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Millets: The future smart food

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Abstract

In India 86 per cent of farmers are small and marginal who are facing financial insecurities. Indian women and children are facing malnutrition and hidden hunger problems. In the upcoming decades, the world agriculture production could decrease due to climate change. To address these major ongoing issues, the role of millets as a smart food is inevitable. India is the leading producer of millets in the world with 10.9 million tons in the year 2019 (Das *et al.*, 2019) [5]. Bajra is having highest production among millets followed by sorghum and ragi in India (Gowri and Shivakumar, 2020) [6]. There is a declining trend in the area under millet cultivation of India from 1955 to 2019. The government institutes like IIMR and ICRISAT are continuously working to promote the production and productivity of millets by developing various technologies for the farmers & other stack holders. Government of India is also working on millets to improve the level of production and consumption of millets in India by introducing various schemes and policies like ICRP, INSIMP, NFSM, introducing millets as a mid-day meal and providing MSPs to major millets like bajra, sorghum and ragi. However, the demand of millets and its value-added products is very less. So, government should promote the health benefits of millets by organizing various awareness campaigns and should carry intensive consumer survey to assess their perception and knowledge on millets. Government should make provisions to introduce millets in the Public Distribution System to increase the demand for millets and run mid-day meal scheme in schools on large scale basis to eliminate the hidden hunger among the children. Government should also provide incentives and subsidies to new start-ups to promote millet based value-added food production.

Keywords: Millets, smart food, agriculture

Introduction

India is basically an agrarian society- agriculture dependent which means 55 per cent of India's population depends on agriculture. 86 per cent of Indian farmer are small and marginal farmers (Source: Agriculture census, 2015-16). Ever increasing costs of cultivation due to high input costs, the small and marginal farmers are facing crisis of income security. With nearly 60 per cent of India's cultivated area is rain-fed, the damage caused by the climate change which causes droughts and high temperature leads to crop failure in agriculture sector. CGIAR has estimated that the global production of wheat, rice and maize could decrease by 13 to 20 per cent in the coming decades because of climate change (Gowri and Shivakumar, 2020) [6]. More over India has one of the world's highest demographics of children suffering from various types of malnutrition, which is double as compare with Sub-Sahara Africa. According to India's National Family Health Survey, more than half women (55 per cent) have iron deficiency, and anaemia. As per the latest Human Development Index, the rank of India was decrease from 129 to 131 in last year. To address these issues of climate change, malnutrition and poverty, a special smart food should be given priority by the Indian government. Millets can be a potential smart food crops, which can eradicate all these issues as it fulfils the smart food criteria.

ICRISAT introduced the term Smart food i.e., the food that should fill the following criteria of being 'Good for you', 'Good for plant', and 'Good for the farmer'. Millets as a smart food fulfils the criteria as follows, 'Good for you'- These Smart food crops are highly nutritious (iron, zinc, calcium, proteins, fiber) and target some of the largest micronutrient deficiencies and needs, especially of women and children. 'Good for the planet'- Millets have a low carbon footprint, serves as a mitigation and adaptation strategy for climate change. 'Good for the small farmer'- They can survive in high temperature, survive with very little water. They are climate resilient and they have multiple uses such as (food, fodder, biofuel, brewing).

Review of literature

Behera (2017) [3] studied “Assessment of the State of Millet Farming in India” and observed that millets are highly tolerant to high temperature, drought and floods because of effective root system. For example, pearl and finger millet can make do with 28 per cent of paddy’s rainfall needs. It also observed that millets are rich in mineral nutrients and fibers which can overcome malnutrition among the Indian population especially for children and women.

Kumar (2018) [9] studied “Millets: a solution to agrarian and nutritional challenges” and found that world has been facing agrarian as well as nutritional challenges. Owing to low fertility, utilization of dry lands to produce sufficient quality grains is a big challenge. Millets as climate change compliant crops score highly over other grains like wheat and rice in terms of marginal growing conditions and high nutritional value. These nutri-cereals with vitamins, minerals, essentials fatty acids, phyto-chemicals and antioxidants that can help to eradicate the plethora of nutritional deficiency diseases. Millet’s cultivation can keep drylands productive and ensure future food and nutritional security.

Anitha *et al.* (2019) [2] studied “Acceptance and Impact of Millet-Based Mid-Day Meal on the nutritional Status of Adolescent School Going Children in a Peri Urban Region of Karnataka State in India” and concluded that the introduction of millets-based meals in school feeding programs can significantly improve the nutritional outcome of school going

children as compared to fortified rice-based meals, and it was also found that meals can be enjoyed by the children and it can be cost effective if millets are given government pricing support as equally as rice.

Das *et al.* (2019) [5] studied “Growth and Instability in Area, production, Productivity and Consumption of Millets in India: An Analysis” and found that for pearl millet over the time (2001-01 to 2016-17) area under cultivation has decreased, production and productivity however have increased and in case of finger millet, both area under cultivation and production has decreased but productivity has increased. The total millet production and domestic consumption both has increased over time. Instability analysis found higher degree of variation for both pearl millet and finger millet production and productivity.

Gowri and Shivakumar (2020) [6] studied “Millets Scenario in India” and observed that there was declining trend in area under millets of India from (1950-1955 to 2015-2019) at CGR 16.21 per cent; same way production was also decreasing at CGR 13.58 per cent. In case of productivity increasing trend observed from 2005. It was also observed that the market price of ragi was less when compared to MSP from 2018 to 2019, in case of sorghum crop market price was higher than MSP from 2010 to 2019.

