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Research Article

International Year of Millets 2023: Millet Promotion in India for Food Security

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Food security is the need of the hour in the face of a growing population and changing climate. As a country with rich agricultural traditions, India is reviving traditional food crops with climate-resilient traits and rich nutrition profiles. Millets, once known as India's famine reserve, are now getting the status of India's future food. India recognized millets as good for cultivators, consumers, and climate. Considering the beneficial effects of millet in providing food security to the world, India proposed the International Year of Millet 2023, and the UN General Assembly (UNGA) approved it on 05 March 2021. In this context, this paper discusses the initiatives of the central government, state governments, and civil society in India to promote millet cultivation and consumption. It also recommends measures to develop a climate-resilient millet-based food system to address agricultural distress and meet India's nutritional needs.

INTRODUCTION

Global concerns about climate change, population growth, and food security necessitate the revival of Traditional Food Crops (TFCs) that indigenous and ancient societies have long cultivated (Akinola *et al.*, 2020; Anju and Kumar, 2022). Millets are TFCs that have served as a staple food for millions of Africans and Asians for over seven thousand years (UN, 2022). Asia accounts for 40% of global millet production, with Africa producing more than 55% (UN, 2022). Although there are about 300 varieties of millet, only 12 are commonly used in human diets (Reddy, 2021). Historically, Asians and Africans relied upon major millets, namely Great millet (Sorghum/ Jowar/Cholam), Pearl millet (Bajra/ Kambam), and Finger millet (Ragi), and minor millets such as Foxtail millet (Thina), Kodo millet (Koovaragu), Proso millet (Panivaragu), Little millet (Chama), and Barnyard millet (Kuthiravaali), for staple food (Agricultural & Processed Food Products Export Development Authority [APEDA], 2022; Reddy, 2021).

Generally, small-seeded grasses grown in arid and semi-arid regions are called millets or drylands cereals (Bandyopadhyay *et al.,* 2017; Vetriventhan *et al.*, 2020). They withstand high temperatures and reproduce with low water input (Saxena *et al.*, 2018). Indian farmers consider millets climate-smart crops adaptable to increasing temperatures and recurring droughts (Vincent and Balasubramani, 2021). Besides climate-resilient characteristics (Reddy, 2021; Suresh *et al.*, 2022), millets have high nutritional value and are also called Nutri-Cereals (Sharma *et al.*, 202; UN, 2021). They are a good addition to the functional food industry with their excellent nutritional and hypoglycaemic properties (Bora *et al.,* 2019).

Traditionally, various types of millet have been cultivated and consumed in India (Sukumaran Sreekala *et al.*, 2022). India produces around 16 million tonnes of millet, which is 20% of global production (Ministry of Consumer Affairs, Food & Public Distribution [MCAFPD], 2022; Suneja, 2022). However, with the Green Revolution in India that supported high-yielding varieties of rice and wheat, millet production declined considerably and limited their scope to fodder crops from food crops (Eliazer Nelson *et al.,* 2019). Before the 1960s, the per capita millet consumption was around eight times more than an urban Indian's in 2020 (Reddy, 2021).

Nevertheless, recent studies that have revealed millet's ability to cope with climate change and address food security challenges have shared ideas and requirements for mainstreaming its production and consumption

(Antony Ceasar and Maharajan, 2022; Kumar *et al.*, 202; Muthamilarasan and Prasad, 2021). The Government of India put forward the International Year of Millets (IYOM 2023) proposal, and it was endorsed by the members of the Food and Agriculture Organization (FAO) Governing Bodies and the 75th Session of the United Nations (UN) General Assembly (UN, 2022). The announcement of IYoM 2023 aims to

(i) raise awareness of the contribution of millets to food security and nutrition,
(ii) motivate stakeholders to improve sustainable production and quality of millets, and
(iii) focus on research and improved investment in development and extension services to achieve two other objectives (UN, 2022).

Moreover, Narendra Modi, the Honourable Prime Minister of India, stated in the opening ceremony of IYoM 2023 that the "need of the hour is to make millets a food choice for the future" (Press Information Bureau [PIB], 2022a). In this context, this paper details the programs, plans, and prospects for millet production and consumption in India.

