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A profitability and constraints analysis of production and marketing of rice (Paddy) in Satna District of Madhya Pradesh state in India

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Abstract
The study conducted "an economic analysis of production of rice in Satna district of Madhya Pradesh". The field level primary data were collected from randomly selected 240 rice growers of 9 villages of Satna district for the agricultural year 2021-22. The total cost of cultivation in paddy was 42523.32 Rs./ha. The overall basis Gross returns (total income) was observed to the 73972.13 Rs./ha. The net returns was found to be 31448.80 Rs./ha and overall production of paddy product and by-product was 41.65 and 21.02 quintal/ha. The overall major constraints of production of rice were unavailability of labour during peak period (62.88) followed by crop affected by Insect pest and disease and bad weather side effects (56.98) as per average score identified in Garrett's ranking. The overall major constraints were small marketable surplus (59.02) followed by lack of storage facilities (53.47) as per average score identified in Garrett's ranking. The suggestions of rice grower were Efficient marketing is urgently needed in case of paddy crop. Proper marketing information is needed for the marketing of this paddy crop.

1. Introduction
Rice (*Oryza sativa* L.) is the main stable food grain in world it a significant piece of the public economy. India is one of the world's biggest makers of white rice and earthy colored rice, representing 20% of all world rice creation. Rice (paddy) (*Oryza sativa*) otherwise called "Worldwide Grain" is one of the most old yields being developed in 117 nations. It is one of the main staple food varieties of most of Total populace (60%), possessing in front of the pack among developed oats. It is being become under various agro-climatic circumstances. According to the Fertilizer Statistic - 2004-2005, New Delhi, India has the largest rice crop area (44 million hectares) and ranks second in terms of production (132 million tonnes) behind China. The region, creation and efficiency of rice in India is 44.8 million hectares, 99.37 million tones and 2.2 tones per hectare, separately. Rice possesses 23.3% of gross trimmed region of the nation, 43% of all out food grain creation and 46% of all out oat creation in the country. Rice is filled in around 534 locale in the nation spread north of 30 States and Association Domains (CMIE, 2010). In Madhya Pradesh rice is filled in the space of around 1929.976 thousand ha with creation of 5360.905 thousand tons and efficiency 2789 kg/ha in the year 2013-14, which is far underneath than the typical public efficiency (3623 kg/ha) (GoI 2015). Among various regions Balaghat (13.04%) had the most noteworthy area of rice followed by Seoni (7.42%), Mandla (6.71%),

Rewa (6.40%), Katni (5.75%), Satna (5.70%), Anuppur (5.53%), Shahdol (5.28%), Jabalpur (4.35%), Dindori (4.29%), Sidhi (3.79%), Raisen (3.17%), Damoh (3.16%), Gwalior (2.95%), Panna (2.92%), Hoshangabad (2.91%), Umariya (2.49%), Singroli (2.48%), Betul (2.25%), Chhindwara (1.09%), Sehore (1.06%), Narsingpur (0.98%), Sheopur Kalan (0.90%), Shivpuri (0.70%), Tikamgarh (0.65%), Jhabua (0.65%), Chhatarpur (0.60%). These 25 regions out of 51 covered 97.23 percent of rice region of the state.

2. Methodology
The examining strategy of Satna locale of Madhya Pradesh was purposively picked as the review region since it has the biggest region under rice development in the area. In order to select the villages and respondents, which included a variety of farmers involved in the production of rice in the Satna district, a multistage simple random sampling technique (SRS) was used. The information gathered from the respondents incorporates general data, size of property, intercropping, inputs utilized, cost of development, and feelings on different creation and advertising requirements looked by paddy producers. At their homes and at times at a typical spot in the town, the respondents were consulted. The motivation behind the review was additionally clarified for the respondents. Garrett's positioning procedure was utilized to assess the imperatives experienced in the creation

and showcasing of paddy. The subtleties of the examining methods at different stages are given as under:

3. Costs and returns of rice cultivation
In spite of the expenses and return was worked out by old ideas, a standard technique for cost of development of rice was likewise utilized. This technique is acknowledged by The Commission at Agrarian Expenses and Costs (CACP). Under this strategy, the expense of development was registered by utilizing the 7 Expense ideas, which are known as cost A1, cost A2 cost B1, cost B2 and cost C1, cost C2, and cost C3.

