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The Status of Millet Cultivation in Punjab: A Review Paper

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ABSTRACT

This study reveals a stark reduction in millet cultivation post-Green Revolution, with an urgent need for policy and market interventions to revive millets. Despite India's leadership in global millet production, Punjab's share remains minimal, attributed to the predominance of wheat and rice due to lucrative government incentives. Empirical findings underscore the minuscule millet production in Punjab, primarily for fodder, with a marginal segment cultivating millets for human consumption, influenced by market demand, ecological awareness, and the advent of organic farming practices. Notably, the presence of millet processing units, albeit scarce, motivates some farmers towards millet cultivation, highlighting the importance of processing infrastructure in the value chain.

INTRODUCTION

The agricultural landscape of Punjab has undergone a transformative journey, marked by significant growth during Green Revolution. During this time, Punjab earned the status of “Indian Breadbasket of India," symbolizing its pivotal role in making the nation self-sufficient in food production (Ohno, Fujita & Vatta, 2021).

The agricultural landscape of Punjab, encompassing a total geographical area of 5033 thousand hectares, plays a pivotal role in the state's economy. Among this vast expanse, a crucial portion of 4119 thousand

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hectares is cultivable, showcasing the agricultural potential that has been harnessed over the years. (Agriculture Statistics of Punjab by Punjab government).

The government's strategic intervention during the Green Revolution played a pivotal role in shaping Punjab's agricultural landscape. Farmers were encouraged to focus on cultivating paddy and wheat, aligning with the national agenda of achieving self-sufficiency in food production. The establishment of critical infrastructure, such as the Bhakra Nangal Dam and the development of an extensive canal system, facilitated irrigation and played a crucial role in the success of this initiative. The provision of Minimum Support Prices (MSP) further incentivized farmers to invest in and expand their cultivation of paddy and wheat.

Despite comprising only 1.53% of India's total geographical area, of which a mere 2.7% is cultivable, Punjab has emerged as a powerhouse in food production. The state's contribution to rice production ranges from 32% to 49%, while its share in wheat production stands impressively between 51% and 75%, spanning the period from 1980-81 to 2008-09 (Dhiman et al., 2010). This disproportionate contribution is a testament to Punjab's agrarian prowess and the success of agricultural practices implemented during the Green Revolution.

The intensified focus on paddy and wheat cultivation, supported by government policies and infrastructure, led to a reduction in crop diversity. Punjab, which once cultivated 21 different crops, saw a significant reduction to just nine main crops during the Green Revolution. Approximately two-thirds of the agricultural land became dedicated to the cultivation of paddy and wheat, marking a shift from the traditional crop portfolio (Jodhka, 2021).

THE AVERAGE LAND HOLDING IN PUNJAB

The Agricultural Census of India for the year 2015-16 provides insightful data on the distribution of agricultural land and operational holdings in Punjab, offering a comprehensive overview of the state's agricultural landscape. In Punjab, the total agricultural area is segmented across various categories of farmers based on the size of their holdings.

According to the census, marginal farmers, constituting 2.36% of the total. Small farmers, accounting for 7.33%, have slightly larger holdings than marginal farmers. The category of semi-medium farmers represents 24.88% of the total, indicating a substantial increase in land size compared to the previous categories. Moving up the scale, medium farmers, comprising 43.75%, contribute significantly to the

agricultural sector with larger operational land holdings. Lastly, large farmers, representing 21.69%, have extensive land holdings, making them significant players in Punjab's agriculture.

Table: Landholding size of farmers in Punjab

Size of land holdings (%)	Marginal Farmers	Small Farmers	Semi Medium Farmers	Medium Farmers	Large Farmers
Punjab	2.36	7.33	24.88	43.75	21.69

(Source: Agricultural Census of India 2015-16; Government of India)

The detailed breakdown of operational land holdings further elucidates the agricultural scenario in Punjab. With 1093 operational land holdings, the state manages a total operational area of 3954 hectares. This data underscores the diversity within the farming community in Punjab, ranging from small-scale farmers with limited land to larger, more commercially oriented operations.

