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Status and prospects of economics and marketing of millets: A review

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Abstract

India is currently experiencing significant economic growth, in which agriculture sector playing a crucial role. The water scarcity and other resource-intensive practices, raises sustainability concerns. Millets are important in the global food and nutritional sector. They are staple food crop especially for small and marginal farmers. Millets can adapt to a variety of soil types and possess unique characteristics, including ability to thrive in dryland, short life cycle, which permits them to be used in intensive cropping systems. Existing constraints in millet production and marketing systems hampers yields.

This study assesses the current status of area, production and marketing of millets in India through assessing the existing research study. It highlights a continuous decrease in the cultivation area of millets and a lack of adequate marketing channels, ultimately impacting millet production. Marketing of millets can be difficult because of middlemen who often take advantage of small and poor farmers. This leads to hampering the proper prices for producers and fetching higher prices from customer, reducing the overall demand for these nutritious grains. India is the largest producer of millets globally, contributing nearly 41 per cent of the global share. The cultivation of millets plays a pivotal role in various states across India, with Rajasthan, Maharashtra and Karnataka being the major contributors to millet production. Among them, pearl millet is the most widely grown crop, followed by sorghum, ragi and other small millets grown in various regions.

The study revealed that millet farming is profitable for farmers, with a cost-benefit ratio of more than 1. India there is a need for significant infrastructure development, awareness programs, value-added training and incentives for large-scale millet processing to supports millets. These recommendations require collaboration among relevant authorities to boost the growth of millet industry.

Keywords: Millets, production economics, marketing channels, farm profitability, value chain, nutritional security

Introduction

The Indian economy heavily depends on agriculture, covering an extensive geographical area of 328.2 million hectares. Approximately, 70 per cent of rural households depend on agriculture for their livelihoods and among them 82 per cent of Indian farmers categorized as small and marginal (www.fao.org). However, agriculture sector faces several challenges like water stress, low soil fertility and limited access to modern technology. Millets have great potential to cope up with this challenges which require minimal resources.

Millets, collectively known as small-grained cereal grasses, belong to the Poaceae family. They are among the earliest cultivated foods in human history (Tomar and Singh, 2017) ^[1]. Millets are essential food staples, especially in the poor, semi-arid regions of Asia and Africa. They are grown under a wide range of agro-ecological conditions, including plains, coastal areas, hilly terrain and various soil types with varying levels of rainfall.

A concerning trend of decline in area and production of millets in India is being witnessed with increasing in area of major cereal crops like wheat and rice since post green

revolution years (Das *et al.*, 2019) ^[2]. Nowadays, millets are gaining popularity among healthconscious consumer along with increase in organic sustainable food market. There is an immense potential to process millet grains into various value-added foods. In this review paper, our aim is to assess the return potential of millets and examine the production and marketing constraints.

Millets are well known due to their nutritive value and high level of protein, fibre and minerals in comparison to rice and wheat (Anbukkani *et al.*, 2017) ^[3]. They offer a highly nutritious dietary option with a low glycemic index, making them suitable for diabetics (Table 1). Millets often referred “smart food of the 21st century” or a “miracle crop” which are rich in essential components like proteins, carbohydrates, dietary fibre, vitamins, minerals, antioxidants and phytochemicals (Bhattacharjee *et al.*, 2007) ^[4]. Millets not only limited to human consumption, but they serve as essential feed for livestock, fodder crops and is used in various industries such as bio-fuel and brewing. Their cultivation supports organic farming practices and their environmentally friendly nature promotes sustainable agriculture.

Table 1: Nutritional comparison of millets with wheat and rice (per 100g)

Particular	Protein (g)	Fat (g)	Minerals (g)	Fibre (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)
Foxtail	12.3	4.3	4	6.7	31	290	2.8
Little	7.7	4.7	1.7	7.6	17	220	9.3
Kodo	8.3	1.4	2.6	5.2	35	188	1.7
Proso	12.5	1.1	1.9	5.2	8	206	2.9
Barnyard	6.2	4.8	3.7	13.6	22	280	18.6
Sorghum	10.4	3.1	1.2	2	25	222	5.4
Pearl	11.8	4.8	2.2	2.3	42	240	11
Finger	7.3	1.3	2.7	3.6	344	283	3.9
Rice	6.8	0.5	0.6	1	33	160	1.8
Wheat	11.8	1.5	1.5	2	30	306	3.5
Quinoa	14	6	*	7	36	457	4.6

Source: <https://millets.wordpress.com>

The Government of India proposed to the United Nations for celebration of 2023 as the International Year of Millets (IYOM) with the support of 72 countries. The United Nations General Assembly (UNGA) declared IYOM on 5th March, 2021. This initiative aims to actively engage individuals in millet cultivation and consumption by educating them about the benefits of millets. Dr. Nirmala Sitharaman's called millets as "Shreeanna" during the release of the 2023 budget highlighting the significance of millets. This initiative traces back to 2018 when India declared it the National Year of Millets, aiming to aid small farmers, combat malnutrition, and make India a global millet hub.

