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Millet Scenario in India

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ABSTRACT

Millets have high nutritional qualities and produce well under marginal conditions but they are not used to the extent that is possible. It is a number of small-grained cereal grasses and based on the grain size, millets classified as major millets and small grain millets. Major millets include sorghum and pearl millet whereas small grain millet includes finger millet, foxtail millet, kodo millet, proso millet, barnyard millet and little millet. Millets are rich in minerals and vitamins compared to rice and wheat; millets have the huge potential to provide security of food, nutrition, fodder, fiber, health, livelihood and ecology. In view of all these qualities those they so amazingly combine, millets only be called as Miracle Grains/ Nutria-Cereals. Inclusion of millet crops in a concerted way in cropping systems and also particularly in fragile ecosystems, is a virtuous move towards sustainability. Also, importance in marketing and value addition improves the millet cultivation. In this connection, the present study was carried out to examine the scenario of millets in India from 1950-51 to 2018-19 and data were collected from ministry of economics and statistics, seasonal and crop report and analysed by using compound growth rate. The growth rate of millet area and production registered negative growth i.e., area and production declining at the rate of 16.31 per cent and 13.58 per cent per year respectively. In the same way productivity was declining up to 2005 after that, it showed positive growth (3.23 per cent). Also, studied the economics of crops and observed that cost of cultivation for millet crops (sorghum and maize) compared to other important crops was lower i.e. Maize - ₹ 85915/ha, Sorghum - ₹ 47830/ha. In the same way, gross income realized by millet farmer was also low except maize crop. In India, the cost of cultivation was high in Tamil Nadu for most of the millet crop across the states due to the high human labour cost. Hence, there is a need to formulate suitable strategies considering the economic value of the crops. Therefore, the study came out with conclusion of proper cultivation practices, marketing and processing should be given to improve the millet production in India.

Highlights

- Scenario of millets in India shown an decreasing trend.
- Compared to other states cost of cultivation for millets was higher due to high labour cost in Tamil Nadu.
- Good sign of market price for milltes.

Keywords: Trend, millet, area, production, yield, cost

Millets are known as ancient nutritional grain and important food staples, particularly, in poor, semi-arid tropics of Asia and Africa (Mahendra, 2012 and Narloch *et al*. 2009) which are mostly cultivated under a variety of agro-ecological situations like plains, coast hills even diverse soil land varying rainfall. Millets are most popular in developing regions, like India and Africa, where food and nutritional security are the major challenges. The global millet production was estimated at 27.8 million ton (Mondal *et al*. 2016). India is the world's leading producer of millets and has the largest global share of around 41 per cent followed by

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Africa. The consumption of millet in global level has declined at the rate of nearly one per cent and expected to witness positive movement during 2019-2024 (Anbukkani *et al*. 2017). In the last two decades, the importance of millet as food staples, in India (Michaelraj and Shanmugam, 2013b) and global level, has been declining due to demand and supply factors like rising incomes, urbanization, and government policies (King, 2017). More than 50 per cent of the millet production is currently finding its way into alternative uses as opposed to its consumption only as a staple (Uma Gowri and Chandrasekaran, 2011).

In India, millets are mostly cultivated in Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra, Odisha, Madhya Pradesh, Rajasthan and Uttarakhand states. Rajasthan (87 per cent of Cumbu area), Maharashtra (75 per cent of sorghum area) and Karnataka (54 per cent of Ragi and 32 per cent of Cumbu) occupies maximum area of millets (Stanly and Shanmugam, 2013). Now a day, the productivity of millets is boosting through technologies and high yielding varieties. The area under small millets was decreased from the last six decades i.e. 8 million hectare (1949-50) to 1.8 million hectare (2017-18). Likewise, the production of small millet showed the same trend from 4 million ton to 2.44 million ton in the respective year, predominantly loss was occur in all other small millets compared to finger millet (Shadang and Jaganathan, 2014).

