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AN ECONOMIC ANALYSIS OF VARIETAL DIVERSIFICATION OF PADDY IN DHAMTARI DISTRICT OF CHHATTISGARH

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ABSTRACT

Varietal diversification of paddy refers to the practice of cultivating different rice varieties within the same field or across a farm. This approach offers several advantages over planting a single variety. Different rice varieties have varying levels of resistance to pests and diseases by planting a diverse range of varieties, farmers can reduce the overall impact of an outbreak on their crops, Rice varieties have different tolerances to environmental stresses such a drought, heat, and flooding Varietal diversification can help farmers adopt to the changing climate by ensuring that at least some of their crops will survive in challenging conditions. A wider range of adoptable rice varieties can help to me food security, especially in regions vulnerable to crop failures due to pests, diseases, or climate extremes. Planting a diverse range of rice varieties can create a more complex habitat that attracts beneficial insects and pollinators. This can improve soil health and fertility, and reduce the need for pesticides. "An Economic Analysis of Varietal Diversification of Paddy in Dhamtari District of Chhattisgarh" Present study was conducted in Dhamtari, kurud and Magarlod, block of Dhamtari district 102 farmers was selected to fulfil the objective of the study results that the average size of holding was to be 2.57 Ha. Overall literacy percentage was observed to be 68.43 percentage only paddy crop was growing in the kharif season. The diversity index was 0.47 The dominant paddy varieties work Hybrid (Bayer Arize 8433DT), total cost of cultivation of Bayer Arize 8433DT variety was 71392.45 Rs/ha., Net return was 128233.38 Rs/ha., and B:C ratio was 1:80 Major source of paddy seed was Dealers. Major constraint in paddy production and seed availability was; High input cost, Panicle mite and sheath blight, Rising cost of labor, Lack of seed availability for new varieties, Limited extension services and Lack of certified seed at village level.

Keywords: Rice, Variety, Economic, Farmer, Market

INTRODUCTION

Rice is a major grain in Indian cuisine and may be found in almost every Indian home. In India, it is the most popular food and grain. India is the world's second-largest rice producer. Rice is farmed extensively in India on an area of around 46.37 million hectares, with an annual production of 130.29 MT and an average yield of 2809 kg/hectare. Every year, the country's food grain production increases. A huge section of the Asian population consumes rice at every meal. In certain nations, rice accounts for more than 70% of total calorie intake. Rice accounts for over thirty percent of all calories in Asia. Known as the "Rice Bowl of India" (Reference: Directorate of Economics and Statistics, Department of Agriculture and Cooperation). Paddy, or rice, is a staple food for more than half of the world's population, particularly in Asia. Varietal diversification in paddy cultivation involves the introduction and cultivation of different rice varieties.

This practice aims to enhance resilience to various environmental conditions, pests, and diseases, as well as improve yield and quality. This economic analysis explores the implications and benefits of varietal diversification in paddy cultivation Chhattisgarh, one of the Indian states, is known for its paddy cultivation. The state is divided into three regions: the Northern Hills, the Plains, and the Bastar Plateau. It's a diverse paddy-growing region. In the year 2020-21, paddy was cultivated in an area of 1681.31 thousand hectares, which produced a total of 9249.69 thousand tonnes of paddy, with a productivity of 5.50 tonnes per hectare. In 2021-22, the paddy cultivation area was 1677.72 thousand hectares, producing 8825.66 thousand tonnes of paddy, with a productivity of 5.26 tonnes per hectare. Agriculture is the backbone of the Indian economy, a way of life rather than a business. During the eleventh five-year plan, Indian agriculture experienced an average annual growth rate of 4.1 percent. 2013-14 in Significant progress in coverage and productions has been documented. The 126.2 million ha and 28 million ha of oilseed coverage under food grains have been reached. Chhattisgarh can be roughly described as a mono-cropped rainfed area with 76 percent cultivable land and less than 30 percent irrigation from all sources. Rice is the most widely grown crop, accounting for around 80% of cultivable area, with an average productivity of 1.14 tonnes per hectare.

