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Socio-economic Profile, Farm Structure and Production Constraints of Paddy Farmers in Raipur District of Chhattisgarh

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Abstract

Paddy cultivation plays a pivotal role in ensuring food security, generating rural employment and sustaining agricultural livelihoods in India. However, the productivity and sustainability of rice based farming systems depend heavily on the socio-economic profile of farming households and the production constraints they encounter. This study examined the socio-economic characteristics, farm structure and production constraints of paddy farming households in Raipur district of Chhattisgarh, one of the principal rice growing regions of central India. Primary data were collected from 120 paddy farming households selected through a two stage sampling design combining purposive selection of the district with random selection of blocks, villages and households and respondents were subsequently classified based on operational landholding. Data were analysed using descriptive statistics including frequencies, percentages and averages. Marginal and small farmers together accounted for the large majority of the sample confirming the predominance of smallholder agriculture in the study area. The average household comprised approximately six members and overall literacy stood at 88 per cent. Paddy occupied the entire cultivated area during kharif while wheat and gram dominated the rabi season. Cultivation during the summer (zaid) season was negligible owing to limited groundwater availability. Canal irrigation supplemented by borewells was the principal water source with borewell dependence increasing with farm size. Untimely availability of quality inputs, weak institutional support, rising production costs, pest incidence and seasonal labour shortages emerged as the most pressing constraints. The findings suggest that strengthening input delivery systems, agricultural extension, mechanization through Custom Hiring Centres, irrigation management and diversification into suitable rabi and water efficient zaid crops could improve the resilience, productivity and livelihood security of smallholder paddy farmers in central India.

Keywords: Socio-economic characteristics, Farm structure, Cropping intensity, Production constraints

Introduction

Rice (*Oryza sativa* L.) is the staple food of more than half of the world's population and remains central to global food and nutritional security ^[1]. It is cultivated on roughly 165 million hectares worldwide and global production is approaching record levels with the Food and Agriculture Organization projecting output of about 543 million tonnes (milled basis) for 2024-25 ^[2]. Asia accounts for the overwhelming share of both global rice production and consumption ^[1] and rice based farming supports the livelihoods of hundreds of millions of rural households by providing employment, income and a measure of economic stability across the developing world. At the same time, rice production systems face mounting pressure from shrinking landholdings, labour shortages, climate variability and rising input costs ^[3], which has progressively shifted agricultural research from output maximization alone toward strengthening the socio-economic resilience of farming households.

India is the world's second largest producer of rice and one of its largest consumers contributing close to a quarter of global output ^[1]. Rice occupies about 47 million hectares of Indian farmland and sustains rural employment, household income and agricultural gross domestic product. The overwhelming majority of India's rice is grown by small and marginal farmers. Successive rounds of the Agriculture Census show that holdings below two hectares account for about 86 per cent of all operational holdings nationally and the average size of an operational holding has fallen almost continuously from 2.28 ha in 1970-71 to about 1.08 ha

in 2015-16^[4,5]. This continuing fragmentation constrains the economies of scale, mechanization and investment capacity even as it places a growing share of national food production in the hands of resource constrained producers. Improving rice productivity in this context therefore requires more than technological intervention. It demands a systematic understanding of the socio-economic conditions, farm structures and institutional environment within which smallholder decisions are made.

Chhattisgarh, frequently described as the “Rice Bowl of Central India” exemplifies this dynamic^[6]. Rice occupies close to 69 per cent of the state’s cultivated area and Chhattisgarh has emerged as a leading contributor to India’s central pool of procured rice aided by state level minimum support price bonuses and an expanding procurement network^[7,8]. Rice occupies a dominant position in the state’s agricultural economy contributing substantially to household income, rural employment and food security, but the benefits are not uniformly distributed. Households differ markedly in their access to inputs, irrigation and mechanization depending on their operational landholding and affordability with direct implications for productivity, income stability and resilience to production shocks.