Nutrient to nutrient, every single millet is astonishingly superior to rice and wheat, therefore, is the solution for the malnutrition that affects a huge population of the India (DHAN, 2012). Nevertheless, cultivation of these millets now face many limitations/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 these crops. Also, public and private investments are limited to millet seed development and production (Pray and Latha, 2009). International prices for millets are highly volatile, determined largely by supply volumes, and are usually unrelated to those of other major coarse grains, such as maize, sorghum, or barley. Owing to their nutritional content, any improvements/ developments 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, these millets contribute in diversifying our food basket, which is at present is very narrow because of excessive dependence on major cereals like rice and wheat. This paper analyzes the scenario of millets in India and suggests suitable future strategies to revive these crops considering their economic value. The following were the major objectives of this paper;

- To analyze the decadal trend in area, production and productivity of millets in India;
- To examine the cost comparativeness of millets with other crops and across states in India; and
- To suggest suitable policy measures to improve millets crop cultivation in India.

METHODOLOGY

Compound growth rate (CGR)

In the present study, Compound Growth Rate (CGR) of area, production and productivity for the millets in the India were estimated to study the growth in area, production and productivity of millet crops. The Compound Growth Rates are found very convenient for any comparison of growth between two period and two crops. It seems more appreciable to analyse the movement of agricultural crops in terms of compound rather than linear growth rate (Dandekar, 1980). Hence, the compound growth rates are computed for the selected millet crops in Tamil Nadu state. The Compound Growth Rate (CGR), are usually estimated by fitting a semi-log trend equation of the form:

$$\log Yt = \alpha + t\beta t + \varepsilon\, t \qquad \ldots (1)$$

Where,

Yt : Area, production and yield of selected major agricultural crops in years 't' respectively.

t : Year which takes value 1, 2…….n

α & β are the parameters to be estimated, and ε = random error term.

Equation (1) was estimated using Ordinary Least Squares (OLS) technique. The t-test was applied to test the significance of β. This equation is generally used on the consideration that change in agricultural

output in a given year would depend upon the output in the preceding year (Chandrahekhar, 2004).

Compound Growth Rate was then estimated by using the following equation:

$$CGR = [(\text{Antilog of } \beta - 1)*100] \quad \ldots(2)$$

The study considers the yearly database for the major agricultural crops to examine the growth performance of area of cultivation, production and productivity in India. The millet crops under examination included, maize, jowar, bajra and ragi for India were analyzed to predict the better growth performance. In the present study, the necessary data was collected from 1950 to 2019 was purely based on secondary sources and it was collected from various issues of statistical hand book of India and seasonal and crop report. Also, the data was gathered from the unpublished sources of department of economics and statistics, Chennai.

Cost of Cultivation

Cost of cultivation included variable and fixed costs. Variable costs included the cost of human labour, bullock power, machine power, seeds, farmyard manure, fertilizer, plant protection chemicals, irrigation charges and interest on working capital. Fixed costs comprised of depreciation, land revenue, rental value of land and interest on fixed capital.

Gross returns

Per hectare gross returns was calculated based on what the sample farmers realized actually at the market prices for the quantum of the produce in rupees.

Net return

It was calculated by taking into account gross returns subtracting the total costs.

Cost of production

This was calculated by dividing the total cost per hectare by the yield per hectare (quintal/tones/kg).

RESULTS AND DISCUSSION

(I)Growth performance of millets in India

(i) Status of millets in India: From the figure, it could be observed that, there was declining trend in area under millets of India from 51.44 lakh hectares (1950–1955) to 6.23 lakh hectares (2015-2019) and the loss of millet area was at the rate of 16.21 per cent; same way in production of millets from 21.13 lakh tons to 4.01 thousand tons and the loss was 13.58 per cent per year. In case of productivity under millets of India was declining up to 2005, and then it was increasing trend. Trend in area, production and yield of millets during the time periods from 1950-51 to 2018-19 are shown in the Table 1.

Table 1: Trend in area production and yield of millets in India (1950-51 to 2018-19)

Year	Area ('000 ha)	Production ('000 tn)	Productivity (Kg/ha)
1950-51 to 1954-55	5144	2113	409
1955-56 to 1959-60	5098	1987	389
1960-61 to 1964-65	4755	1960	413
1960-61 to 1969-70	4697	1697	361
1970-71 to 1974-75	4512	1758	389
1975-76 to 1979-80	4465	1813	405
1980-81 to 1984-85	3623	1462	403
1985-86 to 1989-90	2895	1204	417
1990-91 to 1994-95	2040	931	456
1995-96 to 1999-2000	1540	688	447
2001-05 to 2004-05	1246	533	428
2005-06 to 2009-10	970	466	480
2011-12 to 2014-15	725	429	596
2015-16 to 2018-19	623	401	655
CGR	-16.21	-13.58	3.23

(ii) Status of small millets in India: In India small millets being cultivated an area of 6.19 lakh hectares with the production of 4.41 lakh hectares. The productivity level is 714 kg/ha. From the figure depicted that, small millets were mainly cultivated in eleven states, in that Madya Pradesh has nearly 30 per cent share in area followed by chattisgarh (14.41 per cent) and Maharastra (13.52 per cent). In the same way, production share also high (25. 57 per cent) in Madya Pradesh followed by Uttarkhand (19.23 per cent) and Maharastra (10.12 per cent). The productivity level was high in Arunachal pradesh.

