P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 8; August 2025; Page No. 330-333

Received: 24-06-2025
Accepted: 26-07-2025

Indexed Journal
Peer Reviewed Journal

Determinants of production, consumption and marketed surplus of pearl millet in Maharashtra

[1]UB Dhake, [2]GL Meena, [3]RB Hile, [4]Latika Sharma, [5]Siddharth Mishra, [6]Kamalesh Kumar Meena and [7]Rajeev Bairathi

[1]Ph.D. Scholar, Department of Agricultural Economics and Management, Rajasthan College of Agriculture, Maharana Pratap Agriculture University and Technology, Udaipur, Rajasthan, India

[2]Professor and Head, Department of Agricultural Economics and Management, Rajasthan College of Agriculture, Maharana Pratap Agriculture University and Technology, Udaipur, Rajasthan, India

[3]Professor and Head, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

[4]Professor, Department of Agricultural Economics and Management, Rajasthan College of Agriculture, Maharana Pratap Agriculture University and Technology, Udaipur, Rajasthan, India

[5]Professor and Head, Department of Animal Production, Rajasthan College of Agriculture, Maharana Pratap Agriculture University and Technology, Udaipur, Rajasthan, India

[6]Assistant Professor, Department of Dairy & Food Microbiology, CDFT, Maharana Pratap Agriculture University and Technology, Udaipur, Rajasthan, India

[7]Professor, Department of Director Extension Education, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

DOI: https://www.doi.org/10.33545/26180723.2025.v8.i8e.2287

Corresponding Author: UB Dhake

Abstract

Pearl millet (*Pennisetum glaucum* L.) is a climate-resilient cereal vital for food security, fodder and rural livelihoods in Maharashtra's dryland farming systems. Despite its advantages, cultivation has declined due to competition from other cereals, market volatility and climate variability. This study, based on primary data from 60 households in Ahilyanagar district, analyzes factors influencing production, consumption and marketed surplus using multiple regression models. Results showed that production was significantly influenced by machine labour, manure, fertilizer and irrigation, with effects varying across farm sizes. Consumption increased with family size, age, taste preference and awareness of nutritional benefits while price also played a role. Marketed surplus was driven by farm size, production level, financial obligations, price and market accessibility with seed and feed needs influencing small and medium farmers. The study recommends integrated interventions focusing on mechanization, input efficiency, irrigation, awareness campaigns and improved market infrastructure to enhance productivity, demand and profitability.

Keywords: Pearl millet, factors, production, consumption and marketed surplus

Introduction

Pearl millet (*Pennisetum glaucum* L.) is a hardy cereal crop widely cultivated in semi-arid and arid regions for its exceptional drought tolerance, heat resilience, low input needs and rich nutritional profile. It is a vital source of carbohydrates, proteins, minerals and dietary fiber, contributing to food and nutritional security. In addition to serving as a staple food, it provides high-quality fodder for livestock, making it integral to mixed farming systems. In Maharashtra, particularly in Ahilyanagar district, pearl millet holds a key place in dryland agriculture due to favorable agro-climatic conditions and its role in sustaining rural livelihoods.

Despite its advantages, pearl millet cultivation has declined in recent decades. Factors such as competition from rice and wheat, changing dietary preferences, unstable prices, inadequate marketing infrastructure, soil degradation and climate variability have reduced its profitability and appeal to farmers. In many areas, productivity gains have been limited due to poor adoption of improved technologies, scarcity of quality seed and constraints in irrigation.

Sustaining and improving pearl millet's economic viability requires a comprehensive understanding of the factors influencing production, consumption and marketed surplus. Production efficiency depends on the optimal use of inputs such as labour, machinery, seeds, fertilizers, manure and irrigation. Consumption is shaped by household demographics, education, price, taste preferences and awareness of nutritional benefits. Marketed surplus is determined by farm size, production level, seed and feed

needs, financial obligations, price realization and access to markets.

Materials and Methods

The study is based on the primary data. Ahilynagar district of Maharashtra was selected for their highest area under pearl millet cultivation. Two tehsils with the highest pearl millet production area were chosen. Two villages from each tehsil were randomly selected, resulting in 4 villages. Pearl millet growing households were classified as small (0.01-1.00 ha), medium (1.01-2.00 ha) and large (2.01 ha and above) based on operational landholding, using the cumulative frequency square root technique. From each village, 15 households were randomly chosen proportionate to their category share, giving a total sample size of 60 households.