Socio-economic characteristics represent the human and resource dimensions of agricultural development. Variables such as age, education, family size, social composition, landholding, irrigation access and cropping pattern jointly determine farmers’ capacity to access information, mobilize labour, adopt improved technologies and use available resources efficiently. A growing body of evidence from across India confirms that such characteristics shape technology adoption, farm productivity and income diversification^[9, 10]. Production constraints including untimely availability of quality inputs, pest incidence, labour scarcity and increasing climatic uncertainty continue to limit the productivity and profitability of rice cultivation in many rice growing regions^[11, 12]. Institutional credit access also remains uneven. Education and cooperative membership are consistently found to be significant, positive determinants of farmers’ access to formal agricultural credit while off-farm income and distance from banking infrastructure act as barriers^[13, 14]. Identifying these constraints alongside the socio-economic profile of farming households therefore provides essential evidence for designing effective agricultural policies and extension strategies. Several studies have examined the socio-economic characteristics, technology adoption and production constraints of rice farmers in other parts of India, from Uttar Pradesh^[9] to Odisha^[15] and Telangana^[10]. However, various studies have examined specific aspects of rice farming in Chhattisgarh such as cropping system diversification, procurement dynamics and broader agrarian structures, a comprehensive micro-level assessments integrating demographic profiles, farm operational characteristics and production constraints within a single farm household framework remain limited in the state. Furthermore, few studies capture the combined dynamics of smallholder dominance, mixed (canal and borewell) irrigation and decentralized procurement unique to Raipur district. This synthesis of household conditions and production challenges is essential for identifying structural bottlenecks and formulating targeted interventions.

Against this background, the present study was undertaken in Raipur district of Chhattisgarh to assess, within a single farm household framework, the socio-economic characteristics, farm structure and production constraints of paddy farming households. By integrating demographic, educational, social, landholding, irrigation and cropping system characteristics with farmers’ perceived production constraints, the study offers an integrated view of the prevailing farming environment intended to inform researchers, policymakers and development agencies working to strengthen sustainable rice production and rural livelihoods in central India.

Materials and Methods

Study area

The study was conducted in Raipur district of Chhattisgarh, India, one of the principal rice growing regions of central India. The district lies within the Chhattisgarh Plain agro-climatic zone, characterised by fertile alluvial soils, a tropical monsoon climate and conditions generally favourable for rice cultivation. Raipur was purposively selected for its strategic importance within the state’s rice production system. The district ranks among the leading rice producers of Chhattisgarh and exhibits production conditions broadly representative of the state’s wider rice growing ecosystem^[7].

Sampling design

Raipur district was purposively selected for its representativeness of Chhattisgarh’s rice production systems. A two-stage random sampling technique was adopted for the selection of blocks and villages. Raipur district comprises four blocks, namely Arang, Abhanpur, Dharsiwa and Tilda. In the first stage, Arang and Tilda blocks were selected through simple random sampling. These blocks comprise 167 and 132 villages, respectively. In the second stage, two villages were randomly selected from each selected block. Accordingly, Parsada-3 and Palaud-1 villages were selected from Arang block, while Sathbawa and Boirjhithi villages were selected from Tilda block. A sampling frame of all paddy growing households in the selected villages was obtained from the respective Rural Agriculture Extension Officers and 30 households were randomly selected from each village yielding a total sample of 120 respondents.

Based on operational landholding, households were classified after selection into four farm size categories following the standard classification used in India’s Agriculture Census: marginal (<1.0 ha), small (1.0-2.0 ha), medium (2.0-4.0 ha) and large (>4.0 ha)^[4]. This classification was applied as a post sampling analytical lens rather than as a pre-determined sampling stratum.

Data collection

Primary data were collected through personal interviews using a pre-tested, structured interview schedule administered during the 2025-26 agricultural year. The schedule assessed household, human capital, social, farm structure, production system and constraint related dimensions, summarised in Table 1.

Table 1: Dimensions and Variables Used for Assessing Socio-economic Characteristics, Farm Structure and Production Constraints

Dimension	Variables
Household characteristics	Family size, Gender composition and Age distribution
Human capital	Educational status and Literacy rate
Social characteristics	Social group and Family composition
Farm structure	Operational landholding, Ownership status and Irrigated and Unirrigated area
Production system	Source of irrigation, Cropping pattern and Cropping intensity
Production constraints	Institutional, Production and Labour related constraints

Enumerators were trained in a common interview protocol prior to fieldwork to minimize inter-enumerator variability and each completed schedule was reviewed for completeness and internal consistency immediately after the interview. All respondents participated voluntarily after the purpose of the study was explained to them and verbal consent was obtained prior to each interview. No personally identifying information beyond that required for sampling verification was retained after data entry and respondents were assured of confidentiality.

