average landholding of the ragi growers was found to be ranging from 1.21 ha to 2.69 in the study area, with Karnataka farmers cultivating this crop in larger area, compared to their counterparts in other states. It was also observed that in all the study states, the farmers were found cultivating this crop mostly under rainfed conditions, except in Karnataka where it was being cultivated under irrigated conditions significantly. More specifically in Tamil Nadu, about 98% of the landholdings was rainfed and only 2% of the land had irrigated ragi, indicating very less priority of the crop in the irrigated lands.

With respect to cropping pattern in the study states, it was observed that the ragi farmers of Karnataka followed by those from Tamil Nadu and Andhra Pradesh were growing more diversified crops than their counterparts in Maharashtra, indicating a different resource endowment patterns existing among the study states. Gross cropped area was found to be maximum in Tamil Nadu, followed by Andhra Pradesh, Maharashtra and Karnataka among the ragi farmers, while the area under ragi was maximum in Tamil Nadu followed by Karnataka, Andhra Pradesh and Maharashtra.

Table 1. Land holding and Cropping Pattern Followed by Ragi growers in the Study States

Particulars	Karnataka		Tamil Nadu		Maharashtra		Andhra Pradesh	
	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed
Land holding (ha)	1.48 (55%)	1.21 (45%)	0.03 (2%)	1.21 (98%)	0.46 (25%)	1.41 (75%)	0.28 (23%)	0.93 (77%)
Crops grown	Ragi, Red gram, Maize, Ground nut, Paddy, Beans, Potatao, Horse gram, Vegetables, Flowers, Grapes, Mango, *Eucalyptus*, Arecanut, Coconut, Banana, Mulberry	Ragi, Red gram, Ground nut, Horse gram, Mango	Ragi, Beans, Potato, Maize, Tomato, Horse gram, Peas, *Eucalyptus*, Green gram, Lablab, Sugarcane	Ragi, Sorghum, Horse gram, Green gram, Little millet	Ragi, Paddy, Sugarcane, Ground nut	Ragi, Groun nut	Ragi, Beans, Sorghum, Potato, Maize, Tomato, Horse gram, Peas, Green gram, Little millet, Lablab, Sugarcane	Ragi, Sorghum, Horse gram, Green gram, Little milet
	GPU-28, Indaf-5, Indaf-9, Indaf-7, Local	GPU-28, ML-365, CO-14, MR-1, PYR-1	VL-149, PES-400, RAU-8,HR-374, DAPOLI-1, GPU 26, PR-202, B-11	Ratnagiri, Godavari, Bharathi				
Ragi varieties grown	430		557		445		473	
Gross cropped area (ha)	237		419		97		208	
Area under ragi cultivation (ha)	55		75		22		44	
Share (%)								

Source: Primary survey, 2016

Resource Use Pattern in Ragi Production by the Farmers in the Study Area

The resource use pattern followed by the growers in ragi production in the study are is furnished in Table 2.

The study revealed that the seed rate practiced by the ragi growers in the study area varied from 5.8 kg/ha to about 30.7 kg/ha. The farmers in Tamil Nadu were found using 30.7 kg seeds per ha, followed those in Andhra Pradesh (14.4 kg/ha), Karnataka (10.8 kg/ha) and Maharashtra (5.79 kg/ha). These findings were due to the variation in the method of sowing followed by the ragi growers, who followed direct sowing in Tamil Nadu was practiced by the farmers, while about equal number of farmers follow both direct seeding and transplanting in Andhra Pradesh and Karnataka.

Conversely, the all farmers of Maharashtra practice transplanting method of sowing, thus requiring less seed for sowing.

