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Research Article

THE MILLETS MANIFESTO FROM FARM TO COMMON MAN'S PLATTER

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Abstract: Small-grained crops cultivated for feed and fodder are millets. Being 'Smart Food' they are easy to cultivate, organic and rich in nutritional content. They are climate resilient and are a sustainable food for the future. Over the years their area and production has decreased but increase in the yield has been observed. India is the largest producer while USA is the largest exporter of the millets in the world. Among all millets pearl millet (bajra) has highest acreage and production in India over the years. Millets accomplish many SDG of the UN programme of sustainable development. They can be promoted through including in MSP, PDS, schools and anganwadis. They require funding from centre and can be fuel of the future. Many ministries and government institutes are engaged in the research and promotion of millets since the declaration of IYM 2023. But government efforts would be in vain unless they involve efforts at individual level. Still a long coarse have to be covered by these coarse grains to fall in the platter of common man.

Keywords: *IYM, Millets, Smart food, SDG*

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Introduction

The word millets is used to describe small-grained cereals like sorghum (jowar), pearl millet (bajra), foxtail millet (kangni/Italian millet), little millet (kutki), kodo millet, finger millet (ragi/mandua), prodo millet (chena/common millet), barnyard millet (sawa/sanwa/jhangora) and brown top millet (korale) belonging to family Graminae or Poaceae. Millets are one of the oldest cultivated food grains known to humans and have been a stable food in China and India prior to popularity of fine cereals like rice and wheat [1]. These crops have a long history of cultivation of more than 5000 years and grown in many states. Being considered as 'Smart Food', millets are easy to cultivate, are mostly organic and rich in nutritional content. These crops score over rice and wheat in terms of minerals, vitamins and dietary fiber content, as well as amino acid profile. Millets are hardy crops, resilient to environmental stress, pests and illnesses, making them a sustainable food supply to fight hunger in a changing world [2]. They are adapted to wide range of temperatures, moisture regimes and demands less input as well as can be grown on uneven topography. Millets are also a long-term alternative for halting climate change and creating climate-resilient agri-food systems [3]. With declaration of 2023 as 'International Year of Millets', millets have gained attention and efforts are underway to obtain their convenient and value added processed products. It has now been proposed to enlarge the food basket and include in the PDS.

Material and Methods

All the data and information compiled in this review paper has been collected, sorted out and well arranged from different secondary sources including research papers from journals, GOI magazines and publications and various trustworthy and renowned newspapers. As the world is celebrating India's put forth commencement on Millets' Year, the data revolving around these crops and their utilization, cultivation and distribution pattern is well described in the later pages.

Results and Discussion

Diversification among millets

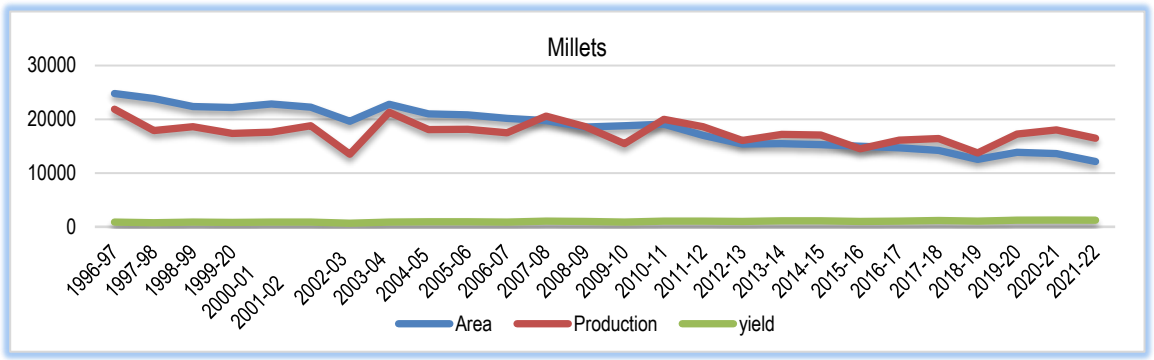
The major millets are sorghum, pearl millet and finger millet covering 95% of the total millet growing area in India and the rest 5% are little millet, foxtail millet, barnyard millet, proso millet, kodo millet and brown top millet [4]. Globally pearl millet [*Pennisetum glaucum* (L.)] occupies 95% of the production followed by foxtail millet [*Setaria italica* (L.)] cultivated for food in semi-arid tropics of Asia and as forage in Europe, North America, Australia and North Africa [5]. Finger millet [*Eleusine coracana* (L.)] is the sixth largest crop serving the rural populations of Africa and southern India. Proso millet [*Panicum miliaceum* (L.)] is a short-season crop cultivated in drier regions of Asia, Africa, Europe, Australia and North America [6]. Barnyard millet [*Echinochloa* spp.] is the fastest growing among the millets with a harvesting period of 6 weeks. Kodo millet [*Paspalum scrobiculatum*] is native to South America and was domesticated in India for 3000 years. Little millet [*Panicum sumatrense*] occupies a major portion of diet amongst tribal people of Sri Lanka and Myanmar [7].