In the scenario of millets, India is the largest producer of millets in the world, contributes nearly 41 per cent of the global share (www.fao.org). In the year 2022-23, India recorded a total millets production of 17.32 mt and millets productivity was 4.94 t/ha (commodities.cmie.com).

During 2022-23, pearl millet emerged as the dominant millet crop in India, with a production of 11.46 million tonnes, followed by sorghum, finger millet and other millets with 3.81, 1.69 and 0.38 mt, respectively (commodities.cmie.com).

Table depicts the export statistics of millets from fiscal year

2013-14 to 2022-23. Data revealed a total quantity of 169,049.21 tonnes worth 608.11 crore. However, the major destinations of Indian millets include the United Arab Emirates, Saudi Arabia, Nepal, USA, and Japan.

Table 2: Export statistics of millets in India

Sr. No.	Year	Quantity (tonnes)	Value (crores)
1.	2013-14	216,418.78	448.21
2.	2014-15	257,386.98	540.53
3.	2015-16	188,985.05	418.83
4.	2016-17	166,942.30	390.89
5.	2017-18	156,274.02	370.07
6.	2018-19	219,402.50	542.50
7.	2019-20	129,012.88	425.69
8.	2020-21	146,993.61	435.80
9.	2021-22	158,509.98	469.36
10.	2022-23	169,049.21	608.11

Source: DGCIS

Table shows that the Compound Annual Growth Rate (CAGR) of the area of bajra as well as sorghum found negative, with values of -1.63 per cent, -4.27 per cent, respectively.

Table 3: CAGR of area, production and yield for bajra and sorghum

Year	Bajra			Sorghum		
	Area	Production	yield	Area	Production	yield
2001-02	9529.10	8284.00	869.30	9795.20	7556.80	771.50
2002-03	7739.80	4718.90	609.70	9299.80	7012.40	754.00
2003-04	10612.30	12109.30	1141.10	9330.70	6681.30	716.10
2004-05	9232.90	7931.30	859.00	9092.30	7244.30	796.80
2005-06	9581.20	7684.00	802.00	8667.30	7629.60	880.30
2006-07	9507.90	8423.70	886.00	8472.50	7150.80	844.00
2007-08	9571.30	9970.10	1041.70	7764.00	7925.90	1020.90
2008-09	8752.50	8887.10	1015.40	7530.90	7245.60	962.10
2009-10	8904.20	6506.40	730.70	7787.20	6698.20	860.20
2010-11	9612.30	10369.90	1078.80	7381.70	6967.10	943.80
2011-12	8776.70	10276.00	1170.80	6245.10	5979.20	957.40
2012-13	7297.40	8742.00	1198.00	6214.40	5281.50	849.90
2013-14	7810.70	9250.10	1184.30	5793.40	5541.80	956.60
2014-15	7318.00	9184.20	1255.00	6161.40	5445.30	883.80
2015-16	7128.60	8066.60	1131.60	6077.00	4238.00	697.40
2016-17	7458.50	9729.90	1304.50	5624.40	4567.90	812.20
2017-18	7480.60	9208.80	1231.00	5024.50	4803.40	956.00
2018-19	7105.00	8664.10	1219.40	4093.30	3475.40	849.10
2019-20	7542.70	10362.60	1373.90	4823.80	4772.10	989.30
2020-21	7652.10	10863.20	1419.60	4377.90	4812.10	1099.20
CAGR	-1.63	1.37	3.05	-4.27	-3.36	0.95

where, area in '000 ha, production in '000 tonnes and yield in kg/ha

Source: data from www.comodities.cmie.com result based on author's calculation

On the other hand, the production of bajra has grown with CAGR of 1.37 per cent and the yield at 3.05 per cent. While, sorghum showed a negative growth rate of -3.36 tih slightly positive yield of 0.95.

Table 4 illustrates that the CAGR of both the area and production of ragi and small millets was negative, indicating declining trends. However, ragi other small millets yield shows an increase at 1.47 and 3.76 per cent, respectively.

Table 4: CAGR of area, production and yield for bajra and sorghum

Year	Ragi			Small millets		
	Area	Production	Yield	Area	Production	Yield
2001-02	1,646.70	2,374.60	1,442.00	1,310.50	576.7	440.1
2002-03	1,415.00	1,315.70	930	1,200.60	459.3	382.6
2003-04	1,666.40	1,965.70	1,179.60	1,191.40	563.8	473.2
2004-05	1,552.70	2,432.40	1,566.60	1,100.60	477.6	434
2005-06	1,533.90	2,353.60	1,534.40	1,064.30	471.6	443.1
2006-07	1,177.40	1,443.60	1,226.10	1,010.20	479.6	474.8
2007-08	1,387.10	2,152.20	1,551.60	1,039.20	550.7	529.9
2008-09	1,381.40	2,039.90	1,476.70	905.2	444.8	491.4
2009-10	1,268.00	1,888.50	1,489.30	830.5	381.9	459.9
2010-11	1,286.20	2,193.50	1,705.40	799.9	442	552.5
2011-12	1,175.80	1,929.20	1,640.80	798.8	451.5	565.3
2012-13	1,131.00	1,574.40	1,392.00	754.1	435.7	577.7
2013-14	1,193.60	1,982.90	1,661.30	682.3	429.9	630.1
2014-15	1,208.10	2,060.90	1,706.00	589.6	385.9	654.5
2015-16	1,138.20	1,821.90	1,600.60	649.9	390.9	601.5
2016-17	1,016.10	1,385.10	1,363.10	619.1	441.9	713.8
2017-18	1,194.30	1,985.20	1,662.30	546.3	439	803.6
2018-19	890.9	1,238.70	1,390.30	453.8	333	733.9
2019-20	1,004.50	1,755.10	1,747.30	458.4	370.8	809
2020-21	1,159.40	1,998.40	1,723.60	444	346.9	781.3
CAGR	-2.40	-0.96	1.47	-5.56	-2.02	3.76