Table 2. Resource Use Pattern in Ragi Production by the Farmers in the Study Area

Inputs	States			
	Karnataka	Tamil Nadu	Maharashtra	Andhra Pradesh
Seed (kg/ha)	10.8	30.7	5.8	14.4
FYM (kg/ha)	1040	1488	4513	3671
Fertilizer (kg/ha)	387	320	275	37
Human labour (mandays/ha)	93	74	169	106
Bullock labour (mandays/ha)	5.50	1.32	5.21	6.38
Machine labour (mandays/ha)	1.60	1.74	0.67	0.38

Source: Primary survey, 2016

The use of farmyard manure (FYM) by the ragi growers was observed to be more in Maharashtra (4513 kg/ha) and Andhra Pradesh (3671 kg/ha) than in Tamil Nadu (1488 kg/ha) and Karnataka (1040 kg/ha). Conversely, the application of fertilizers by them in ragi cultivation was found maximum in Karnataka and Tamil Nadu (387 kg/ha and 320 kg/ha respectively), when compared to them in Maharashtra (275 kg/ha) and Andhra Pradesh (37 kg/ha). Hence in general, it is observed that this crop is cultivated under inorganic conditions in Karnataka and Tamil Nadu, while it is cultivated relatively organic in Andhra Pradesh and Maharashtra.

With respect to labour use pattern, it was found that human labour use in ragi cultivation was found more (169 mandays/ha) in Maharashtra, as compared to Andhra Pradesh (106 mandays/ha), Karnataka (93 mandays/ha) and Tamil Nadu (74 mandays/ha). Bullock labour use was higher in Andhra Pradesh (6.38 mandays/ha) followed by Karnataka (5.50 mandays/ha), Maharashtra (5.21 mandays/ha) and Tamil Nadu (1.32 mandays). Conversely, the machine labour was used more in Tamil Nadu and Karnataka (1.74 mandays/ha and 1.60 mandays/ha respectively), than the other two states (0.67 mandays/ha in Maharashtra and 0.38 mandays/ha in Andhra Pradesh, respectively). This observation of more human and animal labour in Maharashtra and Andhra Pradesh was due to use of them in transplanting and tilling operations in ragi cultivation. It is also evident that great deal of mechanization was happening in Tamil Nadu and Karnataka, especially in the operations of tilling of land and threshing of harvested crops, as is shown by more use of machine labour by the growers.

Cost and Returns of Ragi Cultivation

The cost of cultivation was worked out based on Commission on Agricultural Costs and Prices (CACP) concepts, and the details on costs and returns are furnished in Table 3 and 4. It could be observed from Table 3 that Cost A1, which comprise all the out-of-pocket cost items were found to be highest in Karnataka (Rs. 51,617 per ha under irrigated condition and Rs. 42,692 per ha under rainfed condition, respectively), followed by Tamil Nadu (Rs. 27,729 per ha), Maharashtra (Rs. 25,735 per ha) and Andhra Pradesh (Rs. 13111 per ha). The major item of expenditure here is the cost of labour (69-73% of Cost A1), as it is evidenced from the fact that this crop is a highly labour-intensive one on account of tedious land preparation, removal of weeds, protection from birds, manual harvesting and post-harvest operations (FAO, 1996). The other major expenses among the Cost A1 components are those on fertilizers, except in case of Karnataka where the farmers were found spending more on purchase of farm yard manure.

Table 3. Cost of Cultivation of Ragi Production in the Study Area *(Rs./ha)*

Item/Cost	States				
	Karnataka		Tamil Nadu	Maharashtra	Andhra Pradesh
	Irrigated	Rainfed	Rainfed	Rainfed	Rainfed
Cost A1	51617	42692	27729	25735	13111
Seed	*495*	*495*	*615*	*102*	*79*
FYM	*6700*	*6200*	*1847*	*2535*	*2472*
Fertilizers	*5040*	*4700*	*4121*	*4082*	*541*
Plant protection chemicals	*0*	*0*	*0*	*272*	*0*
Human labour	*23350*	*16250*	*10331*	*11618*	*6298*
Bullock labour	*4400*	*4320*	*1049*	*3817*	*1305*
Machine labour	*9728*	*9260*	*8743*	*2259*	*1932*
Interest on working capital			*1023*	*1050*	*484*
Cost A2	51617	42692	28968	25735	13111
Cost B	56617	47692	29378	27261	14320
Cost C	62057	51885	36253	43772	25269