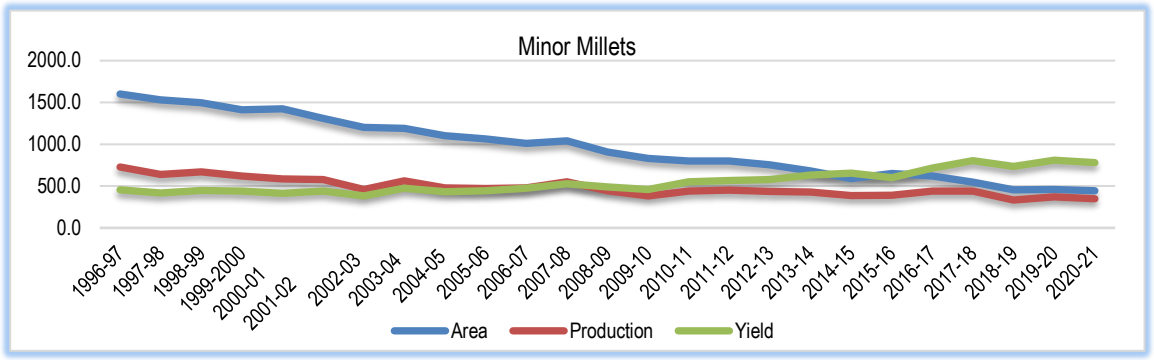
World's perspective towards millets

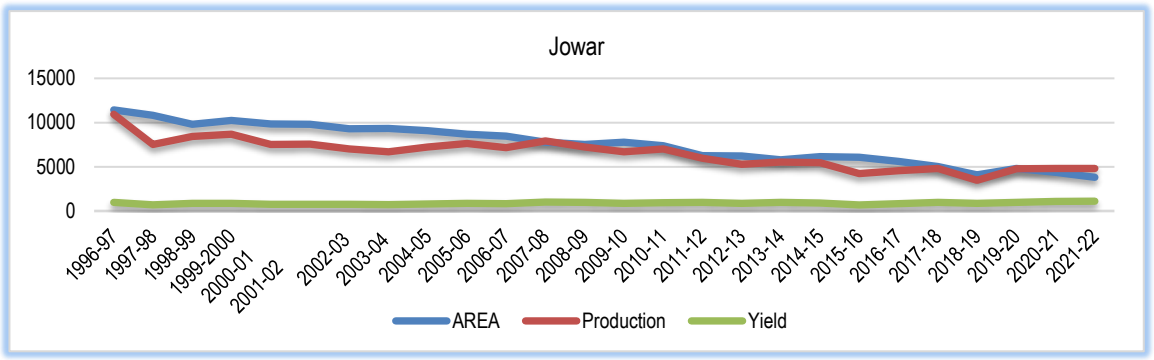
According to a report, 0.9% decline in the global consumption of millets has been administered. But the five year term of 2019-2024, some positive results are expected in the global market. Although largest millets producers in the world are India, Niger and China respectively but the cultivated area has been decreased in these countries while an increasing trend in millet production has been observed in Africa [8]. In Asia, However the millets are considered as the staple food but its importance is declining because of various factors like increase in income, unchecked urbanization and the policies of the government which favours the production as well as consumption of wheat and rice. Although the world's leading producer of millets in the world is India with a share of 41.04%, but the U.S.A. dominates the world export market [17].