Analytical methods:

Collected data were coded, tabulated and analysed using descriptive statistical techniques. Frequencies, percentages, averages and ratios were used to summarise the socio-economic characteristics of the sampled households. Cropping intensity was estimated using the standard formula employed in Indian farm management studies:

$$\text{Cropping Intensity (\%)} = (\text{Gross Cropped Area} / \text{Net Sown Area}) \times 100$$

The selected socio-economic variables were examined sequentially and then synthesised to derive policy relevant conclusions regarding the sustainability of paddy based livelihoods in the study area. This descriptive framework is broadly consistent with approaches widely used in farm level socio-economic research on Indian rice growing regions^[16], while extending them through the simultaneous treatment of demographic, structural and constraint related dimensions within a single sample of households.

Results and Discussion

Demographic and socio-economic characteristics

A total of 120 paddy farming households comprising 676 family members were surveyed. The sample included 66 marginal (55%), 37 small (30.83%), 11 medium (9.17%) and 6 large (5%) farmers (Table 2). The average household size was approximately six members.

Table 2: Demographic and Socio-economic Characteristics of Sampled Households

Sl. No.	Particulars	Marginal	Small	Medium	Large	Overall
1	Total households	66	37	11	6	120
2	Total family members	370	204	65	37	676
3	Gender					
a	Male	190 (51.35)	104 (50.98)	33 (50.77)	19 (51.35)	346 (51.18)
b	Female	180 (48.65)	100 (49.02)	32 (49.23)	18 (48.65)	330 (48.82)
	Average family size	5.6	5.52	5.9	6.17	5.63
4	Age group					
a	Below 15 years					
(i)	Male	40 (10.81)	22 (10.78)	6 (9.23)	3 (8.11)	71 (10.50)
(ii)	Female	38 (10.27)	20 (9.80)	6 (9.23)	3 (8.11)	67 (9.91)
b	15- 60 years					
(i)	Male	122 (32.97)	65 (31.86)	22 (33.85)	11 (29.73)	220 (32.54)
(ii)	Female	114 (30.81)	61 (29.90)	21 (32.31)	10 (27.03)	206 (30.47)
c	Above 60 years					
(i)	Male	28 (7.57)	17 (8.33)	5 (7.69)	5 (13.51)	55 (8.14)
(ii)	Female	28 (7.57)	19 (9.31)	5 (7.69)	5 (13.51)	57 (8.43)
5	Educational status					
a	Illiterate	55 (14.86)	20 (9.80)	4 (6.15)	2 (5.41)	81 (11.98)
b	Primary	90 (24.32)	44 (21.57)	11 (16.92)	3 (8.11)	148 (21.89)
c	Middle	76 (20.54)	45 (22.06)	11 (16.92)	6 (16.22)	138 (20.41)
d	Secondary	82 (22.16)	50 (24.51)	18 (27.69)	10 (27.03)	160 (23.67)
e	Higher Secondary	48	30	13	8	99

		(12.97)	(14.71)	(20.00)	(21.62)	(14.64)
f	Graduate	17 (4.59)	12 (5.88)	5 (7.69)	6 (16.22)	40 (5.92)
g	Post Graduate & Above	2 (0.54)	3 (1.47)	3 (4.62)	2 (5.41)	10 (1.48)
Literacy Rate		85.14%	90.20%	93.85%	94.59%	88.02%
6	Social Group					
a	General	6 (5.00)	2 (1.67)	0 (0.00)	0 (0.00)	8 (6.67)
b	OBC	29 (24.17)	21 (17.50)	4 (3.33)	3 (2.50)	57 (47.50)
c	SC	29 (24.17)	13 (10.83)	5 (4.17)	1 (0.83)	48 (40.00)
d	ST	2 (1.67)	1 (0.83)	2 (1.67)	2 (1.67)	7 (5.83)
7	Family Composition					
a	Small (≤ 3)	5 (4.17)	0 (0.00)	0 (0.00)	0 (0.00)	5 (4.17)
b	Medium (4-5)	14 (11.67)	7 (5.83)	1 (0.83)	0 (0.00)	22 (18.33)
c	Large (>5)	47 (39.17)	30 (25.00)	10 (8.33)	6 (5.00)	93 (77.50)

Figures in parentheses indicate percentages. Percentages for gender, age group and educational status are calculated to the total family members in respective farm size categories (Marginal: 370, Small: 204, Medium: 65, Large: 37, Overall: 676). Percentages for social group and family composition are calculated to the total sample respondents (N=120).