Source: Primary survey, 2016

The leasing of land by the ragi growers was found only in the state of Tamil Nadu. Hence, Cost A2 remained the same for all the other states. Similar trend was observed in case of Cost B, where it was found highest in Karnataka (Rs. 56,617 per ha under irrigated condition and Rs. 47,692 per ha under rainfed condition, respectively), followed by Tamil Nadu (Rs. 29,378 per ha), Maharashtra (Rs. 27,261 per ha) and Andhra Pradesh (Rs. 14,320 per ha).

Similarly, Cost C was found to be highest in Karnataka (Rs. 62,057 per ha under irrigated condition and Rs. 51885 per ha under rainfed condition, respectively), followed by Maharashtra (Rs. 43,772 per ha), Tamil Nadu (Rs. 36,253 per ha) and Andhra Pradesh (Rs. 25,269 per ha). This is due to the fact that Karnataka and Maharashtra farmers were engaging more human labour in transplanting seedlings, weeding, summer ploughing, and winnowing than other states. On the other side, the wage rates were

relatively less for human labour in Andhra Pradesh, implying less cost on family labour.

The returns from ragi cultivation were worked out and the different forms of income for the farm households were listed in Table 4. It showed that the farmers of Karnataka were found getting more returns than their counterparts in other states. After accounting for all the cost components, farmer in Maharashtra and Tamil Nadu were incurring loss in the cultivation of ragi. Finally, the cost of production per kg of ragi was worked out to be highest in Karnataka (Rs. 25.56 under rainfed condition), followed by Maharashtra (Rs.18.12), while it was Rs. 16.62 in Karnataka (under irrigated condition), Rs. 12.48 in Tamil Nadu and Rs.4.75 in Andhra Pradesh. It was calculated by taking into account only the Cost A1.

It is found from the table that ragi cultivation was found to be a loss making agricultural activity in Maharashtra, while it was profitable in the other three states. However, if we impute the value of family labour, it makes loss to the farmers in Tamil Nadu, indicating that the family labour is spent on this farming ignoring better opportunity cost elsewhere. In other words, that ragi growers of Tamil Nadu doesn't appear to make a gainful employment in their farm. However, they might be continuing ragi cultivation for their consumption purpose.

Table 4. Returns from Ragi Production in the Study Area *(Rs./ha)*

Item/ Returns	States				
	Karnataka		Tamil Nadu	Maharashtra	Andhra Pradesh
	Irrigated	Rainfed	Rainfed	Rainfed	Rainfed
Yield (kg/ha)	3105	1670	2279	1329	2582
Gross returns	102410	58985	35530	22348	38785
Profit over Cost A1 (Farm business income)	50793	16293	7801	-3387	25674
Profit over Cost A2	50793	16293	6562	-3387	25674
Profit over Cost B (Family labour income)	45793	11293	6152	-4913	24465
Profit over Cost C (Net income)	40353	7100	-723	-21424	13516
Cost of Production (Rs/kg)	16.62	25.56	12.17	19.36	5.08
Net profit (Rs./kg)	13.00	4.25	-0.32	-16.12	5.23

Source: Primary survey, 2016

Consumption of ragi over time

The consumption of ragi has declined among rural population over the years sharply from 1,811,000 tonnes in 1993-94 to 750,000 tonnes in 2011-12 (Table 5). The state-wise perusal reveals that this sharp decline was happening in Karnataka and Andhra Pradesh. However, Karnataka still accounts for 67.91 per cent of total consumption followed by Andhra Pradesh (12.26 percent) and Tamil Nadu (7.62 per cent) during 2011-12. Whereas it was 52.10 per cent in Karnataka (52.10 per cent) during 1993-94 followed by Tamil Nadu (15.11 per cent) and Andhra Pradesh (10.96 per cent).