The rural population is primarily dependent on rice. The average per-person intake of rice is approximately 120-130 kg per year. The State of Chhattisgarh stands 10th in terms of area and 16th in terms of population in India. About 75 percent of the state's population is engaged in agriculture, and 45 percent of the entire arable land is under cultivation. Rice is the principal crop of the state, earning Chhattisgarh the nickname "Rice Bowl of India." Paddy is grown on an area of 40.79 million hectares, with a production of 8825.66 metric tons and a productivity of 2164 kg/ha, as shown in Table 1.1 (Directorate of Agriculture, 2021). Paddy, also known as rice, is one of the most important staple crops in the world, feeding a significant portion of the global population. Varietal diversification of paddy refers to the practice of cultivating different varieties of rice within a specific geographical area or region.This approach aims to enhance resilience to environmental stress, improve crop yield, and mitigate the risk of pest and disease outbreaks. Indira Gandhi Krishi Vishwavidyalaya (IGKV) is the only organization conducting research and education in the field of agriculture in Chhattisgarh, with its headquarters in the state's capital, Raipur. This prestigious organization has continuously conducted numerous studies for the benefit of Chhattisgarh's farmers, who are primarily rice growers, to improve their socioeconomic status through the adoption of research findings. Many rice varieties have been developed by IGKV, Raipur, including Mahamaya, Poornima, Shyamla, Danteshwari, Indira Sugandhit Dhan-1, Bamleshwari, Samleshwari, Jaldubi, Chandrahasini, Indira Sona, Indira Barani Dhan-1, Karma Mahsuri, Maheshwari, Durgeshwari, Rajeshwari, and Indira Aerobic-1 (Sarawagi et al., 2016). However, only a few varieties, such as MTU-1010, Swarna, and Mahamaya, are commonly used for production. The Rice Germplasm collection of Indira Gandhi Krishi Vishwavidyalaya, Raipur, is the second largest in the world, surpassed only by the International Rice Research Institute in the Philippines, with a collection of more than 23,250 accessions to date. This makes IGKV the institute with the largest germplasm collection of rice in India. Despite the release of numerous rice varieties by various pioneer organizations for commercial production, only a handful have reached farmers for production purposes.

Materials and methods

Out of the five divisions of Chhattisgarh, Raipur Division was selected purposively for the present study. Raipur Division consists of five districts: Raipur, Baloda Bazar, Dhamtari, Gariaband, Mahasamund Among

these districts, Dhamtari District was selected purposively for the study. Out of the total four blocks (Dhamtari, kurud,Magarlod,Nagri) in Dhamtari District, three blocks, namely Dhamtari, Kurud and Magarlod, were selected purposively for the present study. Two villages from each block were selected randomly, namely Kandel, Mujgahan, Sonpur, Umarda, Charbhatha, and Megha. The probability proportionate to size sampling technique was applied for the selection of respondents, and a total of 102 respondents were approached for the collection of primary data.

RESULTS AND DISCUSSIONS

Table 1: Paddy diversification by using Simpson's index

S. No.	Land holding	Simpson value	Diversity index
1	Marginal	0.46	Moderate
2	Small	0.54	High
3	Medium	0.49	Moderate
4	Large	0.47	Moderate
5	overall	0.54	High

Table 1, A study on paddy diversification using Simpson's index reveals that farmers with small land holdings have the highest diversity (0.54), while those with medium and large land holdings have lower values (0.49 and 0.47), indicating moderate diversity in paddy varieties. The overall Simpson value is 0.54.