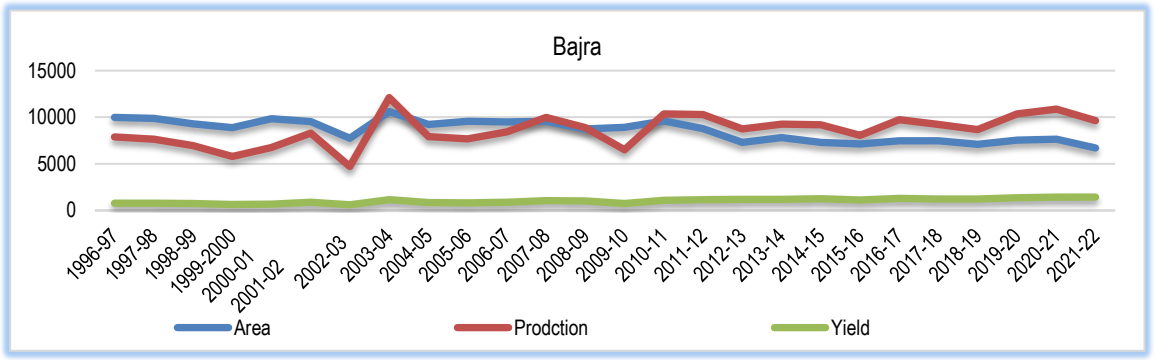
India's millets map

Millets are grown in 130 countries and are traditional food for more than 500 million people. Government has declared millets as 'Power House of Nutrition'. When it comes to diversification of millets in India, Jowar is mainly grown in Maharashtra, Karnataka, Rajasthan, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Telangana and Madhya Pradesh [10]. In 2020-21, the area under jowar stood at 4.24 million hectares, while production was 4.78 million tonnes.