Table 5. Consumption of Ragi in Rural areas of India over Time *(000'tonnes/year)*

State	Year			
	1993-94	1999-00	2004-05	2011-12
Karnataka	943 (52.10)	728 (54.51)	761 (65.21)	509 (67.91)
Andhra Pradesh	198 (10.96)	120 (8.95)	106 (9.11)	92 (12.26)
Tamil Nadu	274 (15.11)	176 (13.17)	149 (12.78)	57 (7.62)
Maharashtra	122 (6.74)	134 (10.02)	62 (5.33)	35 (4.73)
Uttarakhand	NA	NA	22 (1.85)	12 (1.54)
All India	1811 (100.00)	1336 (100.00)	1167 (100.00)	750 (100.00)

Figures in parentheses indicate percentages to All India figures
Source: Various rounds of NSSO

The consumption of ragi among urban population revealed that it was found continuously increasing from 235,000 tonnes in 1993-94 to 272,000 tonnes in 2011-12 (Table 6). However, the state level consumption data shows that the state of Karnataka alone accounts for a major share during the period of analysis, ranging from 81.70 per cent in 2011-12 to 86.40 per cent in 1999-00. This was followed by Tamil Nadu, which has a percentage share ranging from 6.60 per cent in 1999-00 to 7.26 per cent in 2011-12 and Andhra Pradesh, which has a percentage share ranging from 3.20 per cent in 1999-00 to 7.31 per cent in 1993-94. Other states like Maharashtra and Uttarakhand had a small share of consumption of ragi among the All India level consumption.

Table 6. Consumption of Ragi in Urban areas of India over Time *(000'tonnes/year)*

State	Year			
	1993-94	1999-00	2004-05	2011-12
Karnataka	194 (82.37)	216 (86.40)	226 (84.33)	222 (81.70)
Tamil Nadu	16 (6.82)	16 (6.60)	18 (6.77)	20 (7.26)

Andhra Pradesh	17 (7.31)	8 (3.20)	14 (5.31)	17 (6.27)
Maharashtra	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)
Uttarakhand	NA	NA	0 (0.00)	0 (0.00)
All India	235 (100.00)	250 (100.00)	268 (100.00)	272 (100.00)

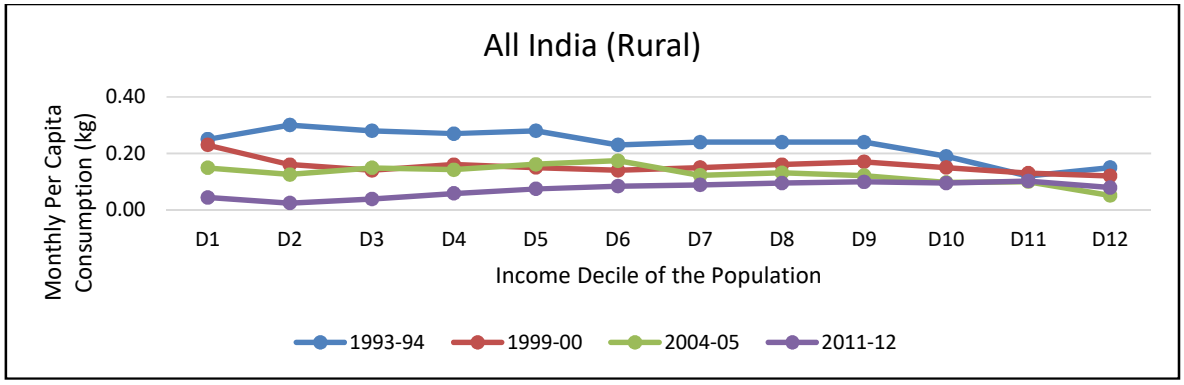
Figures in parentheses indicate percentages to All India figures
Source: Various rounds of NSSO