3.1 Income over different cost
IOC A_1 = GR - (Cost-A_1)
IOC A_2 = GR - (Cost-A_2)
IOC B_1 = GR - (Cost-B_1)
IOC B_2 = GR - (Cost-B_2)
IOC C_1 = GR - (Cost-C_1)
IOC C_2 = GR - (Cost-C_2)
IOC C_3 = GR - (Cost-C_3)
Where, IOC = Income over cost and GR= Gross Income

3.2 Net-Income
It is the distinction between total expenses and total return. So,
NI= GI-TE

3.3 Input – output ratio
It is the ratio of input and output, which is an under
Input - Output Ratio = Value of output / Value of input used.

3.4 Garrett's ranking technique
Garrett's ranking technique is a tool which is commonly used for the variable that makes use of mean scores expressed in ranks. It offers the change of orders of constraints and benefits into numerical ratings. The primary advantage of this technique over simple frequency distribution is that, from the point of view of respondents, the constraints are structured based on their intensity. Therefore, the same number of respondents may have been ranked differently on two or more constraints. Garrett's

formula for converting ranks into percentage is.

Percentage position = 100 * (Rij-0.5)/Nj

Where,
R_{ij} = Rank given for i^{th} constraint by j^{th} individual.
N_j = Number of constraint ranked by j^{th} individual.
The percentage position of each rank was converted into scores referring to the table given by Garrett and Woodworth (1969). The scores of individual respondents will be added together for each factor and divided by the total number of respondents for whom scores will be added. These mean scores for all the constraints will be arranged in descending order; the constraints will be accordingly ranked.

4. The cost and returns of paddy in the study area
4.1 Cost of cultivation
Various Costs used during the time spent creation are contemplated to have a superior comprehension of the expense of paddy development. The consequences of this examination are introduced in the table 1. As per the table, the complete expense of development in paddy was 42523.32 Rs./ha. The Variable Expense and Fixed not entirely set in stone to be 28863.70 Rs./ha and 13659.62 Rs./ha, separately, addressing 67.88 percent and 32.12 percent of the absolute expense of development. It was additionally observed that the overall cost of development in paddy for negligible, little, medium and huge ranchers was 41100.60 Rs./ha, 42783.16 Rs./ha, 44636.10Rs./ha and 45719.13 Rs./ha, separately. For minor, little and medium and enormous ranchers the variable costs represent 67.13 percent, 68.26 percent, 68.57 percent and 68.85 percent, separately. Minimal, little, medium and enormous ranchers, are, burning through 32.87 percent, 31.74 percent, 31.43 percent and 31.15 percent on fixed costs, separately.
According to table 1, the highest human labor (hired and family labor) cost was 22.77 percent, followed by fertilizer and manure (13.53%), plant protection (11.41%), machine power costs (10.19%), seed costs (6.68%), interest on working capital (2.75%), and irrigation (0.55%). The expense of family work is diminishing with the expansion in ranch size.
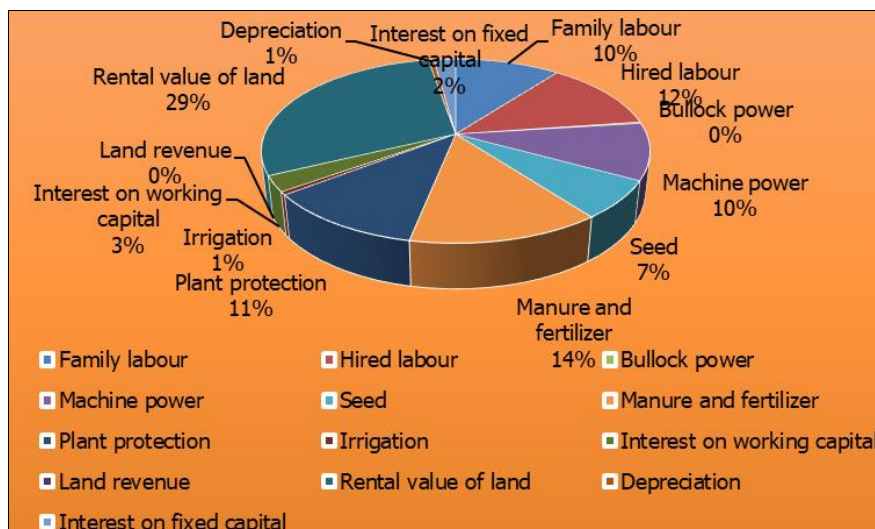
**Fig 1:** Different costs of overall farm size of paddy cultivation
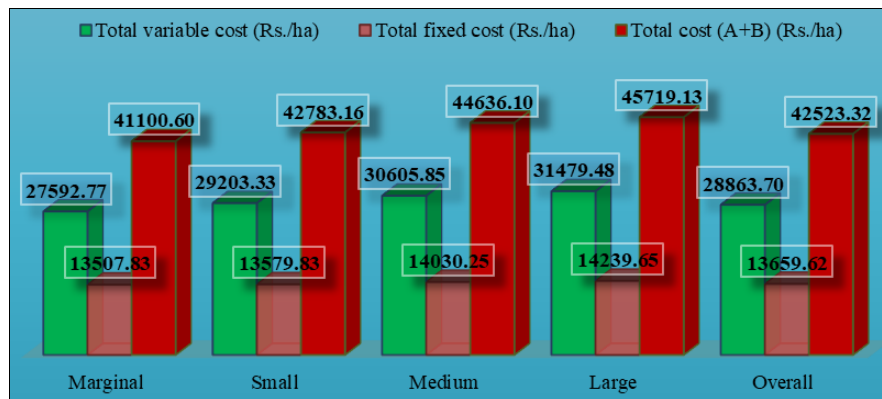
Fig 2: Different costs of different farm size of paddy producer