Scenario of millets

Global scenario in millet production

Table 1: Top 10 millet producing countries in the world (2019)

Sr.no	Country	Production (000) MT	Share (%)
1	India	10,235.83	36.08
2	Niger	3,270.45	11.53
3	China	2,300.00	8.11
4	Nigeria	2,000.00	7.05
5	Mali	1,878.53	6.62
6	Sudan	1,133.00	3.99
7	Ethiopia	1,125.96	3.97
8	Burkina Faso	970.18	3.42
9	Senegal	807.04	2.84
10	Chad	717.62	2.53
	Total	28,371.80	

Source: FAO

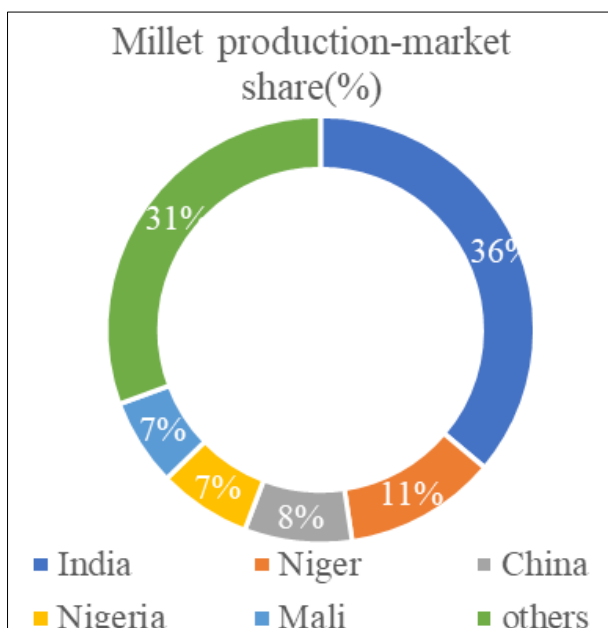
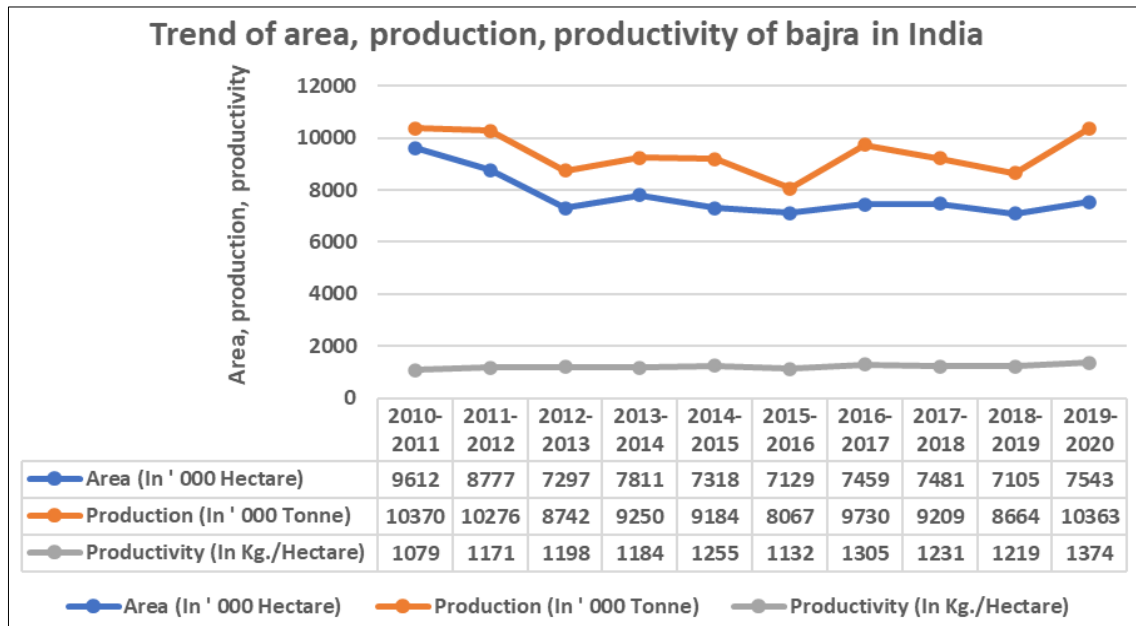


Fig 1: Country wise share of millet production

According to FAO, the global millet production was estimated 28.4 million metric tonnes in 2019. India is the largest global producer with 36.08 per cent global market

share followed by Niger with 11.53 per cent of global share.

Trend of area, production, productivity of bajra in India.