To identify the effect of these factors on production, consumption and marketed surplus multiple regression technique was employed (Degefa *et al.* 2023) [1]. The functional model used to analyze the factor's affecting production of pearl millet is,

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + u$$

Where,
Y = Total output (₹/ha)
X_1 = Seed (₹/ha)
X_2 = Machine labour (₹/ha)
X_3 = Human labour (₹/ha)
X_4 = Manures (₹/ha)
X_5 = Fertilizer (₹/ha)
X_6 = Irrigation charges (₹/ha)
u = Error term
a = Intercept
bi's = Regression coefficients

The functional model used to analyze the factor's affecting consumption of pearl millet is,

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + u$$

Where,
Y = Total consumption (kg/ha)
X_1 = Family Size (No.)
X_2 = Gender (Male =1, Otherwise = 0)
X_3 = Age (Years)
X_4 = Education (Educated = 1, Otherwise = 0)
X_5 = Awareness about nutritional value of millet crop (Yes = 1, Otherwise = 0)
X_6 = Taste preference (Good = 1, Otherwise = 0)
X_7= Price of the commodity (₹/q)
u = Error term
a = Intercept
bi's = Regression coefficients

The functional model used to analyze the factor's affecting marketed surplus of pearl millet is,

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + u$$

Where,
Y = Total marketed surplus (q/ha)
X_1 = Family Size (No.)
X_2 = Farm size (ha.)
X_3 = Production level (q/ha)
X_4 = Seed and feed requirement (q/ha)
X_5 = Financial obligation (Yes = 1, Otherwise = 0)
X_6 = Price of the commodity (₹/q)
X_7= Accessibility to the market (Good = 1, Otherwise = 0)
u = Error term
a = Intercept
bi's = Regression coefficients

Results and Discussion

Factors Affecting Production, Consumption and Marketed Surplus of Pearl Millet

Factors Affecting Production of Pearl Millet

The regression analysis depicted in Table 1 explains the factors affecting the production of pearl millet for small, medium and large farmers as well as for the overall group. The results were statistically reliable, as indicated by the high R-Square values ranging from 0.72 to 0.80, meaning the selected variables explain a large portion of the variation in production.

Table 1: Factors affecting the Production of Pearl Millet

Sr. No.	Particulars	Small	Medium	Large	Overall
1	Intercept	-0.15 (0.33)	0.86*** (0.16)	0.74 (0.61)	0.63 (0.56)
2	Seed (₹/ha)	0.58 (0.50)	0.87 (0.72)	0.13 (0.87)	-0.32 (0.47)
3	Human labour (₹/ha)	0.27 (0.48)	0.41 (0.36)	0.21 (0.20)	0.41 (0.52)
4	Machine labour (₹/ha)	0.14 (0.35)	0.32*** (0.09)	0.36*** (0.05)	0.32** (0.10)
5	Manure (₹/ha)	0.32*** (0.08)	0.32*** (0.09)	-0.12 (0.15)	0.19*** (0.04)
6	Fertilizer (₹/ha)	0.14** (0.07)	0.74 (0.78)	0.74*** (0.19)	0.27 (0.79)
7	Irrigation Charges (₹/ha)	0.33 (0.24)	0.32*** (0.08)	0.36 (0.73)	0.24** (0.08)
8	R^2	0.74	0.78	0.72	0.80

Figures in the parenthesis are the standard errors of the respective regression coefficient
Note: *** and ** indicate that 1 and 5 per cent level of significance, respectively

Among the important factors, machine labour had a significant and positive effect on production for medium, large and overall groups. This showed that the use of machinery helps in increasing pearl millet output, especially for larger farms where mechanization was more common. Manure application also positively influences production and was statistically significant for small, medium and overall farmers, suggested that organic inputs play a key role in boosting crop yield.

For small farmers, fertilizer use shows a positive and

significant effect, meaning proper chemical input was essential for better production. A similar finding was reported by Joshi *et al.* (2023) [4], where the study observed a significant and positive impact of fertilizer use on millet production. Irrigation charges, which represent access to water, were positively and significantly related to production in the medium and overall groups, highlighting the importance of water availability. However, some variables like human labour and seed cost show no significant impact in most groups which indicated an inefficiency or inconsistent use of these inputs.

In conclusion, the study found that the main drivers of pearl millet production were machine labour, manure use, fertilizer and irrigation. These inputs were particularly effective when used efficiently. The findings were statistically sound and provide helpful insights for improving pearl millet productivity, especially through better input management and technology adoption.

Factors Affecting Consumption of Pearl Millet

The findings of a regression analysis conducted to identify the key factors influencing pearl millet consumption across different household sizes have been presented in Table 2.

Across all groups, family size was found to have a positive influence on consumption. In the medium-size category and overall, this factor was statistically significant which means that as family size increases, the consumption of pearl mill*et al*so tends to rise. Similarly, age had a positive and significant effect in small and overall groups, indicated that older individuals may be more likely to consume pearl millet, possibly due to traditional preferences or health reasons. The result aligns with Meng *et al.* (2021) [6], who found that age positively influences millet consumption, with older individuals more likely to consume millet products. Awareness about the nutritional value of pearl millet significantly influenced consumption in the medium, large and overall groups. This suggested that people who were more aware of the health benefits of pearl millet were more likely to include it in their diet. Another strong factor was taste preference, which was significant in almost all groups, especially in the overall analysis. This means that if people enjoy the taste of pearl millet, they were more likely to consume it.

