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A Critical Analysis of Farmers Field School on Nutrient Management, Processing and Value Addition in Little Millet in Tumakuru District of Karnataka, India

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Authors' contributions

This work was carried out in collaboration between all authors. Author RBP designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors BM and MHS managed the analyses of the study. Author TSS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Millets are of minor importance in the west but a staple food in the diets of African and Asiatic people. Their agricultural importance arises from their hardiness, tolerance to extreme weather and could be grown with low inputs in low rainfall areas. With this background the Farmers Field School programme was conducted in the Patrehalli village of Tiptur taluk, Tumakuru district, Karnataka, India. Totally 25 beneficiaries were selected for the programme and systematically implemented with technical sessions on improved production practices, value addition, processing, branding and marketing. The result reveals that, There was significant change in the soil nutrient was observed after effective management of nutrient during cropping season based on soil test analysis report in the initial stage. With this, there was a reduction in soil pH from 6.9 to 6.27, Electric Conductivity (pH) from 0.62 to 0.37, Organic Carbon percentage increased from 0.19 to 0.24. 68 percentage of

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beneficiaries were unaware of a new variety of little millet OLM-203 and 32% of farmers were known about importance of soil sampling before the implementation of the programme. And after the implementation of the programme majority (88%) of the beneficiaries had knowledge on new variety OLM-203, preparation of specified products. A good number (92%) of them were aware about importance of soil sampling, value added products of little millet, nutritional importance / health benefits and skill on milling, winnowing and labeling of value added products to get higher market price. With respect to economic analysis of the implemented programme, they obtained an yield of 10.10 Q against adoption of recommended practice (11.60 Q). Farmers have made an gross cost of Rs 11469 and obtained Rs 25,250 as gross return with their traditional practice and obtained benefit cost ratio 2.20. Because of intervention of KVK in little millet nutrient management practices, they made an gross cost of Rs 12,245 and obtained gross return of Rs 29,000 and benefit cost ratio of 2.36. KVK has organized technological interventions in scientific processing, packaging, branding and channelized with suitable marketing. With this the beneficiaries have made an gross cost of Rs 4700 per quintal for the above practices and obtained an gross return of 8000 per quintal with benefit cost ratio of 1.70.

Keywords: Little millet; nutrient management; processing; value addition; knowledge.

1. INTRODUCTION

Millet is a generic term used for small sized grains that form heterogeneous group and referred along with maize and sorghum as coarse cereals. Millets are of minor importance in the west but a staple food in the diets of African and Asiatic people. Their agricultural importance arises from their hardiness, tolerance to extreme weather and could be grown with low inputs in low rainfall areas. *Bajra* or pearl millet (*Pennisetum americanum*), *ragi* or finger millet (*Eleusine coracana*), *navane* or foxtail millet (*Setaria italica*), *samai* or little millet (*Panicum miliare*), *haraka* or kodo millet (*Paspalum scrobiculatum*), *panivaragu* or proso millet (*Panicum miliaceum*), banti or barnyard millet (*Echinochloa frumentacea*) as one of the most important drought resistant crops, millet is widely grown in semi-arid tropics of Africa and Asia. In the 21st century, climate changes, water scarcity, increasing world population, rising food prices and other socio-economic impacts are expected to generate great threat to agriculture and food scarcity worldwide, especially for the poorest people who live in arid and sub arid region. Millets are short duration crops and resistant to pests and diseases.