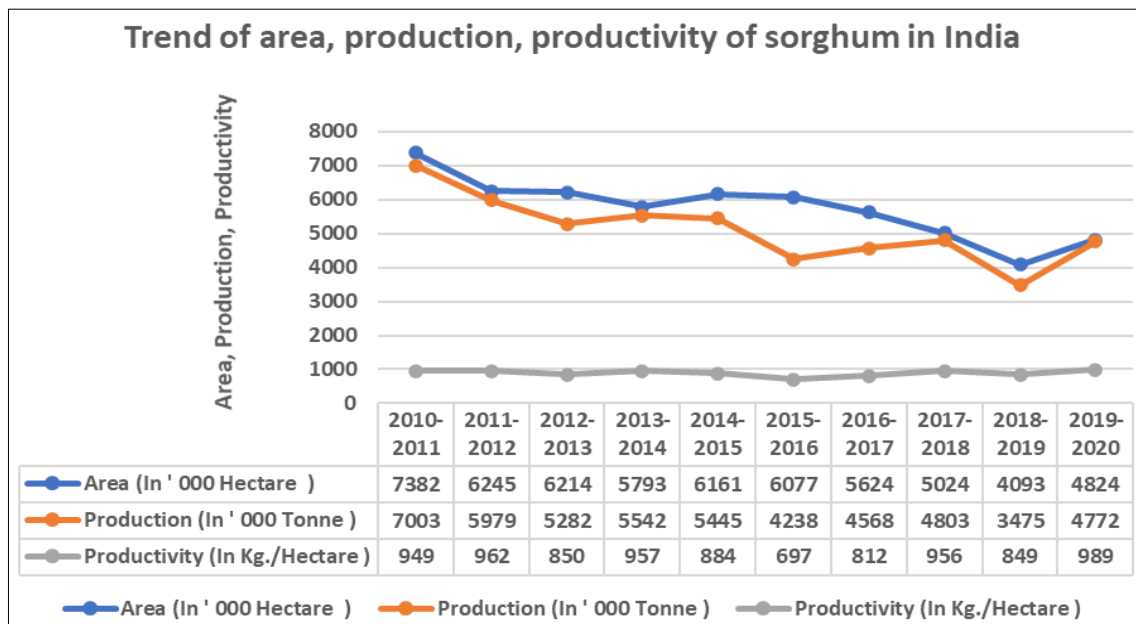
Source: Indiastat

Fig 2: Trend of area, production, productivity of bajra in India (2010-11 to 2019-20)

From the above graph, it is observed that the total area under cultivation of bajra has been decreasing since last decade. It is also observed that there is a declining trend in the production of bajra in year 2011-2012, 2015-2016 and 2018-2019. There is suddenly spike in the production of bajra in year 2017-2017 and 2019-2022 because of the increases in productivity and

area under cultivation when compared with other years. However, the productivity of bajra is gradually increasing in the past decade because of high yield variety and hybrid.

Trend of area, production, productivity of sorghum in India



Source: Indiastat

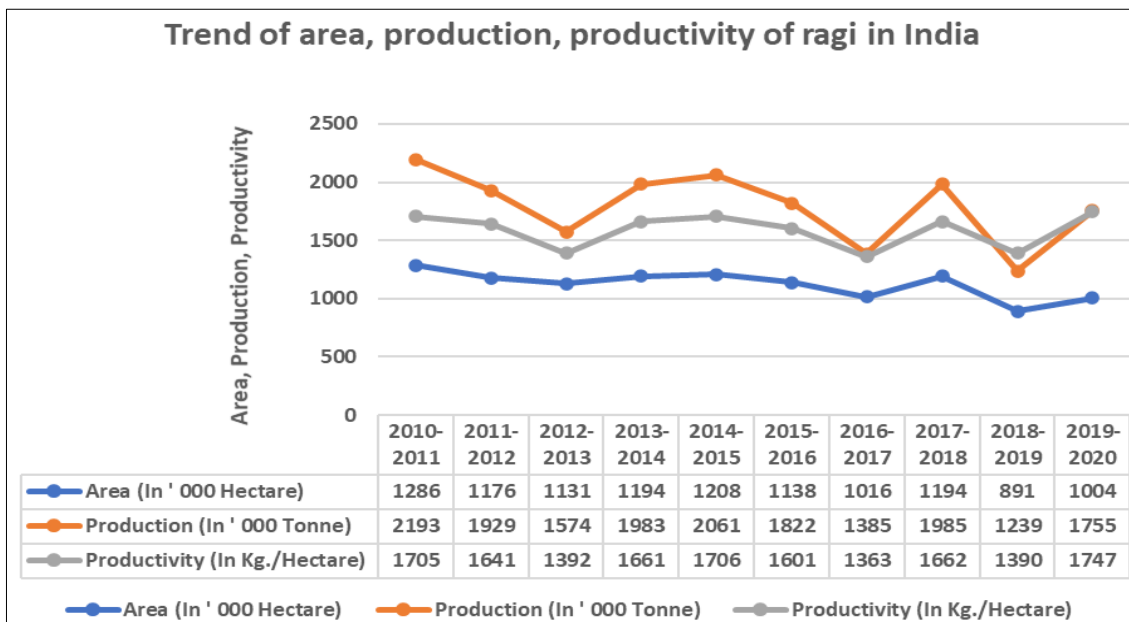
Fig 3: Trend of area, production, productivity of sorghum in India (2010-11 to 2019-20)

From the above graph, it is observed that the area under cultivation and production of sorghum shows declining trend in the past decade.

cultivation, production and productivity were decreased from 2010-2011 to 2012-2013 and 2014-2015 to 2016-2017. It is also observed that there were instability in the area, production and productivity of ragi crop in India from 2016 to 2020.