Millet Promotion in India

A knowledge paper on millets by the Associated Chambers of Commerce and Industry of India (ASSOCHAM) describes millets, India's traditional crops, as India's Future Super Food (ASSOCHAM, 2022). Moreover, India is currently the fifth largest exporter of millet worldwide (APEDA, 2022).

The Union Government Initiatives to Promote Millets

Millet promotion in India was initiated in the last decade as a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY), an initiative for Nutrition Security through Intensive Millet Promotion (INSIMP). Later it was merged with the National Food Security Mission and introduced millets in the Public Distribution System (PDS). Besides, the government increased the Minimum Support Price (MSP) for millets (ASSOCHAM, 2022). Indian Institute for Millet Research (IIMR) was established in 2014. Further, India marked 2018 as the National Year of Millets (Kane-Potaka *et al.*, 2021). Owing to the high nutritive value and anti-diabetic properties (Bora *et al.*, 2019), the Ministry of Agriculture & Farmers Welfare (MAFW) notified millets as 'Nutri-Cereals.' A Sub-Mission on National Food Security Mission (NFSM) – Nutri Cereals implemented from the year 2018-19 in 212 districts of 14 states (NUTRI CEREALS- IYoM 2023 (dac.gov.in)). The National Year of Millet's observation was followed with a proposition to FAO and the UN for an IYOM, which the UN adopted. Also, the Union Finance Minister highlighted critical budget projects in 2022 to improve domestic production and post-harvest value consumption of millet and branding of millet products at national and international levels (Narayan and Malik, 2022). Figure 1 illustrates the timeline of millet promotion in India, and Figure 2 shows the Nutri-cereals in India.

MAFW supports research and development activities, develops markets and value chains, creates awareness for higher consumption, and provides financing for sustainable production. The Union Agriculture Minister said in the prelaunch celebration of IYOM 2023 that the "Government is providing support to Start-up entrepreneurs for recipes and value-added products to promote the consumption of millet" (PIB, 2022b). According to MAFW, India has more than 500 start-ups in the value-added millet chain, with 250 start-ups incubated by IIMR under Rashtriya Krishi Vikas Yojana – Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation (RKVY-RAFTAAR). The government has spent 62.5 million rupees to support these start-ups (PIB, 2022b).

Lately, the National Conference on Karif Campaign 2022 set seven themes for millet promotion to observe IYoM 2023 (Figure 3).

Initiatives by State Governments

Millets are cultivated in 21 states of India and the main producers are Rajasthan, Uttar Pradesh, Haryana, Gujarat, and Madya Pradesh (ASSOCHAM, 2022). However, this situation changes if only the production of minor millets is considered. India's largest producers of minor millets are Madhya Pradesh (20.71%) and Uttarakhand (19.71%) (Anbukkani *et al.,* 2017). In line with the Central Government's initiative, states with a tradition of millet cultivation have taken steps to revive millet, and established millet missions to promote millet production and consumption (Kane-Potaka *et al.*, 2021). This paper discusses the initiatives of Odisha, Karnataka, Madhya Pradesh (MP), Chhattisgarh, Andhra Pradesh, and Kerala.