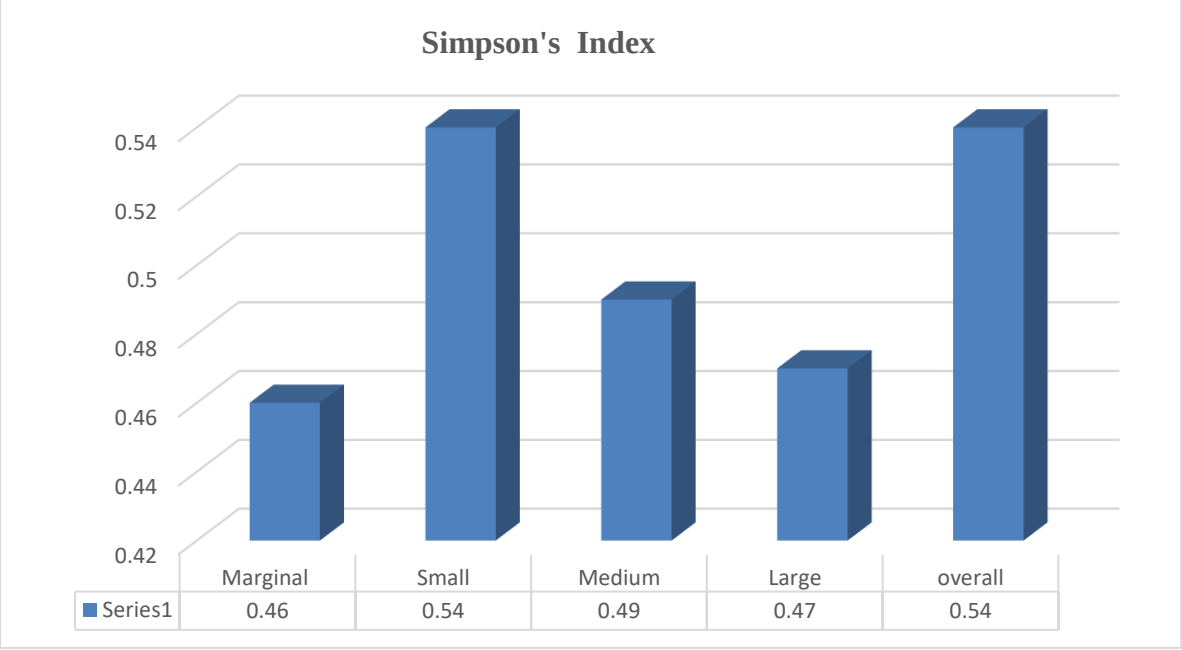

Fig. 1 Paddy diversification by using Simpson's index

Table 2 Cost of Cultivation of Hybrid Variety (Arize 8433 dt) Variety of paddy

S.No.		Particulars	Small	Medium	Large	Overall
1	**Cost A1**	Hired human labour	6726.35 (15.70)	8792.49 (18.78)	9845.61 (20.27)	8454.82 (18.25)
		Own bullock labour	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
		Hired bullock labour	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
		Own machinery	1687.49 (3.94)	6548.73 (13.99)	7094.49 (14.60)	3832.68 (10.84)
		Hired machinery charge and machine labour	7984.49 (18.63)	3457.27 (7.39)	2548.27 (5.25)	4663.34 (10.42)
		Manure charges	2147.85 (5.01)	2348.57 (5.02)	2485.64 (5.12)	2327.35 (5.05)
		Fertilizer charges	8745.67 (20.41)	9578.24 (20.46)	9758.65 (20.09)	9360.85 (20.32)
		Plant protection	6612.62 (15.43)	6248.46 (13.35)	6448.36 (13.27)	6436.48 (14.02)
		Seed cost	4895.46 (11.42)	5124.19 (10.95)	5215.34 (10.74)	5078.33 (11.04)
		Irrigation charge	1475.34 (3.44)	1564.67 (3.34)	1648.91 (3.39)	1562.97 (3.39)
		Miscellaneous expenses	755.18 (1.76)	842.67 (1.80)	903.58 (1.86)	833.81 (1.81)
		Interest on working Capital @3%	1745.68 (4.07)	1987.29 (4.25)	2245.64 (4.62)	1992.87 (4.31)
		depreciation on farm implements @ 10%	65.28 (0.15)	301.26 (0.64)	368.19 (0.76)	244.91 (0.52)
		Land revenue	14.00 (0.03)	14.00 (0.03)	14.00 (0.03)	14.00 (0.03)
Total Cost A1			42855.41 (100.00)	46807.84 (100.00)	48576.68 (100.00)	46079.98 (100.00)
2	**Cost A2**	**cost A1+ rent paid for leased in**	42855.41	46807.84	48576.68	46079.98
3	**Cost B1**	Cost A1+ interest on value of owned capital assets@7%	42973.53	47266.25	49073.29	46437.69
4	**Cost B2**	Cost B1 + Rental value of owned land	65473.53	69766.25	71573.29	68937.69
5	**Cost C1**	Cost B1+imputed value of family labor	46099.40	49455.89	51122.05	48892.45
6	**Cost C2**	Cost B2+imputed value of family labor	68599.40	71955.89	73622.05	71392.45
7	**Cost C3**	Cost C2+10% of cost C2, taking as managerial allowances	75459.34	79151.48	80984.26	78531.69