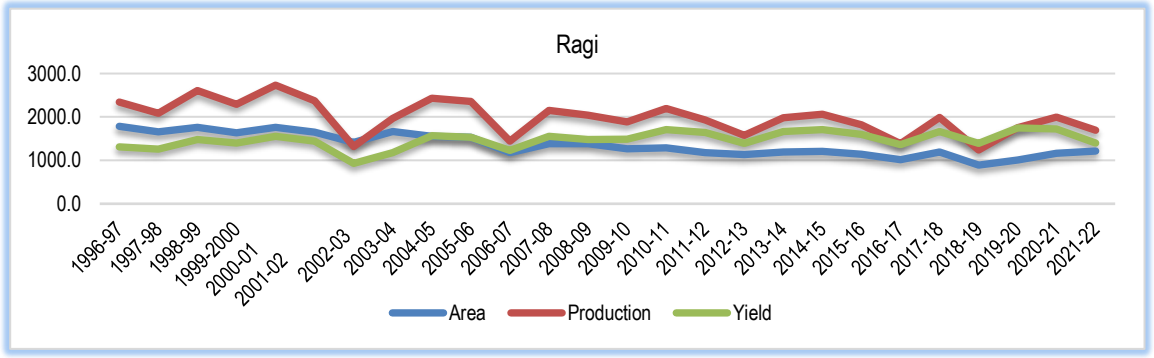


Fig-1 Area, Production and Yield pattern of millets in India

Maharashtra accounted for the largest area (1.94mn ha) and production (1.76 mn tonnes) of jowar during 2020-21. In 2020-21, Rajasthan had the highest bajra cultivation, with 4.32 million hectares out of the total 7.75 million hectares. Bajra is primarily grown in Rajasthan, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh, Maharashtra, and Karnataka. The state also produced the most bajra in the country (4.53 mn tonnes of the total 10.86 mn tonnes) in 2020-21. Foxtail millet is grown in Meghalaya and Karnataka. Finger millet is cultivated in Uttarakhand, Meghalaya, West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Maharashtra and Gujarat. Barnyard millet is seen only in Uttarakhand. Browntop millet is sown only in Karnataka. Little millet is grown in Madhya Pradesh, Odisha, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. Kodo millet is sown in Madhya Pradesh, Odisha, Tamil Nadu and Karnataka. Proso millet is cultivated in Tamil Nadu and Andhra Pradesh. India globally contributes 2.7% and 1.4% in area and production respectively [11-13].

Area, Production and Yield pattern of millets in India

The area, production and yield of different millets in India in 000' hectare, 000' tonnes and kh/ha from 1996-97 to 2021-22 is explained via following graphs [14]:

Table-1 Distribution of millets from 2017-2022 in India

2017-22	Area (000'ha)	Production (000'tonnes)	Yield (kg/ha)
Sorghum	4425	4535	1025
Pearlmillet	7297	9745	1335
Fingermillet	1092	1735	1589
Smallmillet	465	373	802
Total Millet	13279	16388	1234

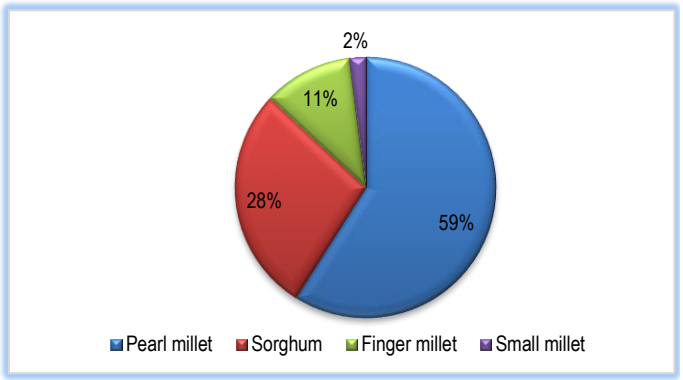


Fig-2 Percentage Production distribution of Millets 2017-2022

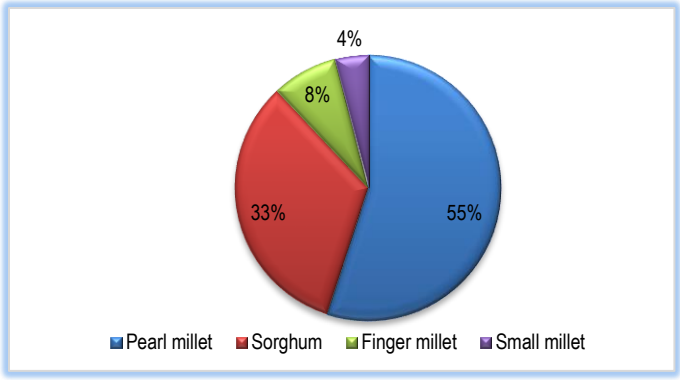


Fig-3 Percentage Area distribution of Millets 2017-2022

Why millets ?

IYM 2023 aims to contribute to the UN 2023 Agenda for Sustainable Development specially SDG 2,3,8,12,13 and 15:

1. The sustainable cultivation of millets can support climate resilient agriculture;SDG 13 (Climate Action) and SDG 15 (Life on Earth) – Millets can grow on arid lands with minimal inputs and maintenance, tolerant to diseases and pests and more resilient to climate shocks than other cereals. they do not heavily deplete soil nutrients. By providing land cover in arid areas, they reduce further soil degradation and help support biodiversity and sustainable land restoration. Expanding the production of millets in national agricultural systems can support the transformation to more efficient, inclusive, resilient and sustainable agrifood systems for better production, better nutrition, a better environment and a better life.