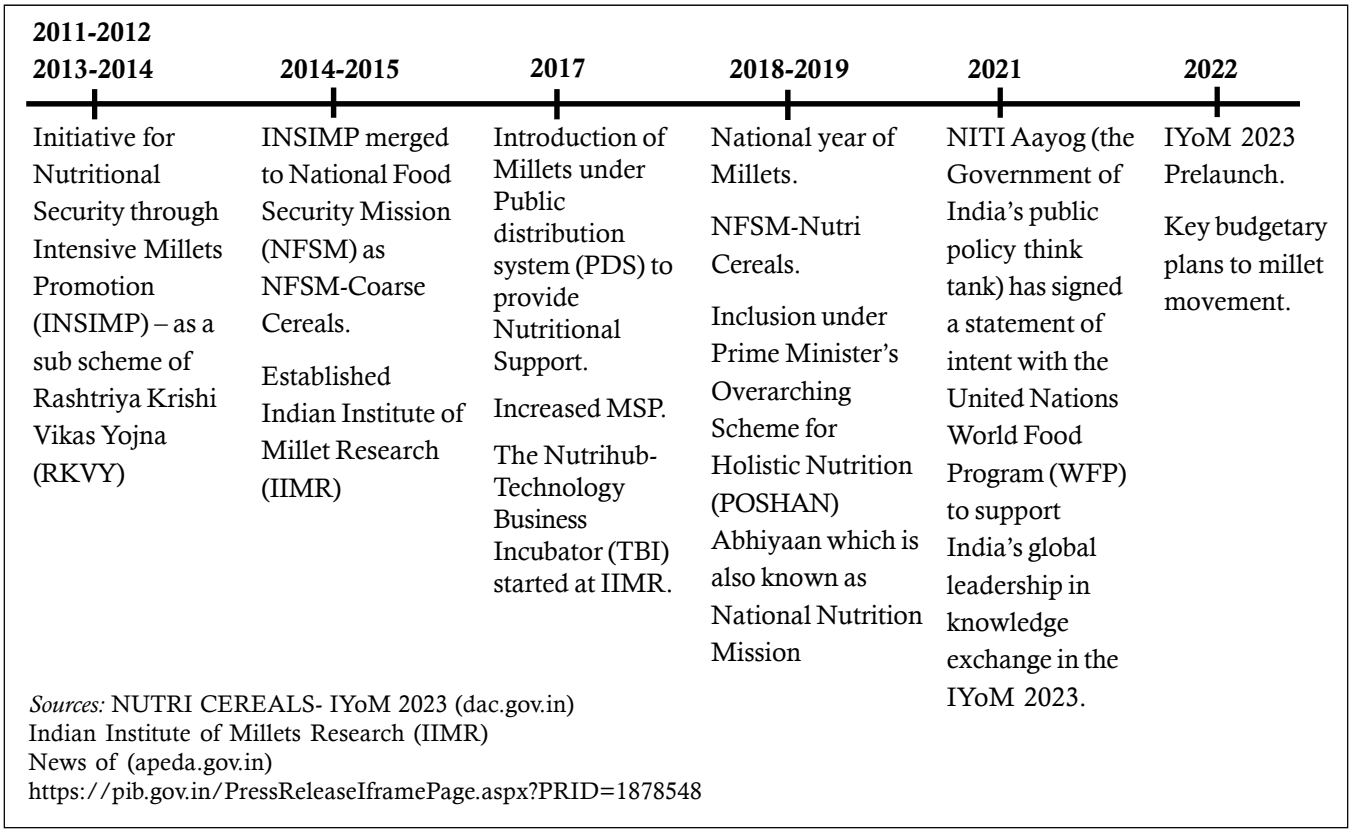
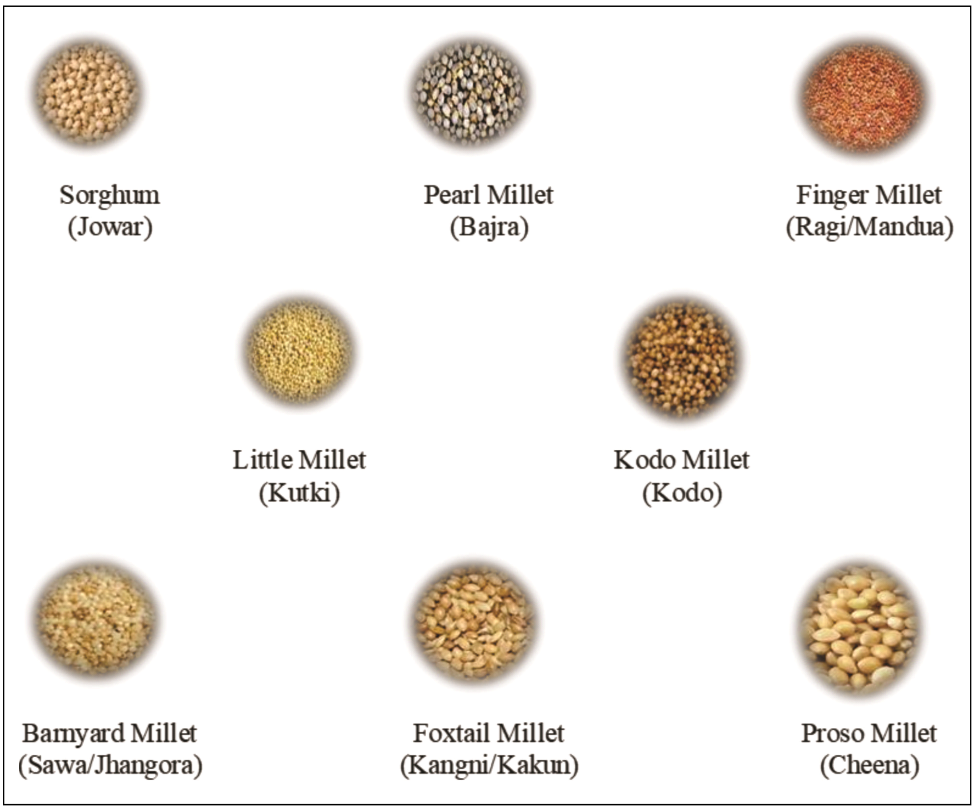