Trend of area, production, productivity of ragi in India

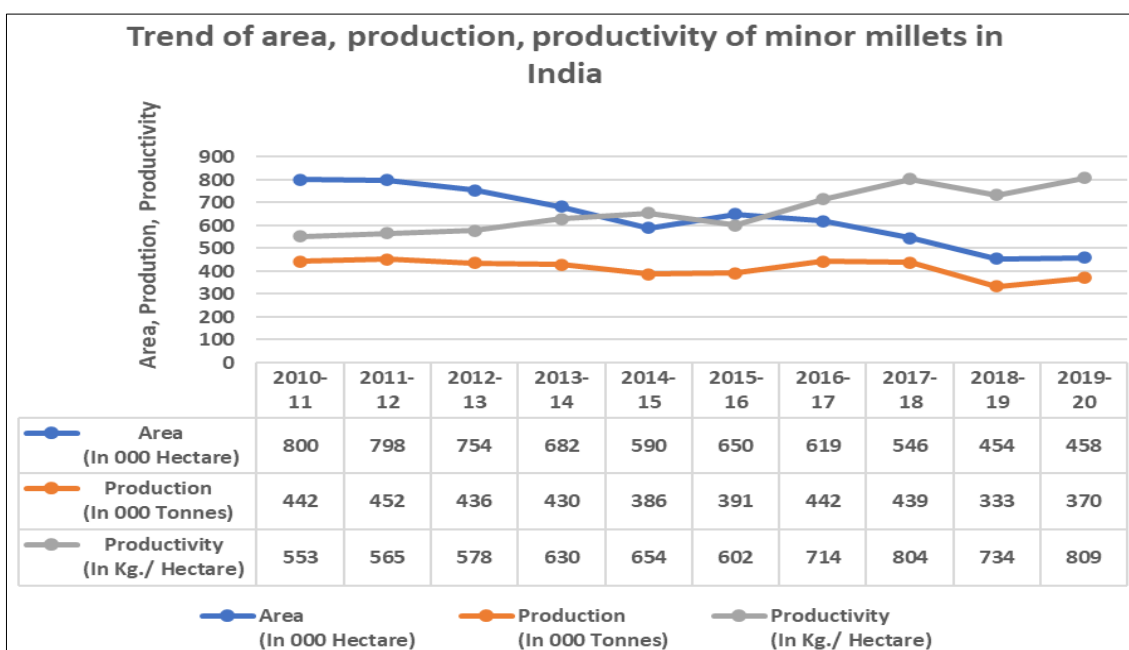
From the below graph, it is observed that the area under



Source: Indiastat

Fig 4: Trend of area, production, productivity of ragi in India (2010-11 to 2019-20)

Trend of area, production, productivity of minor millets in India



Source: Ministry of Agriculture & Farmers Welfare, GOI.

Fig 5: Trend of area, production, productivity of minor millets in India (2010 to 2019-20)

From the above graph, it is observed that area under cultivation of minor millets were in declining trend in the past decade. Whereas, the productivity has been increased in the past decade. The production of the minor millets were decreased over a period of time from 2010-2011 to 2015-2016, later it was observed that the production has been

increased from 2015-2016 to 2017-2018, it is because of increase in the productivity of minor millets in the same period.

Comparative analysis of jowar, bajra, ragi and small millets in India

Table 2: Area, production and productivity of millets in India

Crop	Area - 000 hectare	Production – 000 tons	Productivity – Kg/ha
Jowar	4090.3	3479.4	849
Bajra	7105	8664	1219
Ragi	891	1239	1390
Small millet	454	333	734

Source: (CMIE Statistical Website, 2018-2019)

From the above table we can say that the Bajra remains in 1st position in both area under cultivation and production with 7105 thousand hectares and 8664 thousand tons respectively, followed by jowar with 4090.3 thousand hectares of area under cultivation and 3479.4 thousand tons of production.

While in productivity ragi remains in 1st position with 1390 kg/ha followed by bajra with 1219 kg/hac.

Major producing states of millets and small millets in India

Table 3: Area, production of small millets in India

States	Area (In ' 000 Hectare)	Production (In ' 000 Tonne)	Share in Total Production (%)
Madhya Pradesh	84	74	19.96%
Uttarakhand	53	70.97	19.14%
Karnataka	49	37.49	10.11%
Tamil Nadu	25.85	37.34	10.07%
Arunachal Pradesh	26.76	27.43	7.4%
Andhra Pradesh	22	22	5.93%
Maharashtra	40.98	21.97	5.92%
Chhattisgarh	63.37	19.04	5.13%
Odisha	32.87	16.99	4.58%
Nagaland	8.83	9.98	2.69%
Uttar Pradesh	8	5.82	1.57%
West Bengal	6.1	5.54	1.49%
Rajasthan	10.12	5.24	1.41%
Himachal Pradesh	5.21	4.64	1.25%

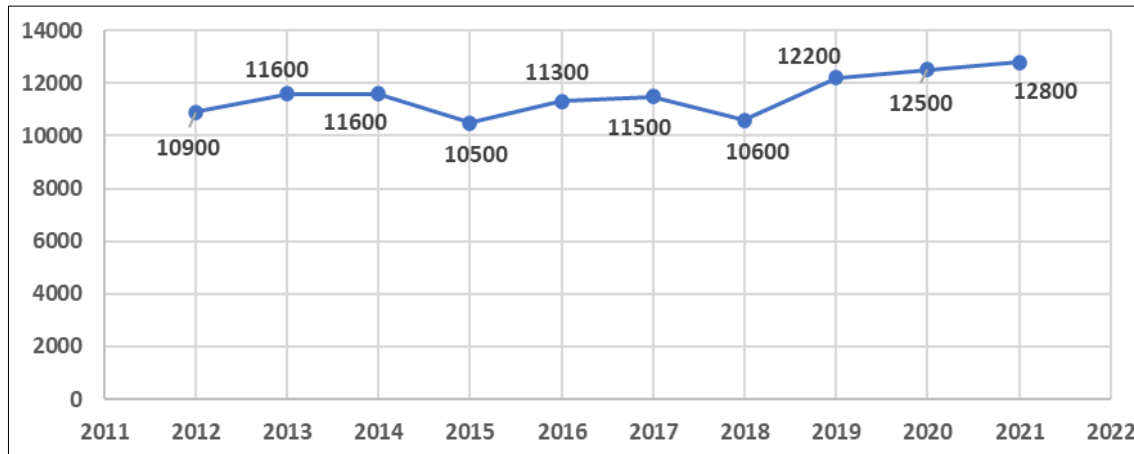
Source: (CMIE Statistical Website, 2019-2020)