Table 2 shows the cost and cultivation of the arize 8433DT variety of paddy. The cost of cultivation is broken down into various categories, including hired human labor, bullock labor, machinery charges, manure charges, fertilizer charges, and seed cost. For Small land holdings, the total cost of cultivation is Rs. 48855.41, with hired human labor (Rs. 6726.35) and fertilizer charges (Rs. 8745.67) being the major cost components. For medium land holdings, the total cost of cultivation increases to Rs. 46807.84, with hired human labor (Rs. 8792.49) and fertilizer charges (Rs. 9578.24) remaining the major cost components. For Large land holdings, the total cost of cultivation further increases to Rs. 48576.68, with fertilizer charges (Rs. 9758.65) and hired human labor (Rs. 9845.41) being the major cost components.. Overall, fertilizer charges are the major cost component across all land holding sizes, with hired human labor being another significant cost component, particularly for larger land holdings.

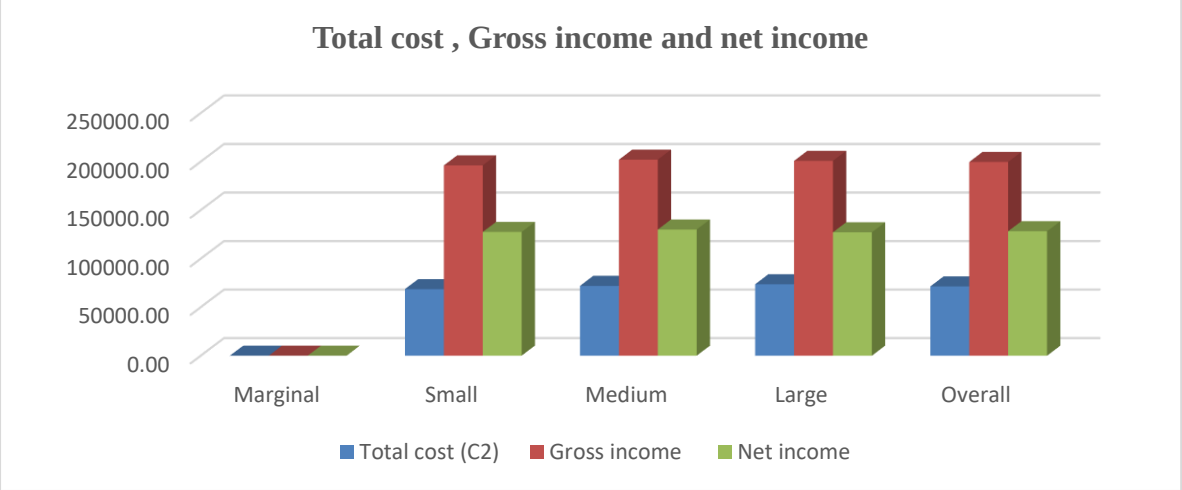

Fig.2 Cost and return

Table 3: Costs, Returns and B:C ratio of (Arize 8433 dt) variety

S.No.	Particulars	Small	Medium	Large	Overall
1	Cost of production (rs/q.)	1097.77	1109.23	1143.38	1116.79
2	Main Product (Q./ha)	62.49	64.87	64.39	63.92
3	Extra product from MSP	10.62	13	12.52	12.05
4	By Product	90.6105	94.0615	93.3655	92.68
5	Value as per MSP+Bonus (2023-2024) @ 3100 rs. / Q.	160797	160797	160797	160797
6	Value of By Product@120rs/q	10873.26	11287.38	11203.86	11121.50
7	Gross income	171670.26	172084.38	172000.86	171918.50
8	Mandi value as per (2023-2024) @ 2300 rs. / Q.	24426	29900	28796	27707.33
9	Gross income	196096.26	201984.38	200796.86	199625.83
10	Total cost (C2)	68599.40	71955.89	73622.05	71392.45
11	Gross income	196096.26	201984.38	200796.86	199625.83
12	Net income	127496.86	130028.49	127174.81	128233.38
13	Input-Output ratio	2.86	2.81	2.73	2.80
14	BC Ratio	1.86	1.81	1.73	1.80

Table 3 shows the costs, returns, and benefit-cost (B:C) ratio of the Arize 8433dt variety of paddy. The total cost of cultivation (C2) is categorized into variable costs, such as hired human labor, bullock labor, machinery charges, manure charges, fertilizer charges, and seed cost, and fixed costs. The gross income from the paddy crop is calculated by multiplying the yield by the market price of paddy, and the value of the byproduct, likely straw, is also included. The B:C ratio, a profitability measure in agriculture, is calculated by dividing the gross income by the total cost of cultivation (C2). A B:C ratio greater than 1 indicates profitability, while a ratio less than 1 indicates a lack of profitability. The gross income from paddy cultivation increases with increasing land holding size, and the total cost of cultivation (C2) also increases with increasing land holding size. The B:C ratio is relatively stable across all land holding sizes, ranging from 2.86 to 2.73, suggesting that paddy cultivation is profitable for all land holding sizes in this study.