The distribution of operational land holdings across different farmer categories reflects the complexity of Punjab's agricultural structure. Small and marginal farmers, while numerically significant, may face distinct challenges due to the limited size of their holdings. Semi-medium and medium farmers, with larger land, play a substantial role in contributing to the overall agricultural output of the state. Large farmers, with their expansive land holdings, contribute significantly to the scale and productivity of Punjab's agriculture.

AGRICULTURE DYNAMICS

In Punjab, the majority of agricultural land, nearly 91% in the 2019-20 season, was dedicated to the cultivation of food grains, including both cereals and pulses, with wheat and rice being the predominant crops. This focus on wheat and rice cultivation is largely attributed to the stable income they provide, leading to an increase in their proportion of the total cropping area over time. Conversely, the cultivation of other crops such as pulses, maize, oilseeds, and various others has seen a decrease. Cotton was grown on just 3.2% of the total agricultural land, while sugarcane and fruits each occupied about 1% of the land, indicating a lesser emphasis on these crops within the region's agricultural pattern.

Punjab is the third largest rice producing state according to the agriculture Statistics 2022. The area under rice production is 2.97 million hectares which is 6.40% wrt whole India. The production is 12.89 million tonnes which is 9.89% to whole India and yield is 4340 per kg/hectare for the year 2021-22.

Table: Rice production in Punjab with production and yield.

	Area	%age to all India	Production	%age to all India	Yield
Punjab	2.97	6.40	12.89	9.89	4340

According to Agriculture Statistics 2022, Punjab ranked third in wheat production. The area under wheat production is 3.52 million hectares which is 11.57% wrt whole India. The production is 14.82 million tonnes which is 13.87% to whole India and yield is 4206 per kg/hectare for the year 2021-22.

Table: Wheat producing area in Punjab along with production and yield

	Area	%age to all India	Production	%age to all India	Yield
Punjab	3.52	11.57	14.82	13.87	4206

The above is the data of wheat production of Punjab for year 2021-22. While the data presented in Press Information Bureau presents that the overall rice production has increased in Rabi Marketing season from year 2022-23 to 2023-24. And Punjab is said to have taken top position in wheat production with 89.97 Lakh metric tonnes.

In report of Agriculture Situation in India (2021), focusing on Punjab's agricultural growth, it's noted that the primary drivers of this growth have been the expansion of the net sown area, increased irrigation, and heightened cropping intensity. However, by 2017-18, these factors had reached their peak levels, with 97% of Punjab's cultivated area being irrigated and both cropping intensity and net sown area remaining stagnant. This stagnation implies that for continued growth and yield maintenance, farmers are required to increase their input usage.

According to the Statistical Abstract of Punjab, there hasn't been a decrease in input consumption. Fertilizer use escalated from 38 kg/hectare in 1970-71 to 240 kg/hectare in 2016-17, and electricity consumption jumped from 0.82 kWh/hectare to 1470 kWh/hectare in the same period. Additionally, the number of tractors and tube wells has consistently risen since 1970-71.

Bhogal & Vatta (2021) described that Punjab's agriculture is heavily reliant on water-intensive paddy and wheat due to historical policies is now facing a critical water crisis. Despite the recognized need for crop diversification to enhance water and agricultural sustainability, its implementation has been limited by policy biases favouring traditional crops and lacking support for alternatives. Key obstacles to crop diversification include the existing policy environment, which favours paddy and wheat cultivation through minimum support prices (MSP), assured procurement, and subsidies. Alternative crops lack such governmental support, making them less attractive to farmers. Moreover, inadequate infrastructure for storage, particularly for perishable crops like fruits and vegetables, and weak market linkages for non-paddy and wheat crops deter diversification efforts.