(II) Cost performance of millets in India

(i) Cost comparativeness of millets with other major crops (₹/ha): The comparative cost of cultivation for major crops is depicted in table. From the table, it could be observed that cost of cultivation per hectare for millet crops (sorghum- ₹ 47820 and maize- ₹ 85915) with other important crops was lower except black gram crop. Gross income realized by maize farmer was high when it compared with paddy crop, since millets being a nutritional supplement to the poor as well as poultry farms. Market price and minimum support price was same for black gram, ground nut, cotton and sugarcane.

(ii) Cost comparativeness of major millet across states in India (₹/ha)

Sorghum: Cost of cultivation of sorghum among states inferred that the Tamil Nadu state has more cost of cultivation per hectare, it was ₹ 42957 followed by Maharashtra (₹ 40818) and Andra Pradesh (₹ 39772). Human, machine and bullock labour cost and fertilizer and manures accounted major portion in total cost of cultivation nearly 63 to 68 per cent due to industrialization in those states. In yield level Madhya Pradesh and Maharashtra stands first and second places in all India and it were 19 qtl and 12 qtl per hectare respectively. Tamil Nadu and Karnataka got only 7 qtl/ha and 6 qtl/ha respectively, since there are no improved varieties, less poor agronomic practices and value addition practices followed. Cost of production per quintal ranged from ₹ 1267 to ₹ 3885 in Madhya Pradesh and Tamil Nadu respectively. Hence, the developmental efforts should be made to enhance the production and productivity of sorghum crop and thus to reduce the cost of cultivation and to increase the income among the sorghum farmers.

Table 2: Major producing states of small millets in India (2016-2017)

State	Area ('000 ha)	Share (%)	Production ('000 Tn)	Share (%)
Madhya Pradesh	184.00	29.72	113.02	25.57
Chattisgarh	89.20	14.41	25.40	5.75
Maharastra	83.70	13.52	44.73	10.12
Uttarkhand	63.00	10.18	85.00	19.23
AP	31.00	5.01	24.00	5.43
Odisha	27.41	4.43	13.84	3.13
Tamil Nadu	23.55	3.80	21.22	4.80
Gujarat	22.00	3.55	28.00	6.34
Karnataka	21.00	3.39	7.00	1.58
Rajasthan	14.67	2.37	10.19	2.31
Nagaland	10.03	1.62	11.13	2.52
Total	**619.11**	**100.00**	**441.94**	**100.00**

Source: *Indiastat*

Bajra: Bajra crop mostly cultivated in Gujarat, Haryana, Maharashtra, Rajasthan and Utter Pradesh states in India. In these states, cost of cultivation

Table 3: Comparativeness of cost of cultivation for major crops (₹/ha)

Cost items	Paddy	Cholam	Maize	Blackgram	Groundnut	Cotton	Sugarcane
Operational Cost	73614	36765	66559	23523	69250	81124	142709
Fixed Cost	22235	11066	19356	11364	19995	20158	41258
Total cost	95850	47830	85915	34887	89245	101282	183968
Yield (qtl/ha)	53	28	58	9	23	23	998
Market Price (₹/Qtl)	2050	1800	1800	5400	4450	5400	265
Total Income	108650	50400	104400	46980	102350	124200	264470
MSP (₹/Qtl)	1570	1700	1425	5400	4450	4020	265
Gross Income	12800	2569	18484	12093	13104	22918	80502

Source: *Directorate of Economics and Statistics, 2018-19.*

was high in Maharashtra (₹ 52311/ha) followed by Gujarat (₹ 48281/ha) state. But the yield level was high in UP and Gujarat and it were 29 qtl and 24 qtl per hectare respectively. In total cost of cultivation, major share occupied by human labour which accounts nearly 30-35 per cent, followed by fertilizer and manures, it was 12-15 per cent across the states of India. Since Gujarat is a drought region, irrigation charges for cultivation of bajra occupies 13 per cent of cost of cultivation. Cost of production per quintal was ranged from ₹ 1117 to ₹ 1963 in India.