where, area in '000 ha, production in '000 tonnes and yield in kg/ha

Source: data from www.comodities.cmie.com result based on author's calculation

Review of literature

The literature review in this paper discusses previously conducted research and their findings related to the production status and marketing efficiency of millets in India.

Millets production and productivity in India

Anbukkani *et al.* (2017) ^[3] revealed that Madhya Pradesh has the highest area under small millets, while Uttarakhand has the highest productivity of small millets per hectare. Overall CAGR of area, production and productivity was -5.13, -2.21 and 3.08 per cent in India, respectively.

Das *et al.* (2019) ^[2] revealed that during 2000-01 to 2016-17, area under cultivation of pearl millet was reduced by -1.78 per cent. However, during the same period, both production

and productivity of the pearl millet got increased by 1.65 and 3.37 per cent in India, respectively. In case of finger millet cultivated area and production showed a declining trend, while, productivity increased by 1.32 per cent.

Vennila and Murthy (2021) ^[5] concluded that area under cultivation and production of finger millet decreased by -2.83 and -3.09 per cent which was found significant at 1 per cent and per cent level, respectively, while its productivity declined by -0.28 per cent in India.

Gowri and Shivakumar (2022) ^[6] reported that cultivation and production of millets in India experienced a significant decline over the years, while productivity enhanced by 3.23 per cent (Figure 1).

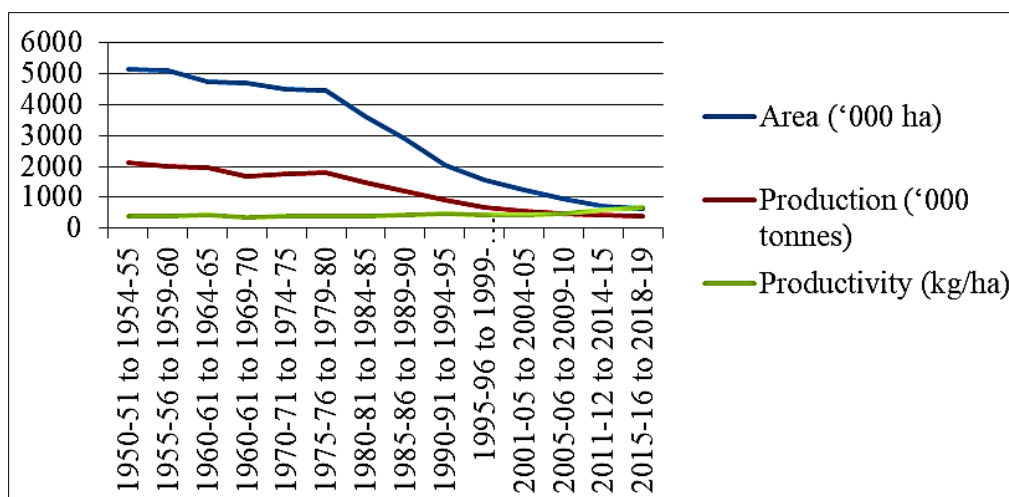


Fig 1: Trends in area, production, and productivity of millets in India (1950-2019)

Sreekala *et al.* (2023) ^[7] concluded that the area of land dedicated to growing millets declined from 1970 to 2018, while productivity of all crops under study increased significantly during the same period.

This trend highlights the hidden potential within millets and suggested need for their revival in cultivation. This revival can be achieved by involving research and development efforts to enhance millet varieties and processing technologies. Moreover, government support, including policy interventions and incentives for cultivators, plays a significant role in promoting millet cultivation. An intensive effort should be made from both the supply and demand side to promote nutritional benefits of millets and enhance the consumption. Such promotion not only promotes sustainable

agriculture but also strengthens food security while offering a cost-effective choice for consumers.

Cost and return analysis

Pearl millet: Chaudhari *et al.* (2015) ^[8] conducted a study on the cost of cultivating summer bajra in Gujarat. Figure 2 highlights the highest costs were associated with working capital, followed by irrigation and human labour in the cultivation of summer bajra. Furthermore, growing bajra in bigger farms had lower costs than smaller ones due to efficient management of resources. Overall, the average income for all farmers was about 15,728 per hectare. Small farmers earn highest profit over cost A, with an income of 25,033 per hectare in the year ₹ 2013-14.