2. The sustainable production of millets can fight hunger and contribute to food security and nutrition; SDG 2 (End Hunger) – In arid areas, millets are the only crops that can be harvested in the dry season and are a crucial part of the household food basket. They can help to overcome food scarcity in difficult periods therefore, contributing to the food security and nutrition of vulnerable population.

3. Millets can be an important part of a healthy diet; SDG 3 (Good Health and Well-Being)–Being the good sources of minerals, dietary fibre, antioxidants and protein, they have low glycaemic index, are a good option for people with high blood sugar, gluten free and an excellent and cost-effective source of iron for iron-deficient diets. As whole grains, each variety of millets provide different amounts and types of fibre. Dietary fibre has a role in regulating bowel function, blood sugar, lipids and satiation.

4. Greater consumption of millets can offer opportunities to smallholder farmers to improve their livelihoods; SDG 8 (Decent Work and Economic Growth) – Millets are deeply rooted in Indigenous People's culture and tradition and therefore, a strategic crop to guarantee food security in areas where they are culturally relevant. Due to dietary preference of wheat, rice and maize, the production and demand for millets has declined. By promoting millets and regaining market opportunities, additional sources of revenue can be created for smallholders and in the food sector, boosting economic growth.

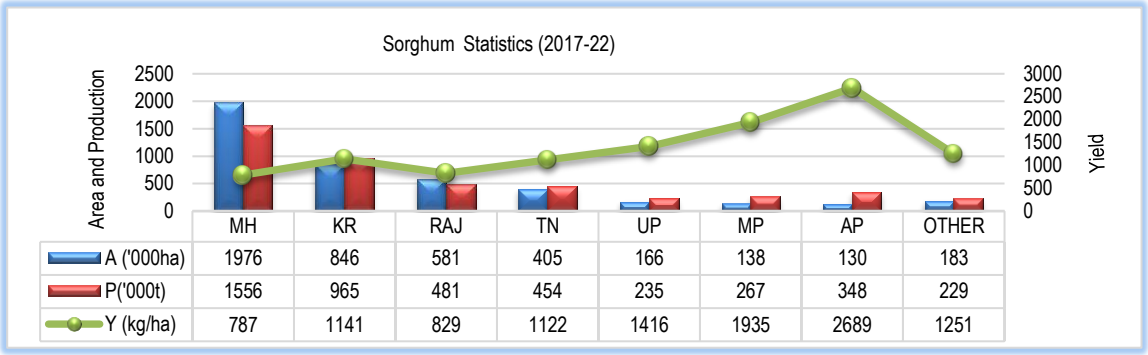
5. Proper handling of millets is key to maintaining their high quality and nutritional benefits; SDG 2 (End Hunger) and SDG 3 (Good Health and Well-Being) – Timely harvest and threshing ensures good grain quality. Controlled mechanised processes for dehusking of millets are more efficient than manual dehusking, as they reduce losses from spillage and provide clean intact grains that are ready for market. Smallholders and supply chain holders benefit accordingly from better incomes and reduced drudgery. Innovative agro-processing, especially in the production of nutritious foods, could target both traditional and non-traditional markets such as youth, urban consumers, tourists, etc. this value addition could lead to market expansion and increased food and nutrition security and incomes for smallholder farmers.