Figure 1. Millet Promotion in India Timeline

Figure 2: Nutri-Cereals in India
Source: NUTRI_CEREALS-IYoM2023(dac.gov.in)



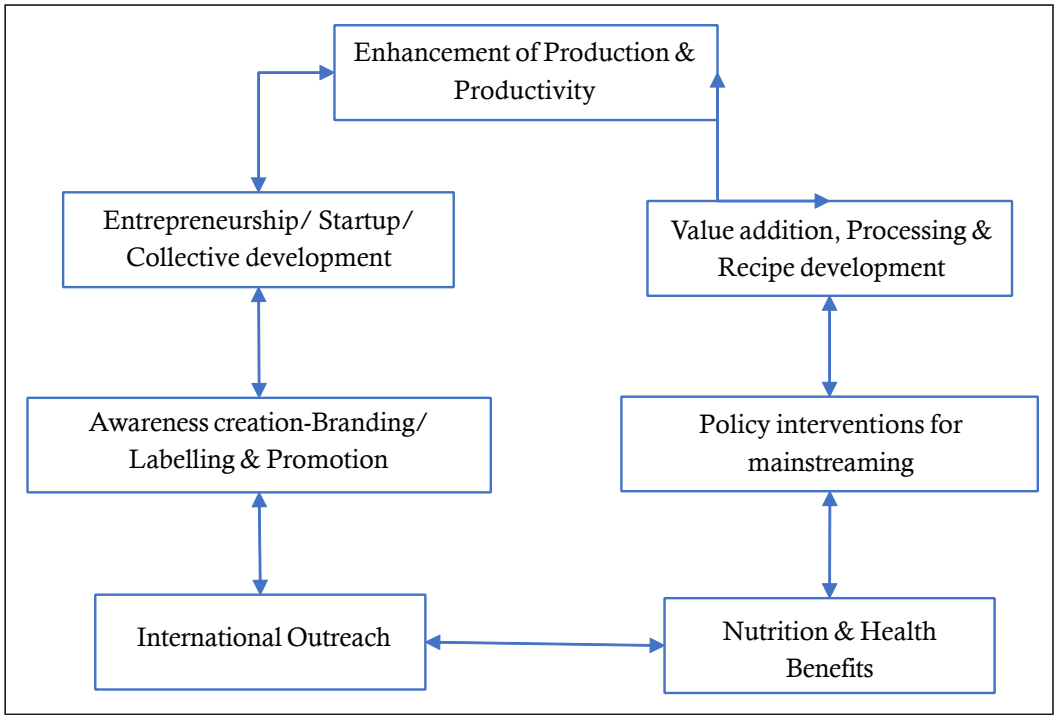


Figure 3. Themes for Millet Promotion
Source: Crops.pdf (agricoop.nic.in)

Odisha Millet Mission (OMM)

Millet is an integral part of the diet and cropping system in tribal areas of Odisha. OMM was launched in 2017 to improve nutritional security by reviving millets on farms and plates. It has scaled up to 143 blocks in 19 districts of Odisha. With a multi-stakeholder framework, OMM promotes farmer-preferred cultivars and culturally appropriate recipes, addresses millet-value chain constraints, enhances consumer awareness, and builds the entrepreneurial capacity of women collectives (Garg *et al.*, 2022). Moreover, it transforms food systems by mainstreaming affordable and healthy diets that enhance rural incomes, women's empowerment, and agricultural biodiversity conservation (Garg *et al.*, 2022).