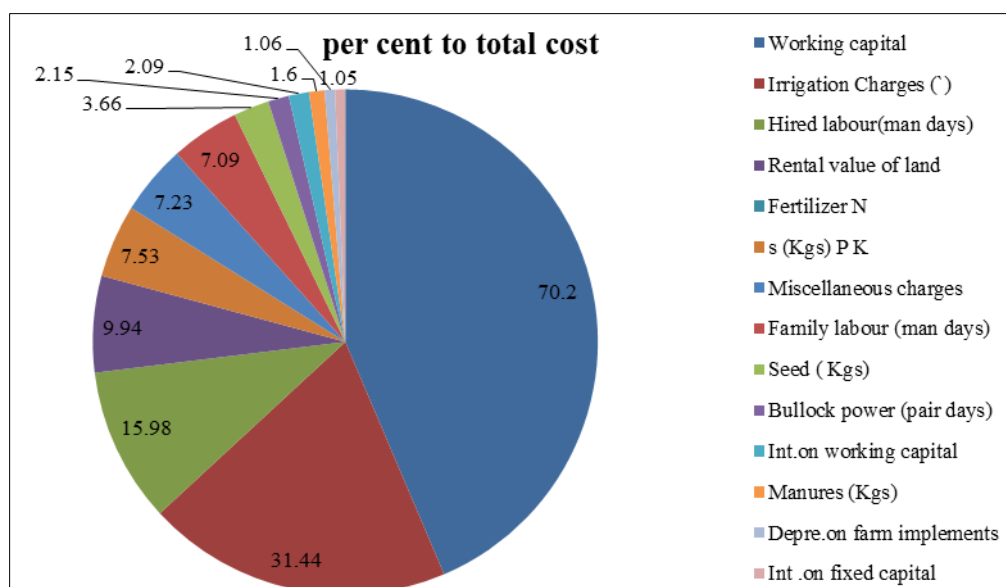


Fig 2: Cost distributions for summer bajra crop in Banaskantha, Gujarat (2013-14)

Lal *et al.* (2020) ^[9] examined the cost of cultivation of pearl millet in Rajasthan during the 2019-20. Their results revealed that the cost of cultivation was highest for small farmers (₹27,020.70/ha), followed by medium-sized farmers (₹26,672.20/ha) and large farmers (₹25,390.50/ha), respectively (Figure 3). Moreover, larger farms had higher

net returns (₹12609.50/ha) compared to medium (₹11327.80/ha) and small farm (₹8979.30/ha). The difference of net return observed as farm size-wise with highest input-output ratio per hectare was observed in large-sized farms (1:1.50), followed by medium (1:1.42) and small-sized farms (1:1.33).

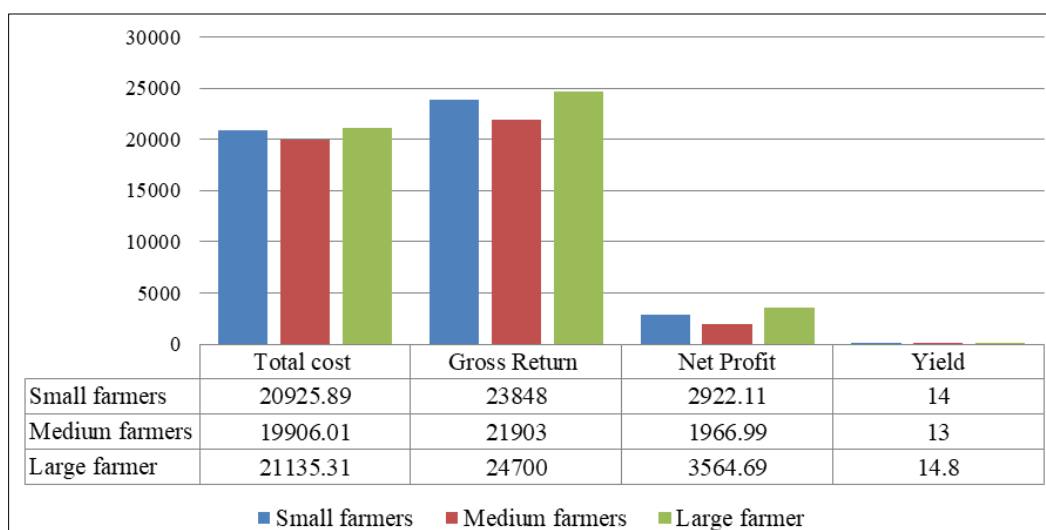


Fig 3: Cost and returns of pearl millet (2019-20)

Sorghum

Basavaraja *et al.* (2005) ^[10] conducted an economic analysis of Kharif sorghum cultivation in Karnataka. The results of their study revealed that sorghum cultivation was profitable, with a cost-benefit ratio higher than 1 with medium sized farmers have the highest benefit-cost ratio, followed by small and large, respectively. These findings highlight the potential for sorghum cultivation to generate profits for farmers of

various sizes, with variations influenced by local conditions and farming practices.

Hile *et al.* (2013) ^[11] conducted a study on the economics of rabi sorghum production and marketing in Maharashtra and found that medium-sized farmers achieved the highest net return with a cost-benefit ratio of 1.25, followed by small and large farmers, respectively (Table 5).