6. Greater trade in millets can improve the diversity of the global food system; SDG 8 (Decent Work and Economic Growth) and SDG 12 (Sustainable Consumption and Production) – Millets including sorghum, account for less than 3% of the global grains trade. With the need to improve the resilience of global trade and its ability to respond to sudden changes in the food-grain market, millets are a valuable option to increase output diversity and mitigate risks related to production shocks. Market structure and transparency, in relation to volume and prices of millets are the key elements to ensure stability and sustainability. It is important to ensure that millet traders benefit from the same tools as other grain traders, such as digitalisation, which could boost the added value of millet along the grains value chain and consequently provide more revenue opportunities for producers [11].

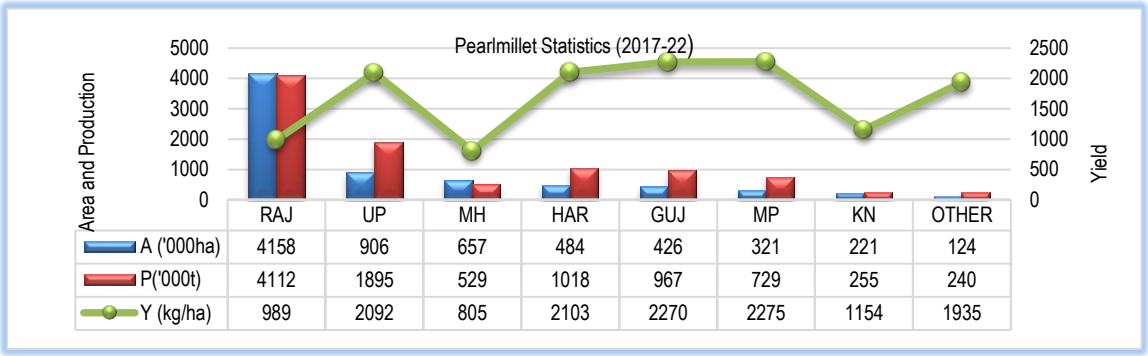
The resolution for millets to approach the centre table of the nation

Millets under PDS

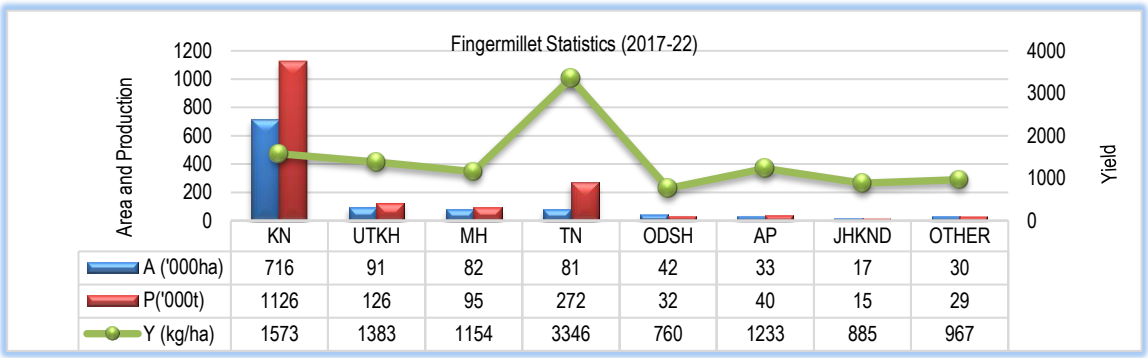
The National Food Security Act (NFSA), 2013 doesn't mention millets in the definition of 'foodgrains'. The quantity of coarse grains procured for the Central Pool and distribution under the NFSA has been negligible. The latest data on stocks with the Food Corporation of India (FCI) show only 2.64 lakh metric tonnes (LMT) of coarse grain was available in the Central Pool on November 2022. In comparison, the stocks of rice, wheat and unmilled paddy were 265.97 LMT, 210.46 LMT and 263.70 LMT respectively. The push to distribute coarse grains under the PDS had not gained momentum. The Centre has accepted the recommendation of a committee set up by it, that millets be included in the PDS to improve nutritional support. The government has set a target to procure 13.72 LMT coarse grains during the Kharif Marketing Season (KMS) 2022-23, more than double the 6.30 LMT procured during KMS 2021-22. The target includes 4.12 LMT of bajra of which 0.95 LMT had been procured until November 2021 [15].