Little millet is reliable catch crop in view of its earliness and resistance to adverse agro-climatic conditions of high drought as well as water logging. It is grown throughout India and a traditional crop of Karnataka. It has received comparatively little attention from plant breeders. The plant varies in height between 30 and 90 cm and its oblong panicle varies in length between 14 and 40 cm. It is mostly mix cropped with other millets, pulses and oilseeds. The seeds of little millet are smaller than those of common millet. It is generally consumed as rice and any recipe that demands staple rice can be prepared using little millet. Little millet crop is cultivated in Madhya Pradesh, Tamil Nadu, Andhra Pradesh and many parts of Karnataka. Constitutes major source of CHO and protein for people living in these areas. It can be grown on lands with low fertility and with little inputs [1]. With respect to other cereals, Millets are nutritionally comparable and even superior to some major cereals [2,3,4], Millets are also rich source of dietary fibre and phyto nutrients [5]. L:ittle millet has fat (4.7 g), Crude fibre (7.7 g), Iron (9.3 g) and Phosphorous (220 mg) per 100 g which is comparable to cereals and other millets [3]. It is a fair source of protein, which is highly digestible and is an excellent source of dietary fibre with good amounts of soluble and insoluble fractions. The carbohydrate content is low and slowly digestible, which makes the Little millet a nature's gift for the modern mankind who is engaged in sedentary activities [6]. Technology used for converting the grain into edible form and thereby enhancing its quality is known as processing. Processing of millets plays a significant role during its utilization as food. Little millet can be consumed by processing it into rice, flour, roasted, popped, porridges and fermented products. As little millet grains are hard seed coat grains, their processing starts with the task of removal of husk [7]. The ethnic millet papads, chakali, paddu, laddu; and millet based novel foods like biscuits, breads, flakes proved to have a good scope for enhancing nutrition security, marketing and income generation [8,9]. Minor millets are neglected crops which seeks least

attention by the farmers in its production practices such as improved variety, nutrient, pest and disease management. With this background the present study was conducted with following objectives and hypothesis.

1. Nutrient management by Little millet growers
2. Processing and value addition in little millet

There was no relationship among farmers with respect to nutrient management, processing and value addition in little millet (Null Hypothesis).

2. MATERIALS AND METHODS

Farmers Field School (FFS) was conducted at Patrehalli village of Tiptur taluk, Tumakuru district of Karnataka state, India during kharif season of 2013 by Krishi Vigyana Kendra, Tumakuru to study the change in knowledge level of nutrient management, processing, branding and value addition in little millet. For this experiment, 25 farmers growing little millet were selected, including a beneficiary farmer, 24 participants and a KVK Scientist as facilitator. Total of 5 ha was taken as demonstrated plot in which improved variety OLM-203 has been introduced, also suggested soil test based nutrient management practices of the crop and remaining 5 ha cropped area was selected as a check plot (Farmers practice), where farmers were practicing cultivation of local variety and improper nutrient management practices. After the cultivation practices the value addition and market linkage facilities were introduced in Self Help Group (SHG), "Swarna Gowri" of same village to improve the economic condition of farm families. A series of Technical sessions were undertaken to improve the knowledge and skill of the beneficiaries.

Initial and final soil samples are collected and analyzed for nutrients viz., pH, electrical conductivity, organic carbon, available nitrogen, available phosphorus, available potassium, Zinc & Boron to know the soil status.

Materials necessary for branding and packaging of little millet rice, little millet papad were given to SHG and it was registered under FSSAI and nutrient management, processing value addition of little millet was demonstrated and knowledge level was evaluated.