Table 5: Costs, Yields, and Returns for Millet Cultivation by Farm Size

Sr. No	Particular	Small	Medium	Large	Overall
1	Cost A	11862.14	10808.15	12922.72	12058.17
2	Cost B	17972.61	16705.57	19062.61	18111.92
3	Cost C	22222.61	20485.57	22992.61	22036.33
4	Yield (qtl)	7.18	6.90	7.15	7.07
5	Gross return	27004.00	25695.00	25729.00	25897.29
6	Net return	4781.39	5209.43	2736.39	3860.96
7	B:C (Benefit-Cost) ratio	1.22	1.25	1.12	1.18

Source: Hile *et al.* (2013)

Prabakar and Peter (2020) ^[12] conducted study on analysis of sorghum cultivation in Tamil Nadu and found that the total cost of cultivation was 18,877.46/ha and yield 650 kg₹ per

hectare. The gross return was 26,000 with the cost-benefit ratio of 1.37 (Table 6).₹

Table 6: Costs, yields, and returns for millet cultivation

Sr. No	Particular	Cost
1	Cost A	9958.1
2	Cost B	18277.46
3	Cost C	18877.46
4	Yield (kg)	650
5	Gross return	26000
6	Net return	7122.54
7	B:C ratio	1.37

Source: Prabakar and Peter (2020) ^[12]

Finger millets

Pant and Srivastava (2014) ^[13] conducted a study on the economics of finger millet cultivation in the hills of the Kumaon region of Uttarakhand. The results revealed that finger millet was primarily cultivated as a subsistence crop in both hill altitudes. The cost of cultivation for finger millet was found to be 13,164.58/ha (Cost C₃) on an overall basis.

In the mid hills, the cost-benefit ratio was 0.50 while in the high hills, it was 0.56, respectively. Crop was grown in these areas due to its adaptability to the harsh climate.

Tandel *et al.* (2018) ^[14] examined the cost of cultivation and profitability of finger millet in the south Gujarat region and reported that benefit-cost ratio was more than 1 for all the cost suggesting profitability in the finger millet cultivation.

Table 7: Cost of cultivation of finger millet per hectare

Sr. No.	Particular	Various Cost	Returns/ha over costs (₹)	B:C Ratio
1	Cost A	9334.67	14417.48	1:2.54
2	Cost B ₁	9370.09	14382.06	1:2.53
3	Cost B ₂	13170.44	10581.71	1:1.80
4	Cost C ₁	17770.09	5982.06	1:1.33
5	Cost C ₂	21570.44	2181.71	1:1.10
6	Cost C ₃	23727.48	24.67	1:1.001

Source: Tandel *et al.* (2018)

Kaushal and Choudhary (2020) ^[15] investigated costs and returns associated with finger millet cultivation in Bastar district, Chhattisgarh. Their findings revealed that the total cost of cultivating finger millet per hectare was 33,336.02, comprising operational costs of ₹ ₹18,095.52 and fixed costs of 15,240.50. The average yield for the main product of finger millet was 14.4 qtl/ha, with the total cost of production estimated at 2,508.35/ha. Moreover, ₹ average total income amounts to 38,880/ha, resulting in a net return of

9,863.98/ha,₹ ₹ demonstrating the profitability of finger millet cultivation.

Minor millets

Verma and Banafar (2013) ^[16] examine the performance of minor millets in Bastar district of Chhattisgarh. And found that ragi has the highest net income of ₹7,508.89 followed by kodo and kutki generated a net income of 959.63 and ₹771.26, respectively. Hence, ragi was found to be the most

remunerative crop in the Chhattisgarh region.

Table 8: Economics of selected minor millets on the sample farms of Chhattisgarh

Sr. No.	Particulars	Minor Millets		
		Kodo	Kutki	Ragi
1	Input cost (₹/ha)	2866.75	2751.01	3342.10
2	Output value (₹/ha)	3826.38	3522.27	10851.00
3	Net income (₹/ha)	959.63	771.26	7508.89
4	Family labour income (₹/ha)	2269.09	984.66	7886.68
5	Farm business income (₹/ha)	2289.10	1804.77	8757.10
6	Input-output ratio	1:1.33	1:1.28	1:3.25

Source: Verma and Banafar (2013)

Tandel *et al.* (2018) ^[14] concluded cost return for Kodo, Kutki, and Ragi, the average cultivation cost per hectare was ₹2,866.75, ₹2,751.01, and ₹3,342.10, respectively, with input-output ratios of 1:1.33, 1:1.28 and 1:3.25, respectively.

Marketing of Millets

Marketing of millets is a crucial aspect of the agricultural landscape, serving as the link between producers and consumers. It encompasses the various processes involved in the movement and exchange of millet products from the farmers to the end consumers who utilize them. This process includes activities such as transportation, storage, packaging and selling of millets, ensuring that they reach the intended markets efficiently. Effective marketing strategies and channels play a significant role in ensuring that millet producers can access broader consumer bases, thereby contributing to the overall growth and sustainability of the millet industry.