Madhya Pradesh is the leading state both in terms of area and production of small millets in India. The total production of small millets in India was dominated by Madhya Pradesh which contributes nearly 20% to the total production. Uttarakhand was the second largest producer contributing 19% to the total production followed by Karnataka (10.1%), Tamil Nadu (10.07%), Arunachal Pradesh (7%), Andhra Pradesh (6%), Maharashtra (6%), Chhattisgarh (5%), and

others about 16% during 2019-20.

Rajasthan was the leading in area under cultivation of Bajra in our country with 4.1 million ha, 2018-19. Karnataka was the leading in area under cultivation of both ragi and sorghum in India, 2018-19.

Millet's consumption pattern and consumer behaviour.



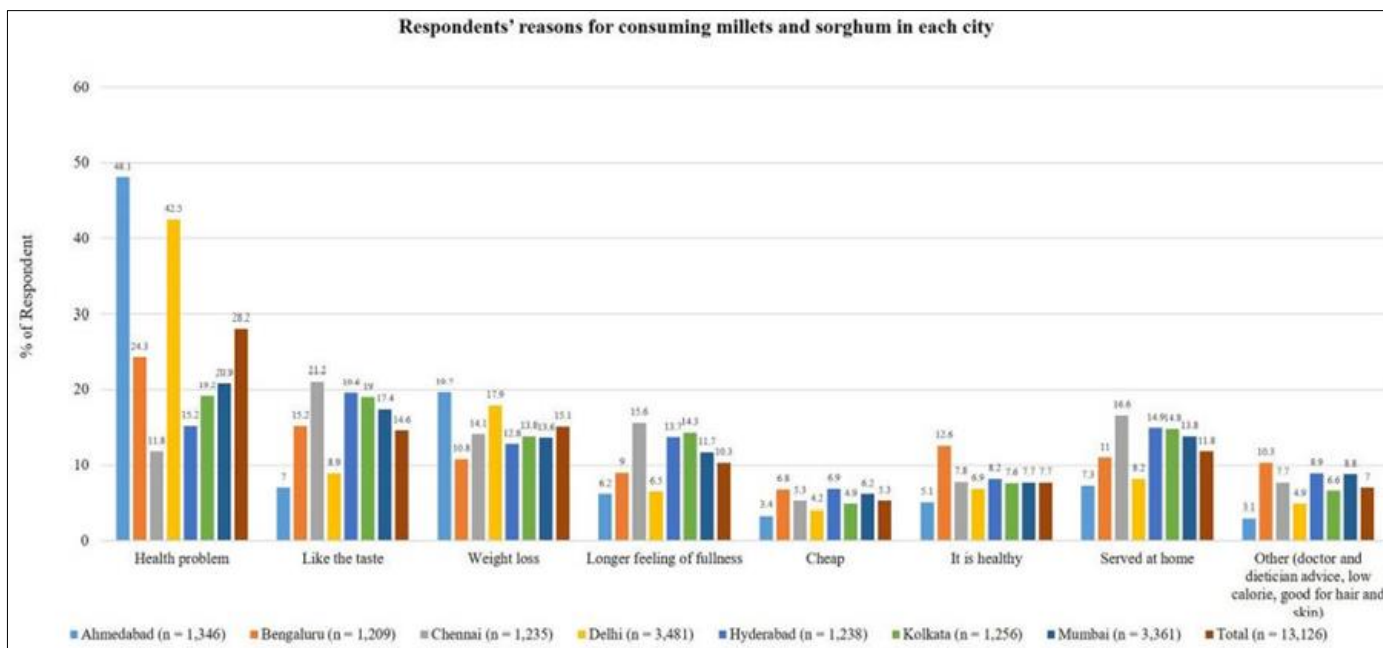
Source: United States Department of Agriculture

Fig 6: Millet consumption in India

The area, production and consumption of millets in India have come down in the recent decades both due to demand side and supply side factors. There lies significant gap in both the demand and the supply side. On the demand side, the consumption of millets has come down due to increased consumption of other fine cereals, negative perceptions of millets as a food for the poor and policy neglect when

compared to other crops. On the supply side, limited productivity of crops and their growing situations and lack of their processing centres in the vicinity which prevents the farmers from realizing additional yield benefits from the improved package of practices and additional income generation.