Odisha was declared the 'Best Millet Promoting state' under the 'Poshak Anaj' awards by the Indian Council of Agricultural Research (ICAR), IIMR, and FAO. The central government asked all states to adopt the OMM model for millet promotion (OMMCOM NEWS, 2021). Moreover, Cambridge University collaborated with OMM to seek alternatives to the Green Revolution framework (OMMCOM NEWS, 2021). The innovative initiative of OMM makes it an exemplar. Keonjhar district was awarded for introducing *Ragi Laddus* under Integrated Child Development Programme (ICDS) scheme and *Ragi Biscuits* under Mid-Day Meal (MDM) Programme (Odisha Bytes, 2022). OMM introduced 'Improved Agronomic Practices' to help farmers. Apart from financial incentives to farmers and a MSP for *Ragi*, OMM has set up Custom-Hiring Centers (CHC) to provide cycle weeders, sprayers, markers, pipes, pump sets, etc., to farmers on a hire basis (Odisha Bytes, 2022). Moreover, OMM conserves the genetic diversity of millets in the highlands of Eastern Gut. Watershed Support Service & Activities Network (WASAN) with the OMM holds a collection of 111 millet germplasm, 108 indigenous, and three rare varieties with information from communities on critical trait-specific characteristics and community-managed seed banks (Sankar Das, 2021).

Karnataka, a Source for Next Gen Smart Foods

Karnataka state government is working to increase millet production and to take consumption locally to globally (Meek, 2022). Solidifying the state's position as one of the top ten millet producers in India, it initiated the *Raitha Siri* scheme, through which farmers were paid Rs 10,000 per hectare for adopting millet cultivation (Meek, 2022). Karnataka stands first in terms of area and production of *Ragi* and is the second-best performer in terms of productivity (Sukumaran Sreekala *et al.*, 2022). With a vision to make the state the Millet Capital of India,

being the source of next-generation smart food, Karnataka hosted the Organics & Millets International Trade Fair 2019 (Times of India, 2019). Kane-Potaka *et al.* (2021) described millets as smart food since they are good for consumers with their dense nutritional contents, for farmers with their climate-resilient traits, and for the planet as they grow with no fertilizers and pesticides and leave lower carbon footprints than other staple crops.

History has recorded class and caste differences in the consumption of ragi and rice in Karnataka, with ragi being the staple food of all working classes, while Brahmins consumed rice (Hazareesingh, 2021). However, smart food campaigns in Karnataka have transformed millets from a marginalized to a miraculous framework (Meek, 2022). The number of organic shops in Bengaluru has grown exponentially in the past few years, with millet being the main product that attracts customers (Erler *et al.*, 2022). Millet producers, development organizations, and the state work together to herald millet in Karnataka (Meek, 2022).

Madhya Pradesh (MP) Mission on Millets

MP is the leading state in terms of both area and production of small millets (Sukumaran Sreekala *et al.*, 2022). The government of MP designed a millet policy collaborating with Revitalizing Rainfed Agriculture (RRA) network and civil society (Balam, 2020). It promoted millets collaborating with women's self-help groups (SHGs) under the National Rural Livelihood Mission (NRLM), through the International Fund for Agriculture Development (IFAD) project, with a focus on the value chain and market linkages (Balam *et al.*, 2022). As part of IYoM 2023, the MP government has prepared a scheme for value addition of millets which supports Scheduled Tribe (ST) farmers under RKVY, and a provision of Rs 13 crore 74 lakhs allotted for the same (NEWS NCR, 2022). This scheme envisions promoting millets such as *Kodo, Kutki, Jowar, Bajra, and Ragi,* through improved seed supply, agricultural input, and cultivation practices in 89 tribal development blocks (NEWS NCR, 2022).

According to a report by Statista (2022), MP's production of Nutri-cereals such as *Jowar* (sorghum), *Bajra* (pearl millet), and *Ragi* (finger millet) increased from 2.15 to 4.95 million metric tons in the last 13 years. For most of the tribals in MP, Kodo millet and small millet are the most widely harvested staple foods (Behera, 2017). These two millets are central to the traditional rainfed food system. They are identified as critical assets to support farmer adaptation to climate change as they escape drought with their low water requirement and early maturation (Meldrum *et al.*, 2020). Projects supported by international and national agencies promoted multistakeholder consultation and involvement in devising pro-poor and gender-sensitive interventions and trained farmers on the best practices of millet farming to unleash the benefits of minor millets in MP (Meldrum *et al.*, 2020).