Emerging trends of millets marketing

In the world of health-consciousness, people are becoming increasingly aware of the importance of their healthy diet and lifestyle choices. The prevalence of pesticides and residues in conventional food has led consumers to seek healthier, organic and toxin-free alternatives. Millets have emerged as a popular choice among those looking for nutritious and sustainable dietary options.

The market now offers a wide variety of ready-to-eat and ready-to-cook millet-based foods, which have gained popularity among urban consumers. These products include delicious pizzas, savoury noodles, wholesome chips and many more, which harness the nutritional goodness of millets, providing a tasty yet health-conscious alternative. For individuals with gluten sensitivity or celiac disease, millets serve as crucial gluten-free and allergen-free alternatives. Millets have been important in our culture for a long time. They are often used in fasting and in special ceremonies. Now, they are also becoming popular in our everyday meals.

Marketing Channels

In the market, efficient channels are essential for the

distribution of any commodity to reach the consumer. The path that a commodity follows from the producer to the consumer is known as the marketing channel. Marketing channels vary depending on the commodity, location or specific business. Typically, commodities follow two channels: ^[17] direct marketing channels and ^[3] indirect marketing channels.

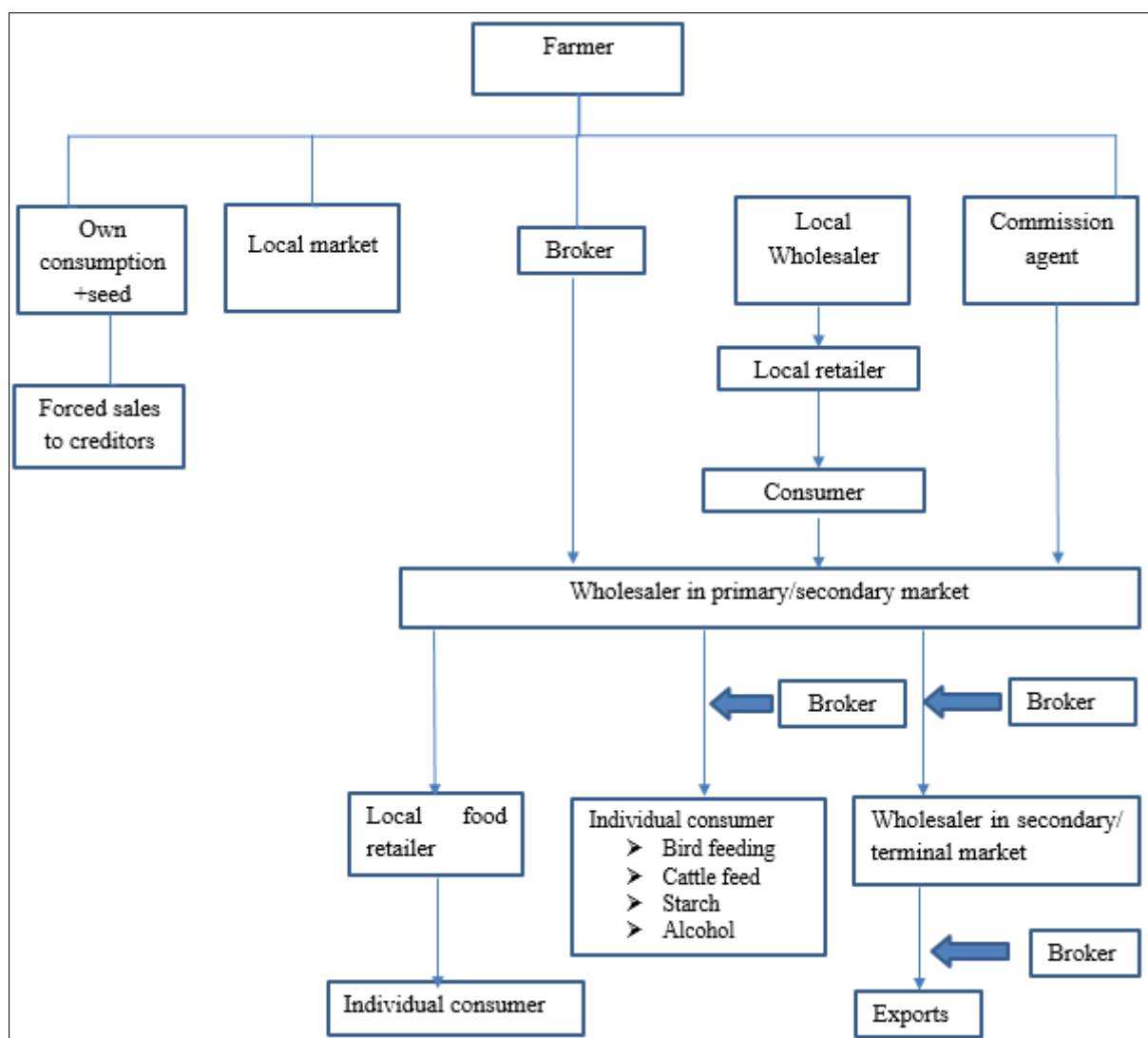
A direct marketing channel is one that connects the producer directly to the consumer without the involvement of intermediaries or middlemen. In contrast, an indirect marketing channel relies on intermediaries or middlemen to exchange of commodities from producers to consumers while a direct channel may be perceived as the most efficient option, implementing it can pose challenges. It is important to note that intermediaries and middlemen play a vital role in ensuring the smooth and efficient distribution of commodities.