Consumer behaviour of millets



(Source: Consumer survey about millets, conducted by ICRISAT in urban India)

Fig 7: Reasons for consuming millets in urban regions by consumers

Study conducted by ICRISAT on millets in urban areas reveals that largest reason for consuming millets is that they have health problem which is stated by 30 per cent of respondents. The major reason for not consuming millets is 40 per cent of the respondents stated that millets are not eaten at home, followed by 22 per cent of respondents stated that they don't like the taste of millets. The main source of information about health benefits are from social media stated by 51 per cent of the respondents, followed by friends and family 34 per cent. The most commonly eaten forms of millets are RTE 46 per cent and porridge consumed by 38 per cent. Frequency of consumption of millets a considerable proportion of consumers ate millets frequently (49.6 per cent consumed 1 or more times per week). However, there was 39 per cent of the respondents who had never consumed millets which is reasonable proportion of the people. (Source: Consumer survey about millets, conducted by ICRISAT in urban India)

Overview on millets

"Millet" is a common term to categorize small-seeded grasses that are often termed nutri- cereals or dryland-cereals. Millets are round-shaped cereal seeds, naturally available in many colours and sizes, depending on the variety. These are predominantly grown in semi-arid tropics of Asia and Africa. Millets are useful for both food and fodder purpose. Millet's history- Domesticated in India and Africa, domestication dates back to 4000BC West Africa. Foxtail millet probably originated in southern Asia and is the oldest of cultivated millets. Pearl millet is the most cultivated millet,

grown predominantly in India and parts of Africa. 97 percent of the global millet production and seed demand comes from the developing countries.

Regrettably, Millets have been gradually edged out of the food chain largely because the government provided subsidies and have been given encouragement to only crops like rice and wheat. Coarse cereals have been dubbed, as poor man's crops for long, have remained neglected with respect to their appropriate position in the commercialized food system, and investment in development. Despite the condition millets have managed to survive, it is because they are cultivated for feeding the livestock, bird feed and for growing industrial uses such as for production of starch and alcoholic beverages. (Source: Collected from various websites)

Millets classification

Millets are broadly classified into two categories: Major millets- Sorghum, Pearl millet.

Minor millets- Finger millet and small millets (Barnyard, Kodo, Foxtail, Little, Proso).

Value added products of millets

Millet based foods categorized into two types RTE and RTC foods. Ready to Eat foods such as snacks (extruded snacks, popcorn), bakery (bread & biscuits), instant food (flakes).

Ready to cook foods such as Instant food (Noodles, vermicelli, pasta, khichdi, porridge), mixes (Idly, Dosa, upma), multi grain flour, beverages (malt drink mix, weaning foods).

Millets as a Nutri House

Table 4: Nutritive value of millets vis-à-vis other cereals (per 100g at 12 per cent moisture)

Grain	Carbohydrates (g)	Protein (g)	Fat (g)	Energy (Kcal)	Dietary fiber (g)	Ca (mg)	P (mg)	Mg (mg)	Zn (mg)	Fe (mg)
Sorghum	67.7	9.9	1.73	334	10.2	27.6	274	133	1.9	3.9
Pearl millet	61.8	10.9	5.43	347	11.5	27.4	289	124	2.7	6.4
Finger millet	66.8	7.2	1.92	320	11.2	364	210	146	2.5	4.6
Kodo millet	66.2	8.9	2.55	331	6.4	15.3	101	122	1.6	2.3
Proso millet	70.4	12.5	1.10	341	-	14	206	153	1.4	0.8
Foxtail millet	60.1	12.3	4.30	331	-	31	188	81	2.4	2.8
Little millet	65.5	10.1	3.89	346	7.7	16.1	130	91	1.8	1.2
Barnyard millet	65.5	6.2	2.20	307	-	20	280	82	3.0	5.0
Wheat	64.7	10.6	1.47	321	11.2	39.4	315	125	2.8	3.9
Rice	78.2	7.9	0.52	356	2.8	7.5	96	19	1.2	0.6

Nutritive value of millets vis-a-vis other cereals (per 100g @ 12% moisture)

Source: IIMR

From the above table we can observe that millets are storehouse of nutrition, by any nutritional parameter; millets are miles ahead of rice and wheat in terms of their mineral content, compared to rice and wheat. Each one of the millets has more fiber than rice and wheat. Finger millet is having highest calcium content among all the cereals which is 364 mg per 100g. Technically it is having three times more calcium than milk. Finger millet has thirty times more calcium than rice. Pearl millet is rich in iron (6.4 mg) and phosphorous (289 mg). In their Iron content, foxtail and little millet are so rich that rice is nowhere in the race. Iron deficiency is very high among Indian women, which is plentifully present in Korra. Foxtail millet is rich in protein (12.3 grams) and as well as magnesium with 153 mg per 100 grams of grains. Korra is also a low-fat grain and therefore answers the concerns of obese people. The protein content of many millets is close to wheat and are richer in vitamins, especially in vitamin B, iron, phosphorus, and many other key nutrients.

In addition to these, millets have phytonutrients that reduce the risk of cardiovascular disease. Eating whole grains, such as millet, has been linked to protection against atherosclerosis, ischemic stroke, diabetes, insulin resistance, obesity, and premature death. Eating a serving of whole grains, such as millet, at least six times each week is an especially good idea for postmenopausal women with high cholesterol, high blood pressure or other signs of cardiovascular diseases. Above all, Millet's high protein content makes up for energy deficiency in vegetarian diets. Millets are the superfoods for the present and future., their short growing season - from planted seeds to mature, ready to harvest plants in as little as 65 days make them commercially sound.