Maize: Maize is one of the most important millet crop and it mostly cultivated in nine states. Cost of cultivation of maize was more in Tamil Nadu state (₹ 92710/ha) followed by Maharashtra (₹ 72873/ha) and Andhra Pradesh (₹ 67285/ha). The major share of cultivation was occupied by human labour, fertilizer and manures and machine labour, which accounted 46-67 per cent among the states. Seed cost was occupied by nearly 10 per cent of the total cost of cultivation. The yield level was high in Maharashtra followed by AP. Cost of production per quintal of maize was ranged from ₹ 1134 to ₹ 1981 across the states in India.

Farmers are moving from millet crops to other cereal and cash crops mainly to earn more income even though millets are drought resistant and rich in nutrients. Like new technology and new variety may break through the increase the area under millets and can increase the production. Varietal improvements and yield gap are the major concern for increase in production of millets.

Table 4: Cost comparativeness of sorghum across states in India (₹/Ha)

Particulars	AP	Karnataka	MP	Maharashtra	Rajasthan	TN
Operational cost	28265	14041	21624	30031	23088	24938
Human labour	14638	7682	12523	15936	17332	16271
Bullock labour	5690	2537	2796	4158	108	0
Machine labour	1638	2008	2393	5438	3198	2885
Seed	1412	422	1282	550	1065	1147
Fertiliser and manures	3338	914	2066	2364	1036	1840
Insecticides	103	3	161	27	0	42
Irrigation charges	846	148	0	825	53	2196
Interest on working capital	600	325	336	710	295	558
Miscellaneous	0	1	67	24	0	0
Fixed cost	11506	7080	11413	10786	9275	18019
Total	39772	21121	33037	40818	32363	42957
Yield	11	6	19	12	9	7
A_2+FL/QTL	1982	1880	856	1539	1292	2291
C_2/QTL	2865	2795	1267	2038	1783	3885

Source: *Directorate of Economics and Statistics, 2018-19.*

Table 5: Cost comparativeness of bajra across states in India (₹/Ha)

Particulars	Gujarat	Haryana	Maharashtra	Rajasthan	UP
Operational cost	36711	24731	39676	20886	21499
Human labour	17185	14606	19287	15566	14814
Bullock labour	773	81	2986	82	213
Machine labour	5656	6304	9010	3214	3738
Seed	1941	932	1023	832	1180
Fertiliser and manures	4024	1955	4895	755	876
Insecticides	42	122	0	79	6
Irrigation charges	6226	209	1485	102	336
Interest on working capital	864	522	988	257	337
Miscellaneous	1	0	3	0	0
Fixed cost	11570	16155	12635	8080	18729
Total	48281	40886	52311	28967	40228
Yield	23	22	23	12	29
A_2+FL/QTL	1026	886	1465	966	787
C_2/QTL	1323	1423	1963	1290	1117

Source: *Directorate of Economics and Statistics, 2018-19.*

Table 6: Cost comparativeness of bajra across states in India (₹/Ha)

Particulars	AP	Bihar	Karnataka	Maharastra	Odisha	Punjab	Rajasthan	TN	UP
Operational cost	41188	32263	28221	51408	46489	33144	34106	65438	29498
Human labour	17679	14526	11864	18286	26967	14389	22250	33112	16991
Bullock labour	2476	0	3846	5081	4287	309	2593	41	1239
Machine labour	5712	3747	4046	10197	2056	6180	4701	8071	4120
Seed	5068	2790	2866	5002	5384	3673	1716	4409	2627
Fertiliser and manures	7624	4862	3886	7314	6356	5548	2398	13385	2198
Insecticides	829	0	219	126	355	1808	0	567	31
Irrigation charges	681	5461	769	4102	280	408	2	4217	1737
Interest on working capital	1060	688	725	1300	804	828	442	1539	555
Miscellaneous	58	0	0	0	0		0	97	1
Fixed cost	26097	15147	14336	21465	14968	19920	9624	27273	13097
Total	67285	47409	42557	72873	61458	53064	43731	92710	42595
Yield	53	36	32	55	42	36	18	45	24
A_2+FL/QTL	753	792	841	839	1090	1053	1603	1412	1064
C_2/QTL	1218	1134	1252	1174	1422	1381	1932	1982	1509