Chhattisgarh Millet Mission (CMM)

Although paddy is the main crop of Chhattisgarh, millets sustain its tribal population (Painkra *et al.*, 2022; Sidar *et al.*, 2017; Verma and Banafar, 2013). The culture of the tribes and many rituals are related to millet cultivation. The *Pahadi Korwa* tribespeople of Chhattisgarh believe that hanging millet stalks in their yards brings good hunting and bountiful harvest (Gita, 2018). However, they swapped to paddy owing to the government's policy and are now returning to their traditional millet farming as policies are in place to promote millet-based agriculture (Gita, 2021a). Kodo millet, little millet, and foxtail millet are their traditional grains. Current moves to restore millet cultivation are bringing millets back into the food baskets of tribals, a good source of nutrition, and their consumption is said to be good for convalescence (Gita, 2021a). SHGs of marginalized women bake and market millet cookies under the brand name Tribal Taste (Gita, 2021b).

With a vision to make the state the millet hub of India, Chhattisgarh Government launched Millet Mission on 10 September 2021 (Majumdar, 2021). It aims to increase the income of tribal farmers and give a commendable identity to the state. Under the millet mission, a memorandum of understanding (MoU) was signed between IIMR and 14 districts in Chhattisgarh (Nair, 2021). With the support, guidance, technical know-how, and high-quality seeds provided by IIMR, CMM plans to increase the productivity of millets in the state. In addition, CMM is on its way to establishing seed banks with the support of IIMR. Training and incentives for farmers are also promised by CMM (Waghmare, 2021).

Andhra Pradesh (AP) Millet mission

The AP state government has implemented a comprehensive scheme to revive tribal millet cultivation

in northern coastal Andhra and Rayalaseema. Special programs have been launched to promote this nutritious grain by keeping millets on board. The aim is to encourage the millet diet at all levels and help people drive home the long-term benefits of including power-packed millet in their diet (Seeds Development Corporation Limited [SDCL], n.d.). Also, the program provides a vital role to women SHGs and Farmer Producer Organizations (FPO) in millet cultivation in AP (APEDA, n.d.).

In AP, millets are essential in mitigating household climate risk by diversifying production portfolios and as a 'contingency crop' to cope with delayed rainfall during planting (Fischer *et al.*, 2016). As many farmers in AP depend on livestock and dairy as their livelihood, they grow millets as fodder crops (Bramhaiah *et al.*, 2018). Therefore, millet cultivation is crucial in the agro- and animal husbandry-dominated rural economy of the arid regions of AP.

Kerala Millet Village

Millet Village is an Integrated Tribal Development Programme (ITDP) in the selected hamlets of Attapady in Kerala, initiated jointly by the Agricultural Department and the Scheduled Tribe's Development Department of Kerala in 2017 (ITDP Attappady, n.d). In the first phase of 2017-2018, the project aimed to provide traditional and nutritious food to tribals in 45 hamlets suffering from malnutrition and infant mortality (Times of India [TOI], 2018). However, this phase failed due to drought and the reluctance of the officials to listen to the tribals about the suitable time for millet cultivation, depending on the monsoon (TOI, 2018). Despite the flop, the project launched seven value-added products, such as finger millet-based energy drinks and a little millet-based '*puttu*' (a south Indian breakfast dish) flour (Shaji, 2018).

In the second phase of 2018-2019, the project was extended to 70 tribal villages to save traditional millet varieties' seeds and ensure the tribals' food security and livelihood (TOI, 2019a). This project, worth Rs. 68.7 million, entered its third phase in 2019, and five villages in Attappady declared model millet villages (TOI, 2019b). Apart from the farm's irrigation facilities and electric fencing, the farmers were provided with farming equipment, quality seeds, storage jars, and reed mats for drying millet (TOI, 2019b).

While Attappady remains the leader in millet cultivation in Kerala, it is being promoted in other parts of the state. Cherthala South Panchayat in the Alappuzha district of Kerala largely cultivates *Ragi* (Finger millet) (Tell Us Daily, 2022). The Millet Cafe is one of several initiatives by *Kudumbashree* (Kerala Government's State Poverty Alleviation Mission) to promote millet cultivation (Athira, 2022). Run by three tribal women, Millet Cafe in Pudur, Attappady, serves a variety of millet-based dishes, including dosa (a South Indian breakfast dish) and *payasam* (an Indian sweet dish) (Athira, 2020).