Gender composition was close to parity with males and females accounting for 51.18 and 48.82 per cent of household members respectively consistently across farm size categories. This is consistent with evidence that women contribute a substantial share often half or more of total labour input in rice based farming systems, particularly during transplanting, weeding and harvesting^[17, 18], underscoring the importance of extension and mechanization strategies that explicitly account for women's labour contribution, since gender blind technology design risks displacing the labour on which timely crop establishment depends. The economically active population (15-60 years) constituted 63.01 per cent of household members, followed by children below 15 years (20.41%) and elderly members above 60 years (16.57%). Medium farm households recorded the highest share of working age members while large farm households showed a comparatively higher share of elderly members.

Overall literacy stood at 88.02 per cent, rising from 85.14 per cent among marginal farmers to 94.59 per cent among large farmers exceeding the corresponding figure reported for paddy growing households in Ayodhya district, Uttar Pradesh, where about 84 per cent of respondents were literate^[9]. Secondary education was the largest single category (23.67%) followed by primary (21.89%) and middle school education (20.41%) with only a small proportion of respondents holding graduate or postgraduate qualifications. Education remained concentrated at the secondary level, a pattern also noted among tribal paddy farmers in Koraput district, Odisha, where an experience education gradient distinguished older, more experienced but less formally educated farmers from younger, more

educated counterparts^[15]. This suggests that human capital gains from formal schooling in rice growing regions may not yet be fully translating into technical sophistication, and that field based extension, rather than formal education alone, is likely to remain the primary channel through which improved production practices reach the majority of paddy farmers. Other Backward Classes accounted for 47.5 per cent of households, followed by Scheduled Castes (40%) while General (6.7%) and Scheduled Tribe (5.83%) households made up a smaller share. This composition was broadly similar across farm size categories (Table 2) indicating that social group composition in the study villages is not strongly stratified by landholding size.

Large families (more than five members) accounted for 77.5 per cent of households, medium families (four to five members) for 18.33 per cent and small families (three or fewer members) for only 4.17 per cent indicating an adequate family labour endowment across the sample.

Irrigation sources

Canal irrigation was the dominant source used by 55 per cent of sampled households overall, followed by borewell irrigation (39.17%) while 5.83 per cent relied on other sources such as ponds and tanks (Table 3). Within farm size categories, canal dependence was highest among marginal farmers (63.64%) and declined with increasing farm size, falling to 33.33 per cent among large farmers. Borewell dependence showed the opposite pattern, rising from 27.27 per cent among marginal farmers to 66.67 per cent among large farmers, consistent with the greater financial capacity of larger landholders to invest in private irrigation infrastructure.

Table 3: Source of Irrigation of Respondents

Sl. No.	Source of Irrigation	Marginal	Small	Medium	Large	Overall
1	Canal	42 (35.00)	16 (13.33)	6 (5.00)	2 (1.67)	66 (55.00)
2	Borewell	18 (15.00)	20 (16.67)	5 (4.17)	4 (3.33)	47 (39.17)
3	Others	6 (5.00)	1 (0.83)	0 (0.00)	0 (0.00)	7 (5.83)

Note: Figures in parenthesis indicates percentage to total (N=120)

No sampled household reported a complete absence of irrigation access and only a small share depended entirely on rainfall for both kharif and rabi cultivation indicating a comparatively favourable irrigation endowment relative to more rainfed rice growing tracts of central India. The tendency for borewell dependence to increase with farm size is consistent with the broader pattern in Indian agriculture whereby access to private groundwater infrastructure is closely associated with landholding size and investment capacity since the capital cost of drilling and operating a borewell is more easily absorbed by larger holdings. While this supports production stability for larger farmers, it also implies that marginal and small farmers remain comparatively more exposed to rainfall variability and canal supply interruptions which is a vulnerability likely to

intensify under the more erratic precipitation patterns anticipated for South Asia under continued climate change [3].

Farm structure and operational landholding

Land ownership was largely formal across the sample. Instances of share cropping or informal tenancy were rare and most owned land had been acquired through family partition rather than market purchase. The average operational holding was 1.30 ha, of which 93.85 per cent was owned and 6.15 per cent leased in indicating that farming in the study area is overwhelmingly owner operated (Table 4). Owned land increased progressively across farm size categories from an average of 0.50 ha among marginal farmers to 6.30 ha among large farmers.