4.2 Measures of farm profit in paddy cultivation in Satna district: Table 2 departed that the overall per hectare gross profits from paddy cultivation were computed using the market price of 1650 Rs. per quintal and overall gross return from paddy was found to be 73972.13Rs./ha. The cost of production of paddy was found to be 1066.16Rs./qtl, 1047.32Rs./qtl, 1038.53Rs./qtl, 1034.14Rs./qtl and 1021.03Rs./qtl for marginal, small, medium, large and overall farms size, respectively. While overall input-output ratio were found to be 1.00:1.74, On an overall basis Gross returns (total income) was observed to the 73972.13Rs./ha, while net returns was found to be 31448.80Rs./ha and overall production of paddy product and by-product was 41.65 and 21.02 quintal/ha.

Table 1: Cost on different heads of paddy in the Satna district (Rs./ha)

Sl. No.	Particular	Marginal		Small		Medium		Large		Overall	
		Rs./ha	%	Rs./ha	%	Rs./ha	%	Rs./ha	%	Rs./ha	%
A.	Variable cost										
1.	Human labour										
a.	Family labour	5031.12	12.24	4525.03	10.58	3210.25	7.19	2665.33	5.83	4427.12	10.41
b.	Hired labour	4240.12	10.32	5424.33	12.68	6841.50	15.33	7512.50	16.43	5257.40	12.36
	Total human labour	9271.24	22.56	9949.36	23.26	10051.75	22.52	10177.83	22.26	9684.52	22.77
2.	Bullock and Machine power										
a.	Bullock power	242.17	0.59	0.00	0.00	0.00	0.00	0.00	0.00	105.95	0.25
b.	Machine power	3980.15	9.68	4280.33	10.00	4620.50	10.35	4720.50	10.33	4228.20	9.94
	Total Bullock and Machine power	4222.32	10.27	4280.33	10.00	4620.50	10.35	4720.50	10.33	4334.15	10.19
3.	Seed	2665.50	6.49	2885.33	6.74	3032.65	6.79	3275.25	7.16	2840.06	6.68
4.	Manure and fertilizer	5525.50	13.44	5800.50	13.56	6108.33	13.68	6210.33	13.58	5752.82	13.53
5.	Plant protection	4565.33	11.11	4865.00	11.37	5316.22	11.91	5580.33	12.21	4849.91	11.41
6.	Irrigation	230.00	0.56	236.00	0.55	239.00	0.54	241.00	0.53	234.17	0.55
7.	Interest on working capital	1112.88	2.71	1186.81	2.77	1237.40	2.77	1274.24	2.79	1168.07	2.75
	Total variable cost	27592.77	67.13	29203.33	68.26	30605.85	68.57	31479.48	68.85	28863.70	67.88
B.	Fixed cost										
1.	Land revenue	10.00	0.02	10.00	0.02	10.00	0.02	10.00	0.02	10.00	0.02
2.	Rental value of land	12500.00	30.41	12500.00	29.22	12500.00	28.00	12500.00	27.34	12500.00	29.40
3.	Depreciation	122.33	0.30	134.50	0.31	525.00	1.18	724.50	1.58	227.15	0.53
4.	Interest on fixed capital	875.50	2.13	935.33	2.19	995.25	2.23	1005.15	2.20	922.46	2.17
	Total fixed cost	13507.83	32.87	13579.83	31.74	14030.25	31.43	14239.65	31.15	13659.62	32.12
C.	Total cost (A+B)	41100.60	100.00	42783.16	100.00	44636.10	100.00	45719.13	100.00	42523.32	100.00
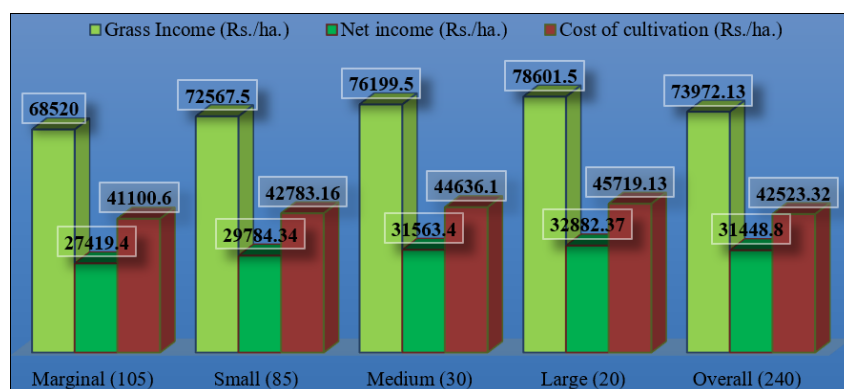
**Fig 3:** Cost and returns from maize in different farm size

Table 2: Yield, value of output and cost of production of paddy in Satna district

Sl. No.	Particular	Marginal (105)	Small (85)	Medium (30)	Large (20)	Overall (240)
1.	Yield main product (qtl./ha)	38.55	40.85	42.98	44.21	41.65
2.	Rs. of main product (Rs./ha.)	63607.50	67402.50	70917.00	72946.50	68718.38
3.	Quantity of by-product	19.65	20.66	21.13	22.62	21.02
4.	Rs. of by-product (Rs./ha.)	4912.50	5165.00	5282.50	5655.00	5253.75
5.	Grass Income (Rs./ha.)	68520.00	72567.50	76199.50	78601.50	73972.13
6.	Cost of production (Rs./qtl.)	1066.16	1047.32	1038.53	1034.14	1021.03
7.	Net income (Rs./ha.)	27419.40	29784.34	31563.40	32882.37	31448.80
8.	Cost of cultivation (Rs./ha.)	41100.60	42783.16	44636.10	45719.13	42523.32
9.	Input Output ratio	1:1.67	1:1.70	1:1.71	1:1.72	1:1.74
10.	Benefit Cost ratio (B:C)	1:0.67	1:0.70	1:0.71	1:0.72	1:0.74

4.3 Cost obtain on the basis of different cost concept of paddy in Satna district: Cost of development of paddy of test ranches in the Satna region has been worked out and introduced in table 3. It is imagined that Cost A1 however assigned as factor cost seemed to be viewed as Rs.24673.74/ha on a general premise, which was added of lease paid for rent in land and Cost A2, was viewed as Rs.24673.74/ha, shows that the interest on fixed capital credited with Cost B1was Rs.25596.20/ha. Ordinarily, ranchers are developing the yield in their own property however it has attributed rental worth of place that is known for Rs.12500.00/ha told Cost B2 was Rs.38096.20/ha. Cost C1, which includes the value of Cost B1 and the imputed

value of family labor, was found to be Rs.30023.32/ha. Cost C2, which included the value of Cost B2 and the imputed value of family labor, was found to be Rs.42523.32/ha, and Cost C3, which included the imputed value of managerial allowances at 10% of Cost C2.