Source: *Directorate of Economics and Statistics, 2018-19.*

Note: *A_2 - Actual paid out cash; A_2+FL - Actual paid out cost plus imputed value of family labour; C_2 - Comprehensive cost including rental value of own land (Net of land revenue) and interest on value of own fixed capital assets (excluding land).*

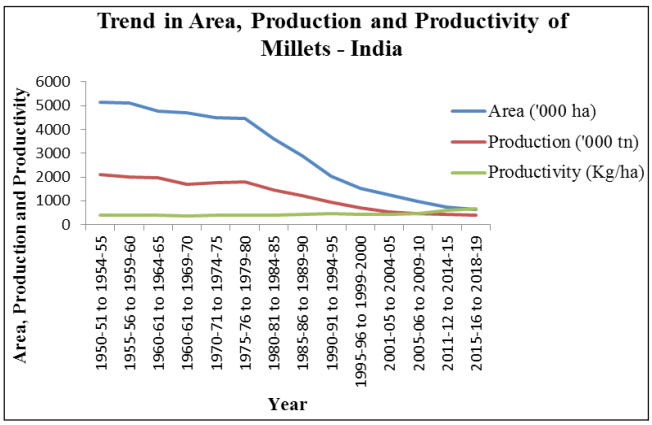

Fig. 1: Trend in area, production and yield of millets in India (1950-51 to 2018-19)

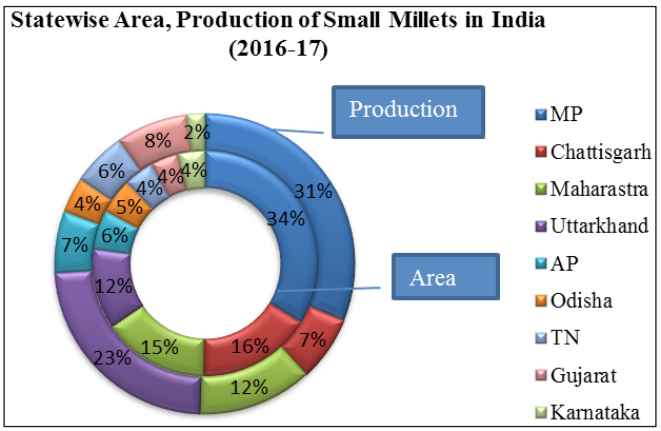

Fig. 2: Selected state wise percentage area and production of small millets in India (2016-17)

iii) Comparison of Millet Market price with Minimum Support Price

Maize is an important millet crop, but market prices were below Minimum Support Price (MSP) in 2014-15 and 2017-18, for ragi it were 2010-11, 2016-17 and 2018-19 (Fig. 3). However, the gap between MSP and market prices narrowed down in 2018-19 as compared to 2017-18. In 2018-19, it was observed that market prices steadily increased during October 2018 to January 2019, showing a good sign of convergence with MSP. The increased production seems to be making a dent on the market prices of maize. It is important to reduce cost of cultivation and improve yield to increase profitability. In order to reduce cost of cultivation of reduce irrigation water requirement as compared to conventional tillage system and improve water and nutrient productivity as well (Price Policy, 2018-19). In case of sorghum crop, market price was higher than MSP in above periods.

Strategies to retrieving millets

Millets known as climate resilient crops since it is drought tolerant and thus it could provide future food and farming secure in India. Millets are rich in minerals, micronutrients and vitamins compared to other cereals like rice, wheat. To enhance the nutritive value of millets, it supplied through