Table 2: Factors Affecting the Consumption of Pearl Millet

Sr. No.	Particulars	Small	Medium	Large	Overall
1	Intercept	-0.72 (0.88)	0.80 (0.91)	-0.77 (0.90)	0.98 (0.59)
2	Family Size (No.)	0.13 (0.08)	0.12** (0.05)	0.12 (0.34)	0.51*** (0.07)
3	Gender	0.37** (0.14)	-0.41 (0.68)	-0.38 (0.64)	0.46 (0.77)
4	Age (years)	0.14*** (0.04)	0.13 (0.12)	0.14 (0.67)	0.31** (0.10)
5	Education	0.64 (0.90)	0.60 (0.45)	0.62*** (0.08)	0.69 (0.56)
6	Awareness about nutritional value	-0.39 (0.71)	0.36*** (0.08)	0.36*** (0.08)	0.55*** (0.14)
7	Taste preference	0.26*** (0.08)	0.27 (1.00)	0.26** (0.09)	0.75*** (0.09)
8	Price of the commodity (₹/q)	0.24** (0.09)	0.29*** (0.06)	0.24** (0.09)	0.82*** (0.23)
9	R^2	0.70	0.69	0.76	0.78

Figures in the parenthesis are the standard errors of the respective regression coefficient

Note: *** and ** indicate that 1 and 5 per cent level of significance, respectively

The price of the commodity also showed a positive and significant effect on consumption in all groups. This suggested that consumers perceive higher prices indicated that they were willing to spend more because the commodity was a staple in their daily diet. On the other hand, factors like gender and education were not statistically significant in most cases, indicated they may not have a strong influence on consumption. The study found that larger families, higher age, better awareness and preference for taste positively affect pearl millet consumption. These factors together explain around 70-78 per cent of the variation in consumption across farm size categories. This highlighted the importance of socio-demographic characteristics and perceptions (nutritional value and taste) in shaping millet consumption patterns.

Factors Affecting Marketed Surplus of Pearl Millet

This study used regression analysis to pinpoint the main factors influencing the marketed surplus of pearl millet. It examined these factors for small, medium and large farm households as well as the overall trend across all farm sizes which have been presented in Table 3.

Table 3: Factors Affecting the Marketed Surplus of Pearl Millet

Sr. No.	Particulars	Small	Medium	Large	Overall
1	Intercept	0.32 (0.26)	0.21 (0.16)	0.28 (0.19)	0.74** (0.33)
2	Family Size (No.)	0.38** (0.14)	0.39 (0.27)	0.39 (0.35)	0.32 (0.24)
3	Farm Size (ha)	0.32** (0.13)	0.44 (0.25)	0.31** (0.11)	0.43*** (0.13)
4	Production Level(q/ha)	0.15 (0.04)	0.29 (0.15)	0.36 (0.28)	0.39 (1.86)
5	Seed and Feed requirement (q/ha)	0.36** (0.12)	0.57** (0.26)	-0.42 (0.46)	0.32 (0.35)
6	Financial Obligation	0.11*** (0.02)	0.31*** (0.08)	0.22 (0.20)	0.26** (0.09)
7	Price of the Commodity (₹/q)	-0.37 (0.66)	-0.44 (0.73)	0.40** (0.10)	0.38** (0.14)
8	Accessibility to the market	0.20 (0.17)	0.51 (0.37)	0.73*** (0.12)	0.56*** (0.11)
9	R^2	0.79	0.83	0.79	0.76

Figures in the parenthesis are the standard errors of the respective regression coefficient

Note: *** and ** indicate that 1 and 5 per cent level of significance, respectively

In the overall analysis, several factors were found to significantly affect the marketed surplus. The intercept (0.74) was significant at the 5 per cent level. Farm size had a strong positive effect (0.43) and was highly significant at the 1 per cent level, indicated that larger farms tend to sell more surplus. Financial obligation and price of the commodity were also positively and significantly related to marketed surplus, meaning that farmers with more financial responsibilities and those who received higher prices tended to sell more.

Among small farmers, family size, farm size, seed and feed requirement and financial obligation were significant contributors to marketed surplus. This suggested that for smallholders, both household needs and economic pressures influence how much they sell. For medium farmers, financial obligation and nature of the crop were key significant factors, showing that economic needs and crop type influence surplus levels. Seed and feed requirements were also positively significant.