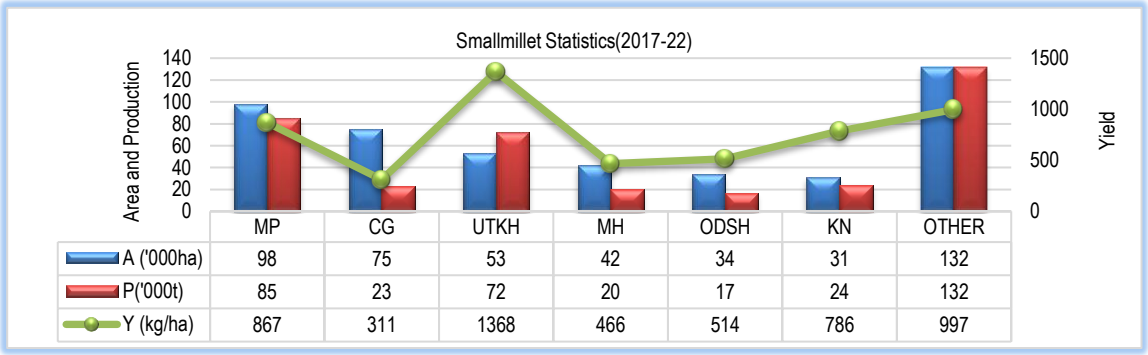
	MH	KR	RAJ	TN	UP	MP	AP	OTHER
A ('000ha)	1976	846	581	405	166	138	130	183
P('000t)	1556	965	481	454	235	267	348	229
Y (kg/ha)	787	1141	829	1122	1416	1935	2689	1251



	RAJ	UP	MH	HAR	GUJ	MP	KN	OTHER
A ('000ha)	4158	906	657	484	426	321	221	124
P('000t)	4112	1895	529	1018	967	729	255	240
Y (kg/ha)	989	2092	805	2103	2270	2275	1154	1935



	KN	UTKH	MH	TN	ODSH	AP	JHKND	OTHER
A ('000ha)	716	91	82	81	42	33	17	30
P('000t)	1126	126	95	272	32	40	15	29
Y (kg/ha)	1573	1383	1154	3346	760	1233	885	967



	MP	CG	UTKH	MH	ODSH	KN	OTHER
A ('000ha)	98	75	53	42	34	31	132
P('000t)	85	23	72	20	17	24	132
Y (kg/ha)	867	311	1368	466	514	786	997

Fig-4 State wise distribution of millets in India from 2017-2022

MSP for millets

The government declares a Minimum Support Price (MSP) for jowar, bajra and ragi only. For KMS 2022-23, the MSP for jowar hybrid was declared at Rs. 2,970 per quintal and that for jowar maldandi at Rs. 2,990 per quintal. The MSP for bajra and ragi were Rs. 2,350 per quintal and Rs. 3,578 per quintal respectively. Howsoever, if MSP would be declared for minor millets too, their area, production and market would ultimately boost. MSP procurement of millets should be part of a decentralised nutritional programme specifically targeting tomorrow's citizens [13].

The solution in Schools and Anganwadis

According to the latest official data for 2021-22, India has 26.52 crore children enrolled in 14.89 lakh schools from the pre-primary to higher secondary levels. In addition, 7.71 crore children and 1.80 crore pregnant & lactating women are being provided supplementary nutrition in 13.91 lakh anganwadi care centres. This is potentially a huge 'market' for millets. Given the dire need to alleviate micronutrient malnutrition especially iron and zinc deficiency that are major causes of anaemia and stunting respectively, while also contributing to impaired cognitive performance and vulnerability to diarrhoea- millets could be made a staple part of children's diets. Serving daily a hot meal of millets with a glass of milk and an egg will help combat hidden hunger, besides giving a boost to crop diversification by creating demand for millions of small millet, dairy and poultry farmers [3].