4.4 Return obtained over different cost of paddy in Satna district: Table 3 also shows that the general returns over Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2, and Cost C3 was acquired to be Rs.49298.39/ha, Rs.49298.39/ha, Rs.48375.93/ha, Rs.35875.93/ha, Rs.43948.80/ha, Rs.31448.80/ha and Rs.27196.47/ha, individually.
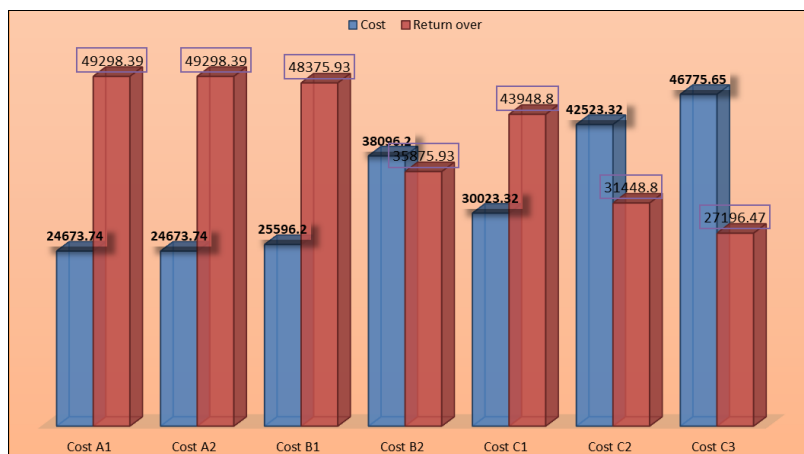
Fig 4: Break-up of different cost and income obtained over different cost of overall paddy crop

Table 3: Break-up of total cost, and income obtained over different cost of paddy crop

Break-up of over different cost of paddy crop					
Cost/ Category	Marginal (105)	Small (85)	Medium (30)	Large (20)	Overall (240)
Cost A$_1$	22693.98	24822.80	27930.60	29548.65	24673.74
Cost A$_2$	22693.98	24822.80	27930.60	29548.65	24673.74
Cost B$_1$	23569.48	25758.13	28925.85	30553.80	25596.20
Cost B$_2$	36069.48	38258.13	41425.85	43053.80	38096.20
Cost C$_1$	28600.60	30283.16	32136.10	33219.13	30023.32
Cost C$_2$	41100.60	42783.16	44636.10	45719.13	42523.32
Cost C$_3$	45210.66	47061.48	49099.71	50291.04	46775.65
Break-up of income obtained over different cost of paddy crop					
Cost/ Category	Marginal (105)	Small (85)	Medium (30)	Large (20)	Overall (240)
Return over cost A$_1$	45826.02	47744.70	48268.90	49052.85	49298.39
Return over cost A$_2$	45826.02	47744.70	48268.90	49052.85	49298.39
Return over cost B$_1$	44950.52	46809.37	47273.65	48047.70	48375.93
Return over cost B$_2$	32450.52	34309.37	34773.65	35547.70	35875.93
Return over cost C$_1$	39919.40	42284.34	44063.40	45382.37	43948.80
Return over cost C$_2$	27419.40	29784.34	31563.40	32882.37	31448.80
Return over cost C$_3$	23309.34	25506.02	27099.79	28310.46	27196.47

4.5 Constraints in production of paddy production

The overall major constraints were unavailability of labour during peak period (62.88) followed by crop affected by Insect pest and disease and bad weather side effects (56.98) as per average score identified in Garrett's ranking. The other constraints were knowledge about recommended package of practices for the crop and knowledge about recommended package of practices for the crop (47.40), Lack of knowledge about hybrid varieties of paddy (47.27), lack of irrigation facility (47.14), high price value of paddy seedling and seed (45.46) and lack of sufficient financing problem (48.13), respectively.

4.6 Constraints in marketing of paddy

The overall major constraints were small marketable surplus (59.02) followed by lack of storage facilities (53.47) as per average score identified in Garrett's ranking. The other

constraints were lack of marketing intelligence (51.00), high price fluctuation of paddy (50.11), lack of regulated and co-operative market (48.39), lack of transportation facilities (45.58) and higher number market functionaries in the market (42.53), respectively.