For large farmers, the price of the commodity and accessibility to the market were most influential. This indicated that better market access and favorable prices strongly encourage larger sales from big farms. The results are in line with Sharma and Wardhan (2015) [13], who confirmed that access to markets has a significant positive impact on the marketed surplus of bajra. The R-square values across all groups ranging from 0.76 to 0.83 show a good fit of the model. These findings highlighted the importance of improving market infrastructure, ensuring fair pricing and providing financial support mechanisms to enhance millet marketing efficiency across all farm sizes.

The study found that machine labour, manure, fertilizer and irrigation significantly boost pearl millet production, especially for larger farms. Consumption was positively influenced by family size, age, taste preference and awareness of nutritional benefits. Price also encouraged consumption, possibly due to perceived quality. Marketed surplus was higher among farmers with larger farms, financial obligations and better market access. Small and medium farmers' surplus was shaped by household needs and crop type.

Conclusion

Pearl millet production was significantly influenced by machine labour, manure, fertilizer and irrigation, with efficiency varying across farm sizes. Consumption increased with family size, age, taste preference and nutritional awareness, indicated the scope for education-based demand promotion. Marketed surplus was driven by farm size, production level, financial obligations, price and market accessibility, with small and medium farmers also affected by seed and feed needs. Integrated interventions focusing on improved inputs, awareness campaigns, fair pricing and better market infrastructure can enhance productivity, demand and marketing efficiency, ensuring sustainable and profitable pearl millet cultivation in Maharashtra's dryland regions.

References

1. Degefa K, Abebe G, Biru G. Factors affecting sorghum production in Western Ethiopia: evidence from smallholder farmers. Int J Food, Agric, Nat Resour. 2023;4(2):33-9.
2. Hota SK. Agricultural production and marketable surplus - A study on marketing of paddy. Int J Mod Agric. 2021;10(2):4545-65.
3. Jerop R, Owuor G, Mshenga P, Kimurto P. Effects of finger millet innovations on productivity in Kenya. Cogent Food Agric. 2020;6:1-18.
4. Joshi HP, Techato K, Phoungthong K, Panthee KR. Determinants of millet production in Nepal. Appl Ecol Environ Res. 2023;21(4):3009-23.
5. Kumar P. Marketed surplus of different crops across farm size: A study in Haryana. Indian J Agric Econ. 1999;54(4):500-21.
6. Meng L, Hairong G, Shuo C, Yina Y, Guomei Z. Study on influencing factors of millet product consumption behavior of residents in Hebei Province: Based on the perspective of planned behavior theory. IOP Conf Ser: Earth Environ Sci. 2021;792.
7. Mohan AR, George A, George G. Consumer perception and factors influencing consumption of millets. J Trop Agric. 2021;59(2):177-82.
8. Padmalini S, Rizwana M, Mohanasundaram T, Mustafizul H, Vetrivel SC. Traditional food consumption in the modern era: assessing the millet consumption behaviour among south Indian urban women. Food Res. 2023;7(3):22-8.
9. Potaka KJ, Anitha S, Tsusaka TW, Botha R, Budumuru M, Upadhyay S, *et al*. Assessing millets and sorghum consumption behavior in urban India: A large-scale survey. Front Sustain Food Syst. 2021;5:680777.
10. Pathak H, Kiran KNM, Gauraha AK. Consumer awareness and consumption pattern of millets and millet-based products in Raipur city, Chhattisgarh. Indian J Agric Econ. 2023;78(3):486-500.
11. Priya KSM, Senthilkumar R, Muralidharan C, Selvi RP. Analysis of marketable and marketed surplus of paddy in Tirunelveli district of Tamil Nadu, India. Int J Curr Microbiol Appl Sci. 2020;9(9):1429-33.
12. Sharma K, Jaulkar AM, Kumar R. Factor influencing marketable and marketed surplus of major crops in Morena district. Int J Curr Microbiol Appl Sci. 2020;9(11):1582-7.
13. Sharma VP, Wardhan H. Assessment of marketed and marketable surplus of major foodgrains in India. Final Report, Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad. 2015.
14. Shibairo SI, Madegwa YM, Onwonga RN. Finger millet (*Eleusine coracana*) production in lower Eastern, Kenya: Status, constraints and opportunities. Br J Appl Sci Technol. 2016;14(6):1-10.
15. Vahini MK, Rani SP, Vidhyavathi A, Hemalatha S, Vasanthi R. A study on factors influencing consumption of millets in Coimbatore district of Tamil Nadu. Int J Stat Appl Math. 2023;8(5):06-10.
16. Tijjani H, Umar BF, Abubakar BZ, Aliyu U. Socio-economic determinants of adoption of improved pearl millet production practices by farmers in Borno State, Nigeria. Agrosearch. 2018;18(2):86-100.