The average monthly per capita consumption of ragi over a period of time is presented in Table 7. The results revealed that the average monthly per capita consumption of ragi at All India level was 0.075 kg in rural areas and it was 0.060 kg in urban areas during 2011-12, while it was 0.240 kg and 0.090 kg respectively during 1993-94. State level analysis on consumption of ragi reveals that Karnataka was the major state in terms of ragi consumption in rural areas (1.130 kg/capita/month) during 2011-12 followed by Uttarakhand (0.137 kg/capita/month) and Andhra Pradesh (0.136 kg/capita/month). While in 1993-94, the same was 2.530 kg in Karnataka followed by Tamil Nadu (0.620 kg) and Andhra Pradesh (0.340 kg). Similarly, in case of consumption of ragi in urban areas, the average monthly per capita consumption in Karnataka was (0.754 kg) followed by Andhra Pradesh (0.050 kg) and Tamil Nadu (0.047 kg) in the year of 2011-12. While in 1993-94, it was 1.160 kg in Karnataka followed by Andhra Pradesh (0.080 kg) and Tamil Nadu (0.070 kg).

Consumption of ragi across income groups

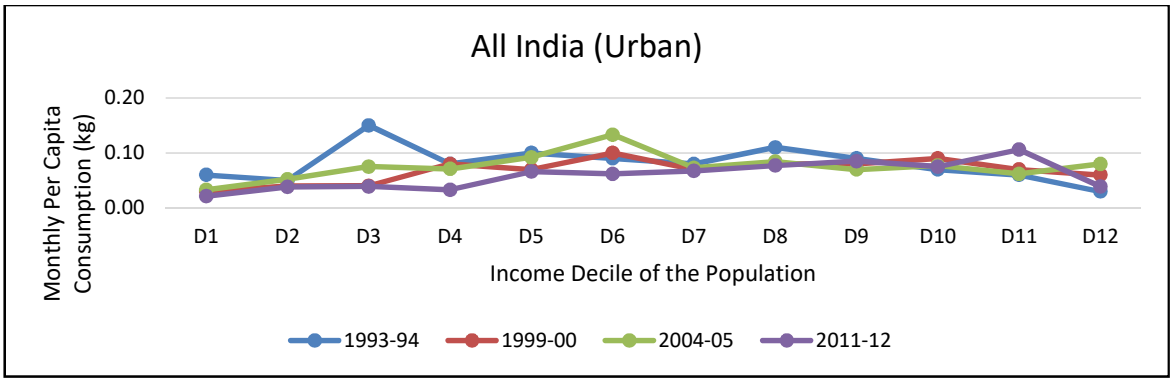
The consumption pattern of ragi over various income decile groups of the population for both rural and urban population of the major states, as well as All India were presented in the Figures I and II. Decile denotes dividing the population into ten groups with equal number of persons.

It could be seen from Figure I that for rural population of India, the consumption of ragi was increasing from lower decile to upper decile in the earlier survey rounds. But, in the recent year, it was increasing till certain upper decile group, after which the consumption was found reducing. The same pattern was very much observed in urban population of India over all time periods (Figure II). This might be due to the reason that people eat outside home at higher levels of income.



Source: Various rounds of NSSO

Figure I. Consumption of Ragi in India (Rural) across groups



Source: Various rounds of NSSO

Figure II. Consumption of Ragi in India (Urban) across groups

Conclusion

Finger millet is continuously getting replaced by other competing fine cereals and commercial crops due to different reasons. The profitability of ragi cultivation is also affected due to its low productivity, absence of an organized seed supply chain, high labour requirement, and lack of markets. Besides, ragi is such a crop which is faced by various myth and taboo when one comes to think of producing or consuming. There are cultural issues in adoption and diversification of food. There is a lack of technical know-how in processing methods and the conventional method of