To promote diversification, policies must include viable crop plans that ensure profitable alternatives to paddy and wheat, effective public procurement for diverse crops, subsidized inputs, easy credit availability, and robust crop insurance schemes. Additionally, strengthening agricultural marketing, developing supply and value chains, and investing in rural industrialization are critical. Successful crop diversification requires concerted efforts from the government to create a supportive environment. This includes providing farmers with incentives for adopting less water-intensive crops and more efficient agricultural practices. The transformation towards sustainable agriculture in Punjab hinges on the government's ability to offer socio-economic and political support, ensuring farmers' economic well-being and contributing to environmental sustainability.

MILLET PRODUCTION

Despite the rich agricultural tradition of Punjab, the production of certain millet crops has been notably low, particularly on a commercial scale. According to the Agricultural and Processed Food Products Export Development Authority (APEDA), the cultivation of Jowar, Ragi, and other small millets in the region is almost negligible from a commercial standpoint. This reflects a unique agricultural dynamic where the emphasis has historically been placed on major crops like wheat and rice.

A case in point is the millet crop Bajra, which stands out as a notable exception in Punjab's agricultural landscape. The estimated production of Bajra in the year 2020-21 is recorded at 0.26 tonnes, signaling a decline from 0.80 tonnes in 2013-14. This decrease in production raises questions about the dynamics influencing millet.

According to Punjab Agriculture University, 11 lakh hectares was under millet cultivation in the 1950s in Punjab, but with the advent of the Green Revolution (1965-66) the millet cultivation area started coming down with the state recording just 2.13 lakh hectares in 1969-70. At present, its area is almost negligible. Punjab – which is contributing around one-fourth of the total cereal grains to the national pool – is said to be lagging behind in millet production, although the state has tremendous potential for its cultivation. Stable economic returns, free power for irrigation and procurement by the central government at minimum support price are some of the reasons why Punjab's farmers are continuing to cultivate paddy, despite its impact on the groundwater levels in the state. Despite years of discussions to phase out paddy in Punjab, owing to its impact on groundwater, latest data shows that the paddy crop area still dominates agriculture in the state. For crop diversification millets holds the promise. Millets are better than major cereals in terms of water use efficiency, nutrient use efficiency, climate resilience, tolerance to biotic/abiotic stresses, and are nutritionally dense.

Table: **Crop wise percentage in Punjab**

Crops	**1960-61**	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2018-19**	**2019-20**
Bajra	2.69%	3.7%	1%	0.2%	0.1%	0.1%	0.03%

(Source: Directorate of Agriculture and Farmers' Welfare, Punjab)

Table: Crop Production Statistic Punjab (Bajra)

State/Crop/ District	**Year**	**Season**	**Area (Hectare)**	**Production (Tonnes)**	**Yield (Tonnes/ Hectare)**
Punjab					
Bajra					
1.BATHINDA	2018-19	Kharif	100	100	1.00
2.FAZILKA	2018-19	Kharif	100	100	1.00
3.MANSA	2018-19	Kharif	400	200	0.50
	2019-20	Kharif	300	200	0.67
4.MOGA	2019-20	Kharif	200	100	0.50

5.RUPNAGAR	2018-19	Kharif	400	200	0.50
6.SANGRUR	2018-19	Kharif	100	100	1.00
Total - Bajra		1600.00	1000		0.63

(Source: DACNet)

Singla, Jain & Aggarwal (2022) reported that there are potential benefits of incorporating underutilized grains into the diets of rural Punjabi women. These grains, possibly including various types of millets or other lesser-known cereals, could enhance nutritional intake and improve health outcomes in this population. They can improve the diabetic situation of the people of India as they have nutritional aspect related to it and have low glycemic index. They can also be preferred for crop diversification as it will promote sustainable agriculture. The study explored how millet grains can be integrated into local cuisines and dietary practices such as chappati, dalia, and their impact on the nutritional status and overall health of women in rural Punjab was assessed. It was found that millet eating improves blood glucose in diabetic and pre-diabetic patients.

The disparity in millet production between traditional crops like wheat and rice, and the relatively minor cultivation of millets, underscores the need for a diversified and sustainable agricultural strategy. While major crops contribute significantly to Punjab's agricultural success, exploring opportunities to promote the cultivation of nutritious and climate-resilient millets could provide a more balanced and resilient agricultural ecosystem.