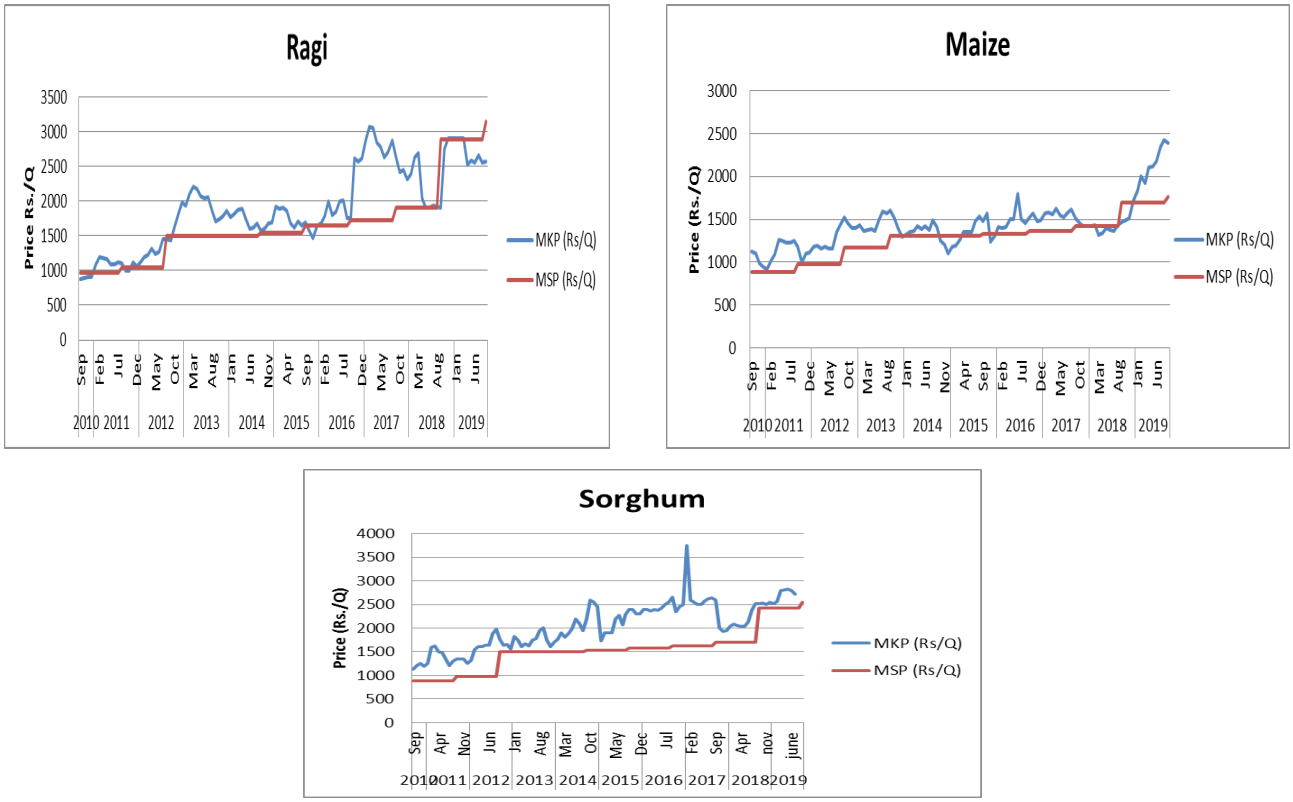

Fig. 3: Comparison of Millet Market price with Minimum Support Price (2010-19)

public distribution system (PDS), new meal scheme, ICDS and other welfare hostel program can be strengthened.

The area under millet is shrinking since it is traditionally cultivated in dry land by small and marginal farmers also tribal communities. Also, the cultivation of millets relays on productivity, labour availability, post harvest operations and farm gate price. It will be promoted through government programmes like INSIMP, NFSM, RADP, RKVY.

Millets are amazing capacity of production without using ground water/surface irrigation, fertilizer, pesticide etc. Hence it must be honored through socio ecological bonus to millet farmers. Also, insurance and institutional finance should be offered to millet farmers.

Difficult processing is the key challenge that hinders consumer demand and upscaling potential for minor millets. Several interventions can be made to facilitate access by value chain actors to processing plants on the one end and by consumers to processed millet products on the other.

Finally, research institution must give a new thrust on millet area and issue.

CONCLUSION

The preceding analysis on the trend in area under millets showed that there is a gradual decline. As millets are predominantly grown in marginal and sub marginal dry lands by poor farmers, the fluctuations in area, production and productivity not only bring hardship to farmers but also could create instability. Considering the economic significance of the crops, developmental efforts should be made through demonstrations and training programmes and thus popularizing the cultivation and processing of these crops. The gradual decline in net availability of cereals and the trend is more towards consumption of rice and wheat i.e. the consumer dietary cereals are being slowly replaced by major cereals like rice and wheat. This is the perspective from which the millet cultivation and its promotion must be regarded.

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