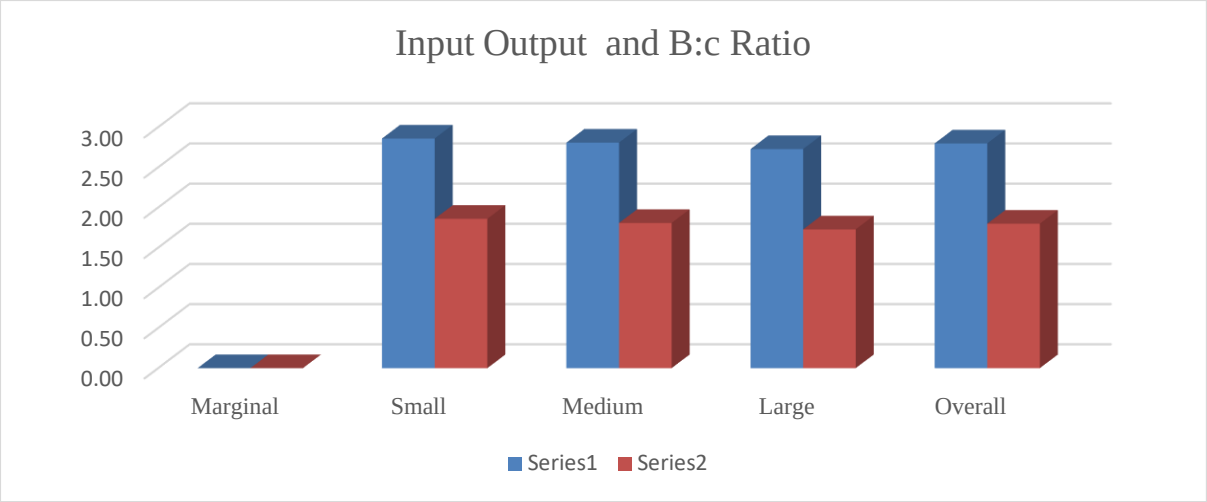

Fig.3 Input –output and B:C Ratio

CONCLUSION

The values of land holding and the diversity index using Simpson's index are presented. Land holdings are categorized into small, medium, and large, with Simpson's index serving as a measure of diversity, where a higher value indicates lower diversity. Small land holdings have the highest diversity (0.54), indicating a wider variety of paddy species planted, while marginal land holdings have lower diversity (0.46). This suggests that farmers with smaller land holdings may be practicing more diverse paddy cultivation in the Dhamtari district. Production increases with farm size, and the small cost per unit (Q/Ha) generally decreases as farm size increases, indicating economies of scale. For example, the main product yield (Q/Ha) increases from 62.49 for small farms to 64.39 for large farms. While the total cost (C2) increases with farm size, it does so at a slower rate than production, suggesting that larger farms may have a cost advantage. Net income follows a similar trend to production, increasing with farm size, with Medium farms having a higher net income (Rs. 130028.49) compared to smaller farms (Rs. 127496.86). The benefit-cost (B:C) ratio is around 1.7 for all farm sizes, indicating the return on investment for every rupee spent. The table shows a B:C ratio of around 1.8 for all farm sizes, suggesting that cultivating Arize 8433dt paddy is profitable. Overall, while Medium

farms tend to have higher overall costs, they also achieve higher yields and net income. The consistent B:C ratio across farm sizes indicates that profitability is not significantly impacted by farm size for Arize 8433dt paddy cultivation.

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REFERENCES

Anonymous. (2021). Directorate of Agriculture. (Attached in ANNEXURE- II)

Baghel, P., Gauraha, A. K., & Chandrakar, M. R. (2019). Economics of aromatic rice in Bastar district of Chhattisgarh, India. *Int. J. Curr. Microbiol. App. Sci*, *8*(12), 7-13.