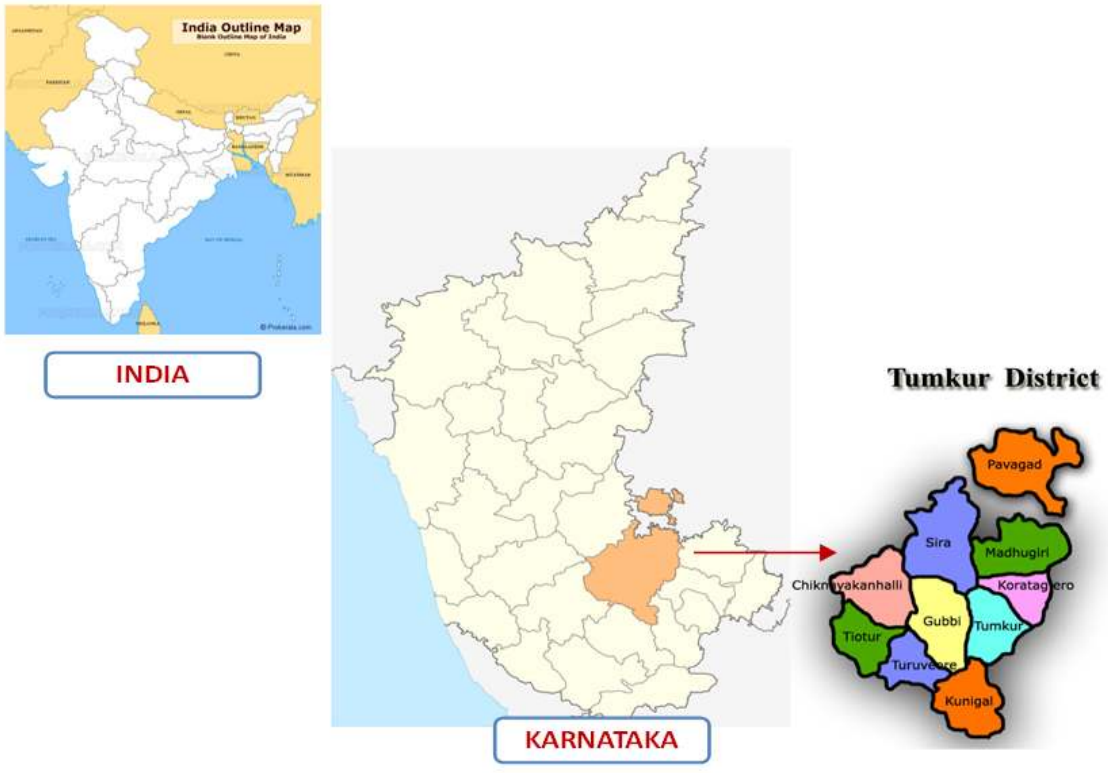

Fig. 1. Location of the study area

Before the implementation of FFS the beneficiaries were trained on nutrient management, processing and value addition in little millet and they were evaluated to understand their knowledge level on above aspects. With this regard the pre and post evaluation was done with 3 point continuum viz., fully known, partially known and not known.

2.1 Sessions Conducted during Programme

Introduction to Farmers Field School, Introduction of improved variety of Little millet (OLM-203), Soil sampling procedures and its importance, Nutrient management practices, Harvesting and processing techniques, Value addition, Branding, Packaging and Labeling and Marketing Linkage.

3. RESULTS AND DISCUSSION

Data in the Table 1 depicts the average Initial and Final soil fertility status of little millet field. The soil sample was taken in the field earlier 15 days before sowing and 15 days after harvest of little millet. There was significant change in the soil nutrient was observed after effective management of nutrient during cropping season based on soil test analysis report in the initial stage. With this, there was a reduction in soil pH from 6.9 to 6.27, Electric Conductivity (pH) from 0.62 to 0.37, Organic Carbon percentage increased from 0.19 to 0.24, available nitrogen in terms of Kg per h. was decreased from 352 to 324, there was a increase in the available phosphorous from 23 to 25 Kg/ ha and a noticeable reduction in availability of potash from 216 to 204 Kg/ha. The results are in line with the findings of Bhag Mal et al. [10]. They opined that, the results of the on-farm demonstrations conducted at the UAS, Bangalore showed that the farmers could increase the productivity of the crop by 30-35% with adoption of improved practices over farmers' practices in Karnataka. The availability of micro nutrients such as zinc and Boron (ppm) was enhanced from 0.60 to 0.83 and 0.56 to 0.64 respectively [11]. This shows that, Effective management of nutrients in little millet can results in low cost of cultivation and make the nutrients effectively available for plant growth and development.