Health benefits of millets

Millets are gluten free grains hence, used for celiac disease patients. Millet's consumption lower blood glucose response and glycosylated hemoglobin thus, rendering glycemic index, helps in reducing the risk of diabetic mellitus which is anti-diabetic property. Free radicals, are removed by the phenolic compounds present in millet grains which reduces oxidative stress. It has anti-cancer properties like millet extracts have anti-proliferative effects on cancer cell line. Inhibit DNA damage and induce the production of phase-2 detoxifying enzymes. Millets prevent the oxidation of low-density lipoproteins reduces the occurrence of hypertension.

Millet Institutes

IIMR

Indian Institute of Millets Research, it is a premier agricultural research institute engaged in basic and strategic research on sorghum and other millets under ICAR. IIMR coordinates and facilitates Millets research at national level through AICRP on Millets, Pearl Millet, sorghum and Small Millets and provides linkages with various national and international agencies.

Mission: IIMR believes that food security objectives can best be met by stimulating growth in market-oriented production systems which should generate additional cash resources for small holders and increase off-farm employment for rural and urban poor and also develop and capitalize on avenues for value addition and exports.

IIMR contributions such as they develop primary processing machineries like destoner cum grader cum aspirator for millets, Sorghum or bajra dehuller, Double stage dehulling machine, Millet polisher, Kodo millet dehuller. Secondary processing machineries rotary oven, Puffing machine, Puff gun. IIMR owned a brand name called Eat rite products under which they are promoting millets. (Source: IIMR)

ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is an international non-profit organization that undertakes scientific research for development. Headquartered in Hyderabad, Telangana, India. Covering 6.5 million square kilometres of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

Mission: To reduce poverty, hunger, malnutrition & environmental degradation in the dryland tropics.

Currently they are working on the crops like chickpea, pigeon pea, ground nut, sorghum, pearl millet and finger millet. ICRISAT builds special expertise across the whole value chain for these mandated crops. They also launched a website named millet finder which facilitates Currently 10 product categories, 580 products, 173 companies, and 34 countries are operating and including under millet finder database.

ICRISAT strongly believes in creating awareness and helping consumers make informed choices while keeping their health

and the environment in view. (Source: ICRISAT)

Government initiatives on millets in India

INSIMP

A new scheme “Initiative for Nutritional Security through Intensive Millets Promotion (INSIMP)” was launched in March, 2011. Announcement of Rs.300 Crores under RKVY for ‘Nutri-cereals’ in budget of 2011-12. They are providing free input up to 2 ha per farmers, seed mini kits, training, support services to large size cluster (200-1000 ha) demonstration involving all categories of farmers. Incentive for certified seed production of hybrids and HYVs of millets. The scheme has a unique feature to support improved technologies for production, post-harvest and awareness among the consumers. Creation of institutional infrastructure for value addition like Centre of excellence for each sorghum, pearl millet and small millets. Support for processing & awareness campaign. (Source: INSIMP)

NFSM

INSIMP is being continued as National Food Security Mission during 12th Five Year Plan (2012-17) with new targets of additional production of food grains of 25 million tons of food grains comprising of 3 million tons of coarse cereals by the end of 12th Five Year Plan. It has Five components, out of five components NFSM-Coarse Cereals - covered in 265 districts of 28 states. Demonstration of improved practices and intercropping; and distribution of certified seeds including hybrids and high yielding varieties (HYVs). The total fund has to be shared 60:40 basis between central and state govt. It primarily focusses on 3 aspects.

Value chain integration of small producers by forming and strengthening of Farmer Producer Organizations (FPOs) is likely to mitigate at least some of the risks and constraints faced by the farmers. The formation of FPOs may offer a collective strength for seed production and seed procurement, access to credit and improved technologies, reduce transaction costs, facilitate value addition and enter into partnerships with private entities on more equitable terms.

Marketing support for pulses and millets for promoting the production of pulses and millets, it is proposed that marketing support would be provided to growers in form of insurance cover, millet processing unit to individual/communities etc. Dal mill and millet processing unit to individual/communities, incentives to processing agencies etc. Assistance will be limited to 50 per cent of the cost of the items.

Exposure visits to international organizations in order to enrich the knowledge base of the technical personnel involved in the Mission, exposure visit/training of technical officers/staff at international organizations like IRRI,

CYMMIT, ICRISAT, AVRDC, ICARDA or any other research organization in crop production technologies etc. would be organized. A sum of Rs.3 crores will be provided for the entire plan period. (Source: National Food Security Mission)

Inclusion of millets under Mid-day meal.

Niti Aayog and MHRD are recommending for inclusion of millets in mid-day meal scheme because of calcium, Iron, protein, fiber and other factors present in them. Millet based MDM was launched on pilot scale basis from 26th January, 2013 in Mahbubnagar (AP), Kolar (Karnataka) and Rural Pune (Maharashtra). Inclusion of 7 more districts in Karnataka and launching of Millet based supplements in Ariyalur and Perambalur districts of TN during 2013.

Price and policy support

Major millets like jowar, bajra and ragi are covered under MSP. MSP of jowar (hybrid), bajra and ragi are 2738, 2250, and 2251 respectively in the year 2021-22. The bajra and ragi MSP has been increased 4.65 per cent and 2.49 per cent respectively when compared to previous year.

Some initiatives by state government

Odisha under Organic Millet Mission initiated custom hiring centre for millets, the government distributed ragi laddu through Integrated Child Development Scheme, government distributed millets through public distribution (PDS) and providing decentralized facilities.

Karnataka pioneer for the international year for millets in 2023. Organized international trade fair on millets, inclusion of millets under PDS under Anna Bhagya Yojana scheme, launched Sahaja Samrudha scheme for millets promotions.