Bhaskar SK, Gauraha AK, Joshi S, Kumar S, Ayush, Choudhary VK. An economic analysis of processing and marketing of spices in Mungeli district of Chhattisgarh. The Pharma Innovation Journal. 2021; 10:817-821

Kujur, P., Gauraha, A. K., & Netam, O.K. (2019). The socio-economic impact of farmer producer organizations in Chhattisgarh plains. *Journal of Entomology and Zoology Studies*, *7*(6), 1104-1106.

Lakra, N., Gauraha, A. K., & Kujur, P. (2019). Economics of sweet potato production and marketing pattern in bastar plateau of Chhattisgarh state. *Journal of Pharmacognosy and Phytochemistry*,*8*(6), 1138-1140.

Pathak, H., Kiran, K. N. M., & Gauraha,A. K. (2023). Consumer Awareness and Consumption Pattern of Millets and Millet-Based Products in Raipur City, Chhattisgarh. ***Indian Journal of Agricultural Economics, 78*(3).**

Pingali, P., M. Hossain, and R. V. Gerpacio. (1997) Asian Rice Bowls: The Returning Crisis. Asian Rice Market: Demand and Supply Prospects. 1:25-28.

Pingali, P.L., and H.P. Binswanger. (1987). Population Density and Agricultural Intensification: a study of the evolution of technologies intropical agriculture. In: D.G. Johnson, and R.D. Lee (eds.), Population Growth and Economic Development-Issues and Evidence.1: 1-8.

Splitz, P. (1987). The Green Revolution Re-examined in India: in Bernhard Gladder (Ed) The Green Revolution Revisited, University of Hyman, Boston State Planning Board, 2000, Data Book on Agriculture, Thiruvananthapuram, Kerala. 1:32-37.

Sarawagi, R., Sundar, S., Gupta, S. K., & Raghuwanshi, S. (2016). Anatomical variations of cystic ducts in magnetic resonance cholangiopancreatography and clinical implications. *Radiology research and practice*, *2016*(1), 3021484.

Shiva, V. (1991). Biodiversity: Social and Ecological Perspectives, Zed Boos Ltd, London and New Jersey with World Rainforest Movement, Penang, Malysia.1:1-5.

Singh, S., Gauraha, A. K., Chaudhary, V. K., & Pathak, H. (2023). Assessing resource use efficiency of paddy crop in tribal and non-tribal farm households: A case study of Chhattisgarh.

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