Before the implementation of FFS the beneficiaries were trained on nutrient management, processing and value addition in little millet and they were evaluated to understand their knowledge level on above aspects. With this regard the pre and post evaluation was done with 3 point continuum viz., fully known, partially known and not known.

Table 1. Average initial and final soil fertility status of little millet field (n=25)

Parameters	Initial	Final
pH	6.90	6.27
Electrical conductivity (ds/m)	0.62	0.37
Organic carbon (%)	0.19	0.24
Available Nitrogen(Kg/ha)	352	324
Available Phosphorus (Kg/ha)	23	25
Available Potassium (Kg/ha)	216	204
Zinc (ppm)	0.60	0.83
Boron (ppm)	0.56	0.64

Before implementation of technological intervention a pre evaluation was conducted to know the knowledge level of beneficiaries on nutrient management, processing and value addition in little millet and also after the implementation over the period post evaluation was also conducted for above purpose and it was presented in Table 2. Remarkable observations were noticed during pre evaluation studies. 68 percentage of beneficiaries were unaware of a new variety of little millet OLM-203 and 32% of farmers were known about importance of soil sampling, 68% of them not known about importance of soil test based nutrient management practices and only 36% of farmers aware about value added products and nutrient composition of little millet. About 56% of them were not aware about nutritional importance / health benefits of little millet. Around 60% of beneficiaries were not having any knowledge on market information, milling, winnowing and cleaning of little millet.

A systematic technical session about nutrient management, processing and value addition including marketing on little millet were organized to impart knowledge and skill on above practices during the intervention and post evaluation was conducted to know the knowledge level of beneficiaries. After the implementation of the programme majority (88%) of the beneficiaries had knowledge on new variety OLM-203, preparation of specified products. A good number (92%) of them were aware about importance of soil sampling, value added products of little millet, nutritional importance / health benefits and skill on milling, winnowing and labeling of value added products to get higher market price. About 80 percentages of beneficiaries have gained knowledge on nutrient

composition of little millet, market information and intelligence on value added products of little millet.

From the above observations, it was clearly indicates that the interventions made by KVK on underutilized crop such as little millet with respect to nutrient management, processing and value addition including marketing made an good impact on gaining the farmers knowledge on improved production practices, processing, value addition, branding and marketing of little millet to increase their economic stability and to improve their health status.

The findings of the present study regarding knowledge enhancement in value addition, processing, branding and marketing through capacity building programmes are in line with the project result of UAS, Bangalore, Karnataka. The project had been able to create awareness among the farmers, communities, entrepreneurs and other stakeholders about the importance and use of millets especially for enhancing income and also for better nutrition. Based on participatory field demonstrations, the millet farmers were highly convinced about the fact that better varieties and improved cultivation practices are opportunities for enhanced production food security and income generation. The training on various aspects of production, processing, value addition and product development greatly helped the farmers in their skill enhancement which provided them greater confidence in venturing in to diversified product development and organized marketing in order to harness better profits from their produce. [10].

Data in the Table 3 reveals that, with respect to nutrient management in the farmers practice, they obtained an yield of 10.10 Q against adoption of recommended practice (11.60 Q). Farmers have made an gross cost of Rs 11469 and obtained Rs 25250 as gross return with their traditional practice and obtained benefit cost ratio 2.20. Because of intervention of KVK in little millet nutrient management practices, they made an gross cost of Rs 12245 and obtained gross return of Rs 29000 and benefit cost ratio of 2.36.