Andhra Pradesh Initiated millet board in 2020 under which they are promoting millet awareness and establishing millet processing units.

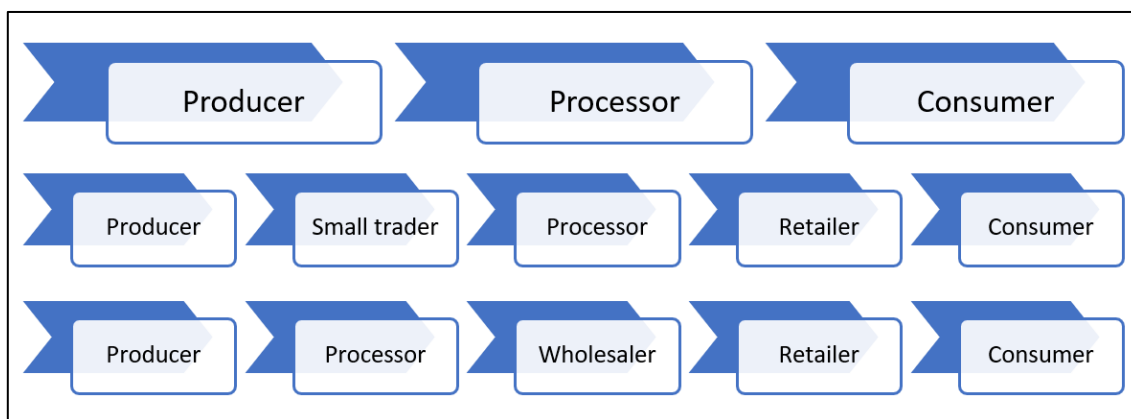
Tamil Nadu Initiated Millet mission scheme which consists of front-line demonstrations, providing mini kits to the farmers and organizing training to farmers.

Gujarat DAHOD ARS conducting research work on small millets and providing training to tribal people located in that area.

Supply Chain of Millets

Modern trade and speciality stores are the most lucrative distribution channels for minor millets. However, speciality stores will account for a relatively lower revenues share of the market than modern trade. Modern trade and speciality stores may witness a slight decline in sales of millets, since online stores are becoming more popular. Traditional grocery stores will continue to be the second fastest expanding distribution channel for minor millets during the forecast period. (Source: Millet market forecast and insight, 2017)

Some of the marketing channels for millets



Some of the marketing channels for millets

Out of these major marketing channel adopted in millets is producer – Small trader – Processor – Retailer – Consumer. (Source: Madhira 2019)^[10].

Challenges in value chain of millets

Weak Supply Chain: Unlike rice and wheat, there has been dwindling development of the supply chain, especially as it relates to support for growers, traders, marketers, subsidiaries, and processors to ensure speed and smoothness. Several cases of intermediaries' exploitations are documented online. Therefore, cost components continue to increase. For example, according to the manufacturers, middlemen can increase the cost component by up to 40 per cent.

Customer Awareness: In addition, customer awareness of the better nutritional value of millets, as well as the ability to evaluate quality, is inadequate or practically non-existent. Customers do not buy what they do not know about. Most of the current customer awareness about millets consists of word-of-mouth information, or informal discussions on its potential nutritional benefits. However, based on nutritional discussions during the customer preference survey, at least 50 per cent of non-consumers of millets indicated an interest in purchasing them.

Poor Yields: Average yields are still quite low. Annual yields of 4–5 quintals as opposed to 20–25 quintals of rice, 18–20 quintals of wheat, and 25–30 quintals of maize are also drivers of the disparity in price and acceptability. Although, when juxtaposed with other factors, small millets have a better yield potential, since they require less area than rice, for example, and can grow in less fertile soils.

Inadequate or Inefficient Processing Facilities: Based on technical meetings and reports reviewed, innovation is a major stumbling block. The feedback loop needed to improve on innovation, development, and use, while reducing drudgery is absent. With a general 60–65 per cent recovery rate during processing, the “un-exploration” of by-products also contributes to the higher final selling price.

Floundering Policy: After the Green Revolution, the policymakers in India have supported the production of intensive crops in more choice resource areas, contributing to the decline of millets (although millets require less cultivation area). Another example is that the Indian Public Distribution

System (PDS) in 2017 did not include small millets. (Source: Adekunle *et al.* 2018)^[11].

Conclusion

The farming systems that we need today have to be more resilient and diversified to meet the food and nutrition demands of the nation while ensuring sustainable use of natural resources hence the role of millets is inevitable. These can not only serve as an income crop for farmers but also improve the health of the community as a whole. Creation of demand for millets and millets value added products will boost the production and consumption scenario of millets in India which will have a long-term impact on the sector. Even though the consumers are eating millets for health benefits, interestingly taste was observed to be a major reason why the respondents both did and did not eat millets, indicating that health awareness alone would not significantly boost millet consumption. Together, these insights showed the need for tasty products and simple recipes made from millets. The use of millets in commercial/pack-aged food will encourage farmers to grow millets and will open new opportunities and revitalize the farmers. Farm mechanization should be equally prioritized to remove the drudgery associated with its traditional processing of millet especially small millets. Government should make provisions for incentives to encourage millets cultivation. Formulation of policy measures exclusively for millets (including the small and minor millets). These policy measures should include inclusion of millets in Mid Day Meal Schemes, inclusion of all millets under MSP, proper procurement of millets and distribution through Public Distribution System (PDS).

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