Although this is a challenge that is the government is dealing with as despite the increase in the Minimum Support Price (MSP) for major millets, the earnings from wheat and rice cultivation remain higher compared to millets like jowar, bajra, and ragi. This disparity persists even though the cost of cultivating rice exceeds that of millets. Enhancing millet prices for farmers could involve improving post-production linkages, promoting Farmer Producers' Organizations (FPOs), and strengthening millet processing value chains. Including millets in the Public Distribution System (PDS) could benefit both consumers and growers, leading to diversified cropping patterns and better millet prices. (NABARD, 2023)

Various strategies have been adopted for promotion of millets in the diets across various states and union territories of India including Chandigarh. The Government of Chandigarh has launched an initiative to incorporate millets (Bajra and Jowar), into the Take Home Ration for beneficiaries at 450

Anganwadi Centers under the Integrated Child Development Scheme. This effort, aimed at improving the health of Anganwadi children, pregnant and lactating women, and adolescent girls, responds to the high rates of anaemia in Chandigarh compared to the national average. The initiative includes training Anganwadi workers about the benefits of millets, distributing millets through NGOs, and conducting awareness programs about their importance in daily diets (NITI Aayog , 2023)

Thakur et al. (2008), conducted a study in Talwandi Sabo and Chamkaur Sahib of Punjab that revealed a higher prevalence of cancer in Talwandi Sabo. The study linked this to farming practices, specifically the higher use of pesticides. Additionally, water samples in Talwandi Sabo showed elevated levels of heavy metals and pesticides like arsenic, cadmium, chromium, selenium, and mercury. Pesticide residues such as heptachlor, ethion, and chloropyrifos were also found in higher concentrations in drinking water, vegetables.

SOCIO CULTURAL HISTORY OF PUNJAB

In various regions of India, including Punjab, folk songs have historically encapsulated the essence of rural life and agricultural practices. These songs often include references to millets like bajra (pearl millet), ragi (finger millet), and others.

Guru Nanak Dev Ji advocated for a simple, honest, and humble life. Guru Nanak Dev Ji's approach to spirituality was deeply connected with everyday life. He encouraged people to find spiritual connection and purpose in their daily activities, including those related to agriculture and food. His teachings fostered a sense of gratitude and respect for all forms of life and nature's gifts, which would naturally include the cultivation and consumption of staple foods like millets.

There is also mention of the millets in the folklore of Punjab referring it as a daily household item to depict the situation of a person. Moreover, specific rituals and festivals in Punjab and other parts of India involve the use of millets. For example, during certain harvest festivals, dishes made from millets like bajra and ragi are prepared and play a significant role in the celebrations. These rituals and the associated foods highlight the importance of millets in traditional Indian culture and cuisine.

Lohri, a festival celebrated to mark the end of winter and the onset of longer days, is accompanied by joyful gatherings around bonfires. Bajra rotis, made from pearl millet, are a cherished part of Lohri feasts. These rotis, often served with sarson da saag (mustard greens curry) and gur (jaggery), symbolize abundance, warmth, and the harvest season's bounty.

Similarly, during Baisakhi, which marks the Punjabi New Year and the harvesting of the Rabi crop, millets like jowar find their way into celebratory meals. Jowar di roti, unleavened bread made from sorghum millet flour, is a staple during Baisakhi festivities. It is traditionally served with sarson da saag, made from mustard greens, along with other delicacies like lassi (buttermilk) and mithai (sweets).

The preparation and consumption of millet-based dishes during Lohri and Baisakhi reflect Punjab's agricultural traditions, reverence for nature's bounty, and the importance of communal feasting in fostering unity and joy. These festivals not only celebrate the seasons' rhythms and agricultural cycles but also serve as occasions for families and communities to come together, share traditional foods, and rejoice in each other's company.

But the dynamics has changed presently. Currently, there is any house that prefers to include millets in their diet and research has found that in Punjab wheat and maize are the staple foods of the population rather than millets, which are overlooked for the previous thirty years (Singla, Jain & Aggarwal, 2022).

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