Table 2. Change in the level of knowledge in nutrient management, processing and value addition in little millet (n=25)

Sl. No	Parameters	Before intervention			After intervention		
		Fully known	Partially known	Not known	Fully known	Partially known	Not known
1	New Variety OLM -3	5 (20)	3 (12)	17 (68)	22 (88)	2 (8)	1 (4)
2.	Importance of soil sampling	8 (32)	9 (36)	8 (32)	23 (92)	2 (8)	-
3.	Importance of soil test based nutrient management practices	3 (12)	5 (20)	17 (68)	21 (84)	3 (12)	1 (4)
4.	Value added products of little millet	9 (36)	7 (28)	9 (36)	23 (92)	2 (8)	-
5.	Nutrient composition of little millet	1 (4)	2 (8)	22 (88)	20 (80)	3 (12)	2 (8)
6.	Nutritional importance/Health benefits of little millet	5 (20)	6 (24)	14 (56)	23 (92)	1 (4)	1 (4)
7.	Preparation of specified products	7 (28)	6 (24)	12 (48)	22 (88)	2 (8)	1 (4)
8.	Market information of specified products	3 (12)	7 (28)	15 (60)	18 (72)	5 (20)	2 (8)
9.	Market intelligence of specified products	2 (8)	3 (12)	20 (80)	20 (80)	3 (12)	2 (8)
10.	Milling of little millet	6 (24)	4 (16)	15 (60)	23 (92)	2 (8)	-
11.	Winnowing and Cleaning of little millet	3 (12)	7 (28)	15 (60)	23 (92)	2 (8)	-
12.	Branding	8 (32)	6 (24)	11 (44)	21 (84)	3 (12)	1 (4)
13.	Packaging	10 (40)	6 (24)	7 (28)	24 (96)	1 (4)	-
14.	Labeling	7 (28)	9 (36)	9 (36)	23 (92)	1 (4)	1 (4)
15.	Marketing of specified value added products of little millet	7 (28)	8 (32)	10 (40)	20 (80)	3 (12)	2 (8)

(Data in the parenthesis are percentage)

Table 3. Outcome of technology intervention

Description	Farmers practice					Recommended practice (demo)				
	Yield (Q)	GC	GR	NR	BCR	Yield (Q)	GC	GR	NR	BCR
Nutrient Management	10.10	11469	25250	14781	2.20	11.60	12245	29000	16755	2.36
Processing to little millet rice	-	3700/Q	4000/Q	300/Q	1.08	-	4700/Q	8000/Q	3300/Q	1.70

GC: Gross Cost, GR: Gross Return, NR: Net Return, BCR: Benefit Cost Ratio

It clearly shows that the adoption of recommended practices with respect to nutrient management in little millet have an good impact on yield and income of the farmers. The results are in par with studies of [12]. They showed that, the recommended dose of fertilizer ($N_{40}P_{20}K_{10}$,) applied to little millet alone proved the most remunerative (Rs. 3765 ha^{-1}) with B:C ratio of 1.71 followed by the application of biozyme (15 kg ha^{-1}) which gave net income of Rs. 3162 ha^{-1} with B:C ratio of 1.59 under the existing agro climatic condition.

With respect to processing of little millet grain to rice, the beneficiaries have made an gross cost of Rs 3700 per quintal including the grains cost and milling and obtained Rs 4000 per quintal as gross return and obtained an marginal return of Rs 300 per quintal from their regular practice. KVK has organized technological interventions in scientific processing, packaging, branding and channelized with suitable marketing. With this the beneficiaries have made an gross cost of Rs 4700 per quintal for the above practices and obtained an gross return of 8000 per quintal with benefit cost ratio of 1.70. From the above intervention it was observed that the interventions made by KVK have improved the knowledge, skill and income level of beneficiaries.

4. CONCLUSION

Millets are nutritionally rich and occupy an important place in the diet of people in many regions of the world. Although millets are nutritionally superior to cereals their utilization as a food is still mostly confined to the traditional consumers and population of lower economic strata. From the present study it was clearly observed that the technological interventions made on minor millet particularly little millet have significant impact on knowledge of farmers with respect to improved production practices and value addition to gain higher economic returns and healthy life. Hence, such interventions will help the farmers to go for production of underutilized crops during vagaries of climate to sustain the food security of the country.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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