hand pounding is a tedious process. Besides, there is also a lack of awareness about the nutritive value of ragi with the opinion that this is a poor men's crop. But, there are evidences that there is a perceptible demand among the urban population. Various measures are very much warranted to save and promote this much neglected crop in our country not just to double the income of the farmers, but to sustain the current income of the farmers, especially in marginal and tribal areas where this is being cultivated. There are efforts to come out with high yielding varieties along with traits of drought resistance through All India Coordinated Project on Small Millets in India, which should be continued. There should be sincere efforts by the government to protect the price risk faced by the farmers by developing the markets for exclusively for millets which are scattered and small at present. In Karnataka finger millet is among the 'climate smart' crops that figures high on the agenda of the government. The state has included finger millet in its flagship mid-day meal scheme called 'ANNA BHAGYA YOJANA to supply this grain at free of cost to Priority Household families, which includes Antyodaya Anna Yojana (AAY) scheme beneficiaries and Below Poverty Line (BPL) families across the State. Such proactive policy initiatives may be thought of by other leading states in finger millet production. More awareness need to be created about the health benefits of ragi and thereby remove the myth on this crop not as poor men's crop, but rich people's diet.

Acknowledgement

The authors thank Dr. Lilian Gilgen, programme Manager, ISCB, ETH-Zurich, Switzerland and Dr. Pratiba Singh, Coordinator, Technology Advancement Unit (TAU), Department of Biotechnology (DBT), Govt. of India for coordinating this study as a part of socio-economic (SE) component of this network project under Phase-IV of the Indo-Swiss Collaboration in Biotechnology funded jointly by DBT, Govt. of India and Swiss Agency for Development and Cooperation (SADC), Govt. of Switzerland and the Joint Advisory Committee of ISCB.

References

I. **D'Andrea, A.C., Lyons, D.E., Mitiku Haile and Butler, E.A. (1999).** Ethnoarchaeological Approaches to the Study of Prehistoric Agriculture in the Ethiopian Highlands in Van der Veen, ed., The Exploitation of Plant Resources in Ancient Africa. Kluwer Academic:Plenum Publishers, New York, 1999.

II. **Dicko, H., Gruppen, H.,Traore, A,Voragen,J. and Berker, J. (2005).** Sorghum grain as human food in Africa. Relevance of content of starch and amylase activities. *African Journal of Biotechnology*, 5 (5): 384-395.

Gopalan, C., B.V. Rama Sastri, and S. C. Balasubramanian. (2000). Nutrient value of Indian Foods. National Institute of Nutrition, ICMR Hyderabad.

III. **Maqbool, S.B., Devi, P. and Sticklen, M. (2001).** Biotechnology: genetic improvement of sorghum (Sorghum bicolour). *In vitro Cell Developmental Biology-Plant,* 37: 504-515.

IV. **Michaelraj, P.S.J. and Shanmugam, A. (2013).** A study on millets based cultivation and consumption in India. *International Journal of Marketing, Financial Services and Management Research,* ISSN 2277-3622, 2 (4): 49-58.

V. **National Research Council (1996).** Lost Crops of Africa: Volume I: Grains. National Academies Press. ISBN 9780309049900.

VI. **Sharma, K.K. and Ortiz, R. (2000).** Program for the application of genetic transformation for crop improvement in the semi-arid tropics. *In vitro Cell Developmental Biology—Plant,* 36: 83-92.

VII. **Shukla, A., Lalit, A., Sharma, V., Vats, S. and Alam, A. (2015).** Pearl and finger millets: The hope of food security, *Applied Research Journal*, 1 (2) : 59-66.

VIII. **Vidyavati, H. G., J. Begum, J. Vijayakumari, S. Gokavi,and S. Begum. (2004).** Utilization of finger millet in preparation of Papad. *Journal of Food Science and Technology*, 41(4): 379-382.