Table 4: Operational Landholding Pattern of Respondents

Sl. No.	Land type based on Ownership	Marginal	Small	Medium	Large	Overall
1	Owned Land	0.46 (92.00)	1.31 (89.12)	2.65 (93.97)	6.30 (100.00)	1.22 (93.85)
2	Leased in Land	0.04 (8.00)	0.16 (10.88)	0.17 (6.03)	0.00 (0.00)	0.08 (6.15)
Land type based on Irrigation						
1	Irrigated Land	0.34 (68.00)	1.06 (72.11)	2.23 (78.98)	5.38 (85.40)	0.99 (76.15)
2	Unirrigated Land	0.16 (32.00)	0.41 (27.89)	0.59 (20.92)	0.92 (14.60)	0.31 (23.85)
	Total Area	0.50 (100.00)	1.47 (100.00)	2.82 (100.00)	6.30 (100.00)	1.30 (100.00)

Note: Figures in parenthesis indicates percentage to total area

On an average, 76.15 per cent of the operational area was irrigated. The irrigated share rose with farm size from 68 per cent among marginal farmers to 85.40 per cent among large farmers while the unirrigated share declined correspondingly. These findings reaffirm the continuing dominance of owner operated, fragmented holdings in Indian rice agriculture. Such fragmentation constrains economies of scale and mechanization compounded by the labour shortages observed during peak operations. Comparable evidence from South Asia indicates that farm mechanization, while expanding rapidly, remains shaped by access to credit and household economic status [11], implying that marginal farmers in Raipur district are unlikely to mechanize without targeted institutional support such as Custom Hiring Centres.

Cropping pattern and intensity

Paddy was the sole crop cultivated during kharif occupying the entire net sown area across all farm size categories (Table 5). During rabi, wheat and gram were the principal crops while zaid cultivation was negligible with only a small

area under vegetables and majority of land left fallow due to the declined groundwater availability during the summer months. The overall gross cropped area was 2.07 ha giving a cropping intensity of 159.4 per cent and cropping intensity increased with farm size from 157.57 per cent among marginal farmers to 178.97 per cent among large farmers indicating an association between farm size and land use intensity in the study sample. It should be noted that not all sampled households cultivated both rabi crops. A subset of farmers grew only gram, another subset grew only wheat and a smaller group cultivated both on different parts of their holding. The Gram and Wheat area figures reported in Table 5 therefore represent average area per household within each farm size category, computed as the total area under each crop (summed across all growers) divided by the total number of households in that category rather than the average area per grower alone. This ensures that the combined rabi area (Gram and Wheat) remains consistent with and does not exceed, the average Net Sown Area reported for each category.

Table 5: Cropping Pattern and Cropping Intensity

Particulars	Marginal	Small	Medium	Large	Overall
Net Sown Area	0.50	1.47	2.82	6.30	1.30
<i>Kharif</i>					
Paddy	0.50 (100.00)	1.47 (100.00)	2.82 (100.00)	6.30 (100.00)	1.30 (100.00)
<i>Rabi</i>					
Gram	0.22 (44.32)	0.81 (54.93)	1.88 (66.49)	3.77 (59.76)	0.58 (44.98)
Wheat	0.21 (42.82)	0.72 (48.66)	1.69 (59.75)	4.59 (72.78)	0.94 (72.32)
Average Rabi Cropped Area	0.22	0.76	1.78	4.18	0.76
<i>Zaid</i>					
Vegetables	0.07 (14.80)	0.09 (6.12)	0.12 (4.17)	0.80 (12.70)	0.01 (0.77)
Fallow	0.43 (85.20)	1.38 (93.88)	2.70 (95.83)	5.50 (87.30)	1.29 (99.23)
Average Zaid Cropped Area	0.07	0.09	0.12	0.80	0.01
Gross Cropped Area	0.79	2.32	4.72	11.28	2.07
Cropping Intensity	157.57%	157.92%	167.38%	178.97%	159.42%

Note: Figures in parentheses indicate percentages to Net Sown Area. Average Rabi Cropped Area represents the mean area of Gram and Wheat. Average Zaid Cropped Area represents the area under vegetables (fallow land excluded from cropped area averages).

This cropping pattern reflects the predominance of a rice based production system common in central India, where paddy continues to dominate the cropping calendar because of established production practices and favourable market support including minimum support price procurement^[6]. The limited crop diversity indicates continued reliance on cereal based cropping. Incorporating pulses and oilseeds into rice based sequences has been shown elsewhere to improve soil fertility through biological nitrogen fixation and to enhance system productivity and resilience.