For cereals, the marketing channel components typically include producers, village traders, wholesalers, cooperative marketing societies, government agencies, flour millers, retailers and consumers. (Acharya and Agarwal, 2013) ^[17]. For the pearl millet marketing different marketing channels is depicted in Figure 4.

Reviews

Deshmukh *et al.* (2010) ^[18] conducted a study on the marketed surplus and price spread in various channels of pearl millet marketing during 2008-09. The results indicated that the quantity of produce marketed through channel I (producer-consumer) was 15.74 per cent, followed by channel II, which involves producer-primary wholesaler-retailer-consumer (19.29 per cent). Channel III, consisting of producer-primary wholesaler-secondary wholesaler-retailer-consumer, had the highest share at 30.02 per cent. It was observed that the cost of marketing is higher in channel III, followed by channel II and channel I, respectively.

Verma and Banfar (2013) ^[16] concluded that in channel-I (P-C), the producer received 100 per cent of the consumer price, while in channel-II (P-R-C) net price received by the producer was 74.90 per cent of the consumer price. Additionally, the retailer obtained a net margin of 18.98 per cent of the consumer purchase price.



Source: Reddy (2013)

Fig 4: Various marketing channels of pearl millet farmer

Makadia *et al.* (2014) ^[20] conducted an experiment on the marketing of minor millets grown in the tribal Dang district of south Gujarat. The results indicated that the total price paid for vari, finger millet, and kodra was 390.10, 337.00, and 200.00 per quintal, ₹ ₹ ₹ respectively. The proportion of price spread was highest in kodra (31.15 per cent), followed by finger millet (28.09 per cent) and vari (16.67 per cent). The margin of intermediaries varied from 13 per cent to 24 per cent.

Reddy *et al.* (2018) ^[21] conducted a comprehensive study on millets marketing channels. The research covered regions including Haryana, Rajasthan and Gujarat, with data collection involving various stakeholders such as farmers, traders, commission agents, exporters and importers. The most important marketing channels identified in the study area are given below:

- Farmer-commission agent of APMC market-wholesalers-retailer-consumer;
- Farmer-village trader-wholesaler-feed processor-retailer-cattle/poultry farmer;
- Farmer-village merchant-commission agent-wholesaler-retailer-consumer;
- Farmer-wholesaler-retailer-consumer;

- Farmer-retailer-consumer;
- Farmers-aggregator-consumer; and
- farmer-consumer

Channel I, VI and VII were selected for detailed study. The research findings indicated an interesting contradiction. Channel VII (producer-consumer), is the most efficient in terms of distribution. However, despite its efficiency, the consumer prices in this channel are the lowest. One possible reason for this could be the quality of seeds being sold through this channel, which the research suggests was of inferior quality compared to the other two channels.

Singh *et al.* (2018) ^[22] concluded that in channel-I (P-VT-W-R-C) and channel-II (P-W-R-C), the marketing efficiency of the Bhiwani market was greater than that of the Mohindergarh market. However, in channel III (P-C), the efficiency of the Mohindergarh market was greater than that of the Bhiwani market. Notably, channel-III exhibited exceptionally high marketing efficiency as it was the smallest channel with no intermediaries involved.

Choudhary and Ramchandra (2019) ^[23] conducted study on economic analysis of pearl millet marketing in Rajasthan. They found that the price spread in channel I

(producer-wholesaler-retailer-consumer) was ₹545/qlt, while in channel II (producer-contractor-wholesaler-retailer-consumer), it was ₹700/qlt. The producer's share in the consumer's rupee for channel I and channel II was 74.65 and 69.57 per cent, respectively. The marketing efficiency for channel I and channel II, was 3.94 and 3.50 per cent, respectively.

Mounika and Maurya (2020) ^[24] studied analyzing marketing

channels, marketing cost, marketing margin and price spread in each channel of sorghum district of Andhra Pradesh. The study identified three distinct marketing channels. The results shown in Table 8 that the most efficient channel was channel I (producer-consumer), with the highest marketing efficiency, followed by channel II (producer -village merchant/retailer-consumer) and channel III (producer-commission agent-wholesaler-consumer).

Table 9: Comparison of marketing efficiency among sorghum grower

Sr. No.	Particulars	Channel I	Channel II	Channel III
1	Total marketing cost	63.5	123.5	121.5
2	Total marketing margin	550	1050	1550
3	Price spared	550	1110	1218
4	Producer's share in consumer's rupee (%)	80.21	67.94	65.99
5	Marketing efficiency	4.52	2.24	2.04

Source: Mounika and Maurya (2020) ^[24]

Export plays a pivotal role in harnessing the growing market potential of millets. It not only broadens the consumer base but also exposes millet-based products to international markets, driving demand and growth. By expanding the global reach of millets, it enhances the economic viability of millet cultivation and opens up new opportunities for farmers and agribusinesses. This raises millets on a broader scale and contributes to the overall diversification of agricultural markets.