5. Suggestions for farmers and future works

1. Farmers should be met with facilities of fund for using as input, this will be beneficial for risk reduction of crop failure and poor yield.
2. Improvement in post-harvest handling techniques will help in reducing post-harvest losses which is very huge in case of paddy.

Proper marketing information is needed for the marketing of this paddy crop

**Table 4:** Constraints in production of paddy crop in Santa district (N= 240)

Constraints	Marginal		Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Unavailability of labour during peak period	61.13	I	62.64	I	63.62	I	72	I	62.88	I
Crop affected by Insect pest and disease and bad weather side effects	57.25	II	56.29	II	54.62	II	62	II	56.98	II
Lack of sufficient financing problem	43.13	VII	45.21	VI	43.62	VII	28.5	VII	42.71	VII
Knowledge about recommended package of practices for the crop	46.94	IV	49	III	50.08	III	39	VI	47.40	III
High price value of paddy seedling and seed	46.31	VI	42.79	VI	44.38	VI	54	III	45.46	VI
Lack of knowledge about hybrid varieties of paddy	46.81	V	47.43	IV	46.62	V	50	IV	47.27	IV
Lack of irrigation facility	47.81	III	46.57	V	46.85	IV	46.5	V	47.14	V

Table 5: Constraints in marketing of paddy crop in Santa district, (N= 240)