Civil Society Initiatives

There are a considerable number of organizations working in the field of millet promotion in India. The first known one is the Millet Network of India (MINI). The Deccan Development Society (DDS) initiated MINI in October 2007 to support millet farmers in AP. In 2018, *Moghulamma* received the *Nari Shakti Puraskar* on behalf of MINI, considering its contribution to women's empowerment (The Hindu, 2018). The following year, MINI received the Equator Prize from UNESCO (Roy, 2019).

Many farmers are reviving millet cultivation in Nagaland with the North East Network (NEN) intervention. The five-day millet festival has reclaimed its place in the social life of Chizami village in Phek district (ICRISAT, n.d). In the Mandla district of MP, the non-profit Action for Social Advancement (ASA) has identified around 30-40 villages for millet promotion. ASA receives technical guidance on millet-based recipes from the Chennai-based non-profit MS Swaminathan Research Foundation (ICRISAT, n.d.). Another MP-based non-profit, Nirman, works with Baiga tribals to improve their nutritional health through millet (ICRISAT, n.d.).

Apart from collective initiatives, individual initiatives support millet promotion. When KR Sanjay Kumar shared the idea of changing the menu for welfare schools with millet-based breakfasts, the Telangana Social Welfare Residential Educational Institutions Society (TSWREI) tested and implemented the 'millet bowl' project. Millet Bowl reaches around 30,000 school-going children with *Roti, Idli, Upma*, three types of vermicelli, and four types of biscuits (Ranipeta, 2017). Similarly, the work of a woman entrepreneur and millet researcher, Bindu Gauri, has been instrumental in promoting value-added millet

products and their market access through Krishi Vigyan Kendra (KVK), Coimbatore (Shiaz, 2018).

CONCLUSION

Food systems must have the potential to support environmental sustainability while nurturing human health (Willett *et al.*, 2019). Climate change and the growing global population warrant climate-resilient millet-based agronomy. Minor millets can withstand a broad spectrum of environmental stresses and have excellent water-use and nitrogen-use efficiency (Singh *et al.*, 2021). On the other hand, the Sustainable Development Goals (SDGs) 2030 target to eliminate all forms of malnutrition by 2030. Achieving this requires interventions to replace the current staple diet of rice, wheat, and maize with highly nutritious grains like millet (Kane-Potaka *et al.*, 2021). Small millets are five- to seven-fold nutritionally rich in protein, bioactive compounds, and micro- and macro-nutrients compared to major cereals (Singh *et al.*, 2021). A study led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) showed that regular millet consumption improved haemoglobin and serum ferritin levels to reduce iron deficiency anaemia (ICRISAT, 2021). Besides, a systematic review collated available evidence proved that millets could reduce total cholesterol, triacylglycerols, blood pressure, and body mass index (BMI) (Anitha *et al.*, 2021a). Also, millets are widely recognized as having a low glycemic index (GI) that helps control diabetes (Anitha *et al.*, 2021b).

Apart from the nutritional benefits, millet cultivation must have the capability to empower the growers economically. The responsibility for developing and distributing highly productive millets rests with the government and researchers. The durability of millet for long-term storage and seed viability also needs to be improved. More value-added millet-based products should be introduced in the market. Also, budgetary allocation to increase the MSP of millet is required.

Although tribal communities are the custodians of crop diversity and traditional knowledge related to agriculture (Patil *et al.*, 2015), the valorization of agriculture in India is linked to elitist initiatives and national politics (Meek, 2022). Against this backdrop, we believe the IYoM 2023 will boost India's initiatives to promote millet cultivation and consumption. Apart from maintaining momentum in millet research and development, we suggest including millet cultivation in college extension programs to impart its importance to the youth and to promote entrepreneurship in millet cultivation, consumption, and exports. Moreover, we recommend millet promotion as part of Corporate Social Responsibility (CSR) projects to revive our traditional food crops for sustainability and food sovereignty. Finally, as envisioned by Narendra Modi Ji, creating a 'millet mindfulness' is essential to revive the tradition and improve agriculture and food diversity.

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