Meena *et al.* (2021) ^[25] conducted a comprehensive study on the global cultivation of millets. Import and export of millets experienced gradual growth from the 1960s to 2017, increasing by 25.4 per cent and 25.9 per cent, respectively. Notably, a significant surge in imports was observed during the 1970s, largely attributed to increased millet imports in Europe. The global import and export values of millets also exhibited an upward trend, with the highest values recorded during the period of 2011 to 2017, amounting to 155.26 million US dollars and 127.60 million US dollars, respectively.

Kumar *et al.* (2023) ^[26] examined export performance and direction of trade of millets of India. They concluded that CAGR of volume of export of millets from India reduced by overall -1.24 per cent during the year 2004-to 2021-22, reflecting reduced exports from India.

Singh *et al.* (2023) ^[27] investigated Indian millet exports performance. Their findings emphasized the global significance of millet exports from 2000 to 2020. Notably, during the period of 2011 to 2020, India's key exporting partners included neighbouring countries such as Pakistan, Vietnam, Nepal and Saudi Arabia, accounting for over 50 per cent of millet exports of India. The research also assessed comparative advantage in millet trade of India using Revealed Comparative Advantage (RCA) analysis. The results indicated that Pakistan, Saudi Arabia, Vietnam, and Yemen were major importing countries with RCA values exceeding one, suggesting significant advantage in exporting millets from India to these nations during the study period from 2011 to 2020.

Challenges in Millets Marketing

1. Inefficient marketing channels: Millet marketing faces challenges such as monopolistic practices and political control of mandis, which limit the availability of

efficient marketing channels. This lack of diversity can hinder fair competition and equitable access to markets. Additionally, the auction process often lacks transparency, making it difficult for buyers and sellers to engage in transactions with confidence.

- 2. Intermediaries impact:** The presence of numerous intermediaries in the millet marketing chain can decrease overall marketing efficiency. Each intermediary adds cost and complexity to the process, potentially reducing the returns for both farmers and consumers. Improving the efficiency requires better organization of the distribution network.
- 3. Consumer demand dynamics:** Adapting to changing consumer preferences and demands for millet products can be a challenge. It is essential to stay updated with consumer needs, tastes and dietary trends related to millets.
- 4. Perishable nature:** Millet grains are often perishable, which means they have a limited shelf life. This adds urgency to the marketing process, requiring efficient handling, storage and transportation systems to prevent spoilage and ensure product quality.
- 5. Infrastructure and processing technology:** The lack of adequate infrastructure and processing technology in millet marketing poses a significant hurdle. Without modern facilities and equipment, processing millet into value-added products becomes challenging. Investment in these areas is necessary to improve overall efficiency and product diversification.

Improving Millet Quality and Market Efficiency

- 1. Contract farming:** Implementing contract farming arrangements can help ensure fair pricing and quality standards for millet farmers. Contracts offer incentives for growers to produce high-quality millets, thereby improving their returns.
- 2. Incentives for cultivators:** Providing financial incentives and support to millet cultivators encourages them to invest in better farming practices and maintain the quality of their produce.
- 3. Forward and backward linkages:** Establishing strong linkages between millet producers, processors and consumers can enhance production and diversification. These linkages facilitate the processing of millets into

various products, increasing their market value.

4. **Self-Help Groups (SHGs) and Cooperative Interest Groups (CIGs):** Encouraging the formation of SHGs and CIGs among millet farmers can promote collective marketing and bargaining power. This empowers farmers to negotiate better prices and access resources more effectively.
5. **Inclusion in Public Distribution System (PDS):** Adding millets to the PDS system ensures their availability to a wider population at affordable prices, supporting both farmers and consumers.
6. **Incorporating millets in school meals:** Introducing millets in school meal programs not only boosts the demand but also educates children and parents about their nutritional value, potentially increasing consumption.
7. **Promotion through trade fairs and seminars:** Organizing trade fairs, seminars and demonstrations can raise awareness about millet products among consumers and stakeholders in the industry. This can lead to increased demand and market growth.
8. **Awareness campaigns and competitions:** Conducting awareness campaigns, cooking demonstrations, and competitions focused on millets can help change consumer perceptions and promote their consumption.
9. **Subsidies for processors and entrepreneurs:** Offering subsidies to millet processors and entrepreneurs can incentivize investment in processing technology, leading to improved product quality and market competitiveness.

Conclusion

The country has witnessed a decline in both the area dedicated to millet cultivation and overall production. However, the significant increase in per hectare yield has played a crucial role in boosting the total production of millet crops. Moreover, the economics of millets (major and minor) showed profitable to the growers in terms of net income and positive input-output ratio. The study indicated that every group of farmers getting profit by millets cultivation. Furthermore, it was observed that in marketing of millets the efficient channel was direct channel (producer-channel) which played a significant role in producer's share in consumer's rupee. Additionally, millets possess substantial potential in the international market and can significantly contribute to economic growth and development of country.

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