Constraints	Marginal		Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Lack of marketing intelligence	51.81	III	49.79	V	54.62	II	46.5	IV	51.00	III
Lack of regulated and co-operative market	46.31	VI	54.57	I	44.38	VI	39	V	48.39	V
Lack of transportation facilities	46.81	V	46.5	VI	50.08	III	28.5	VI	45.58	VI
Lack of storage facilities	55	II	53.79	II	46.85	IV	54	III	53.47	II
Small marketable surplus	59.88	I	53.29	III	63.62	I	72	I	59.02	I
High price fluctuation of paddy	48.25	IV	50.36	IV	46.62	V	64	II	50.11	IV
Higher number market functionaries in the market	43.94	VII	43.71	VII	43.62	VII	28.5	VI	42.53	VII
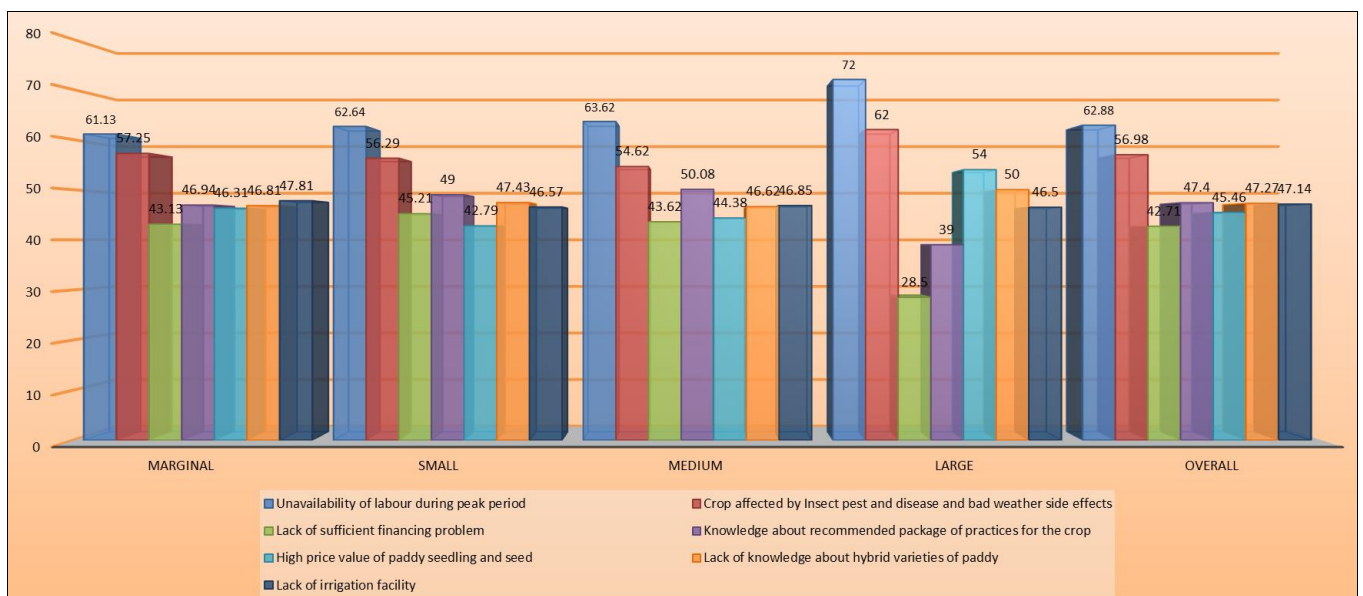
Fig 5: Constraints in production of paddy crop in Santa district (Mean Score)
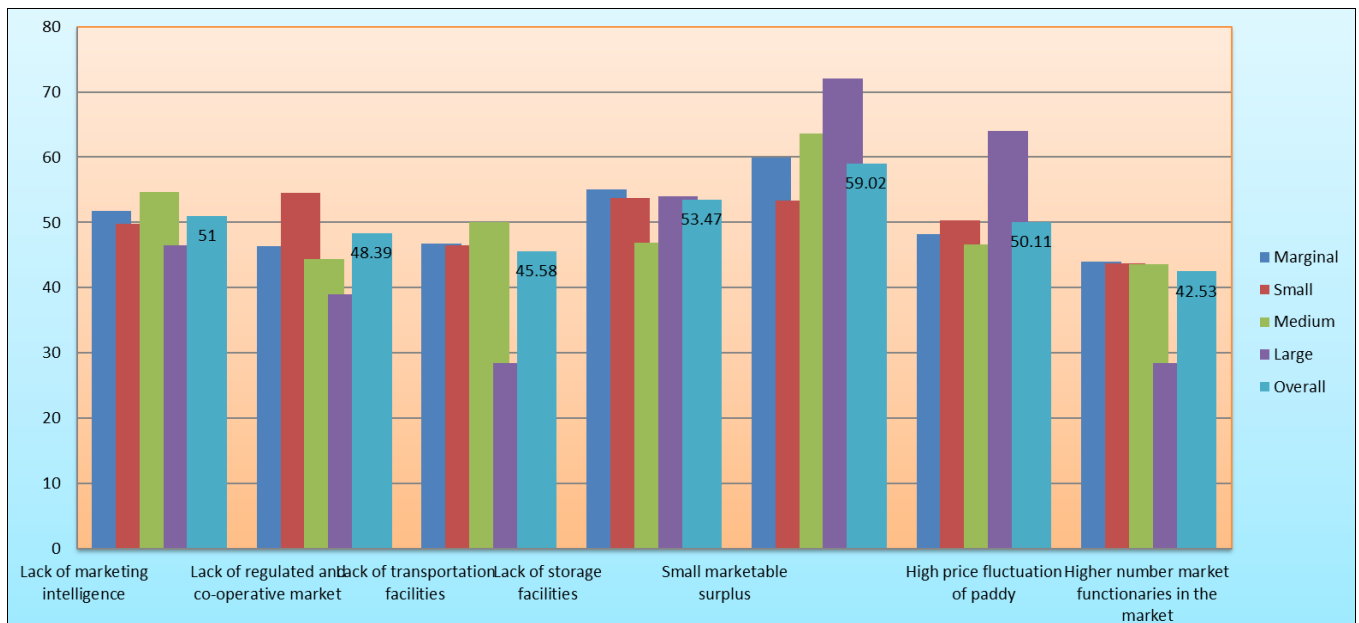
Fig 6: Constraints in marketing of paddy crop in Santa district (Mean Score)

6. Conclusion
The study provides valuable insights into rice cultivation economics in Satna district, Madhya Pradesh. With rice being a vital staple globally and a significant contributor to India's agricultural landscape, understanding its cost dynamics is essential. The analysis reveals substantial expenditure on human labor, fertilizers, and other inputs, with variable costs dominating. Interestingly, the study notes a decline in family labor costs with larger farm sizes. These findings highlight the economic challenges and opportunities faced by rice farmers in the region. Addressing these challenges through targeted interventions could enhance the sustainability and profitability of rice cultivation, contributing to food security and rural livelihoods in the area.

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