The Centre has two existing schemes; Pradhan Mantri Poshan Shakti Nirman and Saksham Anganwadi & Poshan 2.0 with a combined budget of Rs. 30,496.82 crore in 2022-23. These can be better leveraged by making them more millets focused [7]. Besides midday meals, millets could be served in the form of ready-to-eat foods such as cookies, laddu, nutrition bars and snacks.

The Centre's role

The Centre could fund any state willing to procure millets specific to their region exclusively for distribution through schools and anganwadis. (Odisha already has a dedicated millets mission that undertook procurement of 32,302 tonnes worth Rs. 109.08 crore, mainly of ragi, in 2021-22). Rajasthan, U.P., and Haryana might want to do the same in bajra, just as Maharashtra may for jowar, Karnataka for ragi and Madhya Pradesh for kodo/kutki. A combination of central funding with decentralised procurement linked to nutrition goals specifically the eradication of hidden hunger among school age children can do for millets what the FCI achieved with rice and wheat. The government also needs to promote start-ups for processing and value addition of these millets to bring millets in industrial sector [13].

International export of millets

The global market for millets in 2021 was $ 470 million and it is forecasted that by 2026 there will be increment in its annual growth rate of 4.5%.India is the highest producer and 5th largest exporter of millets. Also the exports are increasing exponentially as the demand for millets is increasing at a fast rate worldwide [16]. A good export to the world can bring in good foreign exchange. Hence, promotion of millets in digital markets like forward markets and contract markets would facilitate the sale of farmers at international level. Organizing international fairs, exhibitions and competitions would further scale up the export of millets.

Millets; the fuel of future

At the crucial time when the nation is trying to incorporate biofuel in the demand of fuels, millets can be an alternative option. India has achieved its goal of blending 20% ethanol through the Ethanol Blended Petrol (EBP) Programme through the country and 10% blending in UTs of Andaman & Nicobar and Lakshadweep islands. Finger millet (ragi) can be used as an efficient source for bioethanol production. Seeds, which are already used for brewing, are the most obvious variant of feedstock for ethanol production from this crop. Despite all its importance, however, finger millet is still grossly undervalued both scientifically and internationally. Hence, keen efforts involving quality research and technologies are required to make it fuel of the future [9].

Conclusion

The Government of India has launched a set of seven sutras in the run-up-to IYM 2023 and has allocated different government departments for the same. The seven sutras outline areas in the enhancement of production, nutrition and health benefits, value addition, processing and recipe development, entrepreneurship development, awareness creation-branding, labelling and promotion, international outreach, and policy interventions for mainstreaming. The government also plans to establish Centres of Excellence on millets across the length and breadth of the country and link industries with these centres. Not only this, government institutes like ICAR-IIMR, NIN, AYUSH, CFTRI and ICRISAT are asked to collect evidence in field of research promoting innovations in technologies for millets production and promotion. These efforts from Government involving individuals would definitely bring the millets to the common man's platter in the coming years.

Application of research: During the International Year of Millets various schemes and projects has been implemented by the GOI. Hence, this paper provides basic information regarding millets' importance, area, production, and productivity in India which would facilitate the policy makers, development agencies and other stakeholders in designing the roadmap for accomplishment of the aim of bringing millets to common man's platter.

Research Category: Extension Education

Abbreviations: SDG-Sustainable Development Goals
MSP-Minimum Support Price, PDS-Public Distribution System
IYM-International Year of Millets, NFSA-National Food Security Act
FCI-Food Corporation of India, LMT-Lakh Metric Tonnes
KMS-Kharif Marketing Season, EBP-Ehanol Blended Petrol
AYUSH-Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy

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Research project name or number: Review study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Madhya Pradesh, India

Cultivar / Variety / Breed name: Millets

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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