Production constraints: Respondents reported constraints spanning institutional, production and labour dimensions

(Table 6). Among institutional constraints, delayed and inadequate fertilizer supply through cooperative societies was the most frequently reported problem, compelling farmers either to postpone field operations or to purchase inputs from private dealers at higher prices. Limited availability of quality seed at the appropriate time was also widely reported. These findings are consistent with broader evidence on the challenges facing smallholder agriculture in India. This suggests that strengthening institutional support, including timely credit delivery and input availability, could substantially benefit marginal and small farmers, who constitute the majority of the sample.

Table 6: Category-wise Constraints Reported by Respondents

Sl. No.	Category	Constraints
1	Institutional	(i) Delayed and inadequate supply of fertilizers through societies, resulting in untimely nutrient application and input shortages.
		(ii) Non-availability of quality seed at the time of sowing, leading to delays in crop establishment.
2	Production	(i) Frequent incidence of stem borer infestation.
		(ii) Unpredictable weather conditions leading to waterlogging.
3	Labour	(i) Acute shortage of agricultural labour during peak farm operations leading to delays in farm activities.

Among production related constraints, farmers most frequently cited pest and disease incidence, particularly stem borer (*Scirpophaga incertulas*) and plant hopper (*Nilaparvata lugens*) rising input costs and increasingly erratic weather leading to waterlogging. This mirrored the yield loss due to pest challenges reported across Indian rice growing regions^[12]. Integrated pest management combining field surveillance, biological control and judicious pesticide application has been shown to reduce both yield losses and chemical use elsewhere while climate adaptation studies similarly emphasise integrating agronomic and institutional measures to strengthen production resilience^[10, 12].

Labour related constraints centred on seasonal shortages of hired labour during transplanting and harvesting attributed by respondents to out migration, higher alternative wages and declining participation in farm work. This scarcity was, in turn, reported to be driving increased demand for mechanization, particularly among medium and large farmers with greater capacity to invest in machinery while

marginal farmers more frequently reported continued dependence on manual operations because of limited access to affordable custom hired machinery. This supports the national evidence that rural out migration, rising agricultural wages and declining participation of younger household members have intensified seasonal labour scarcity^[19, 20] and the associated increase in demand for mechanization aligns with evidence that labour shortages are a major driver of farm mechanization across South Asia, although access to machinery remains unequal across farm-size groups^[11]. Institutional and labour related constraints were reported with greater frequency than purely agronomic or technical difficulties suggesting that the binding constraints on paddy productivity in the study area are concentrated in the surrounding support system rather than in crop husbandry itself. Expanding Custom Hiring Centres, promoting machinery sharing arrangements and strengthening Farmer Producer Organizations could improve timely access to farm machinery while reducing the cost burden on smallholders

through collective resource mobilisation ^[21]. Collectively, these findings indicate that improving institutional support, ensuring timely input supply, expanding access to mechanization, strengthening farmer organisations and promoting integrated pest management merit priority alongside technological interventions to sustainably enhance rice productivity and resilience in the study area.

Limitations

The cross-sectional design and purposive selection of a single district limit the generalisability of the findings beyond broadly comparable agro-ecological settings and the descriptive approach. Future research incorporating multivariate econometric analysis and panel data across a wider set of districts would help establish the robustness of the patterns identified here and quantify the contribution of individual constraints to observed productivity gaps. Taken together, these findings suggest that the future trajectory of paddy cultivation in Raipur district and by extension in comparable rice growing districts of central India depends less on new production technologies than on strengthening the institutional and structural environment within which smallholder households already operate. A coordinated approach that improves input supply reliability, expands access to institutional credit and mechanization and modernises irrigation management is likely to yield more durable improvements in productivity and livelihood security than isolated technical interventions.

Conclusion

This study provides an integrated assessment of the socio-economic characteristics, farm structure and production constraints of paddy farming households in Raipur district, Chhattisgarh. Rice cultivation in the study area is practised predominantly by marginal and small farmers operating limited land resources but comparatively favourable irrigation access, supported by a working age, moderately literate population. At the same time, the persistence of fragmented, owner-operated holdings continues to restrict economies of scale, mechanization and investment capacity echoing patterns observed across much of Indian agriculture. Paddy remains the cornerstone of the local agricultural economy during kharif, while in rabi, diversification is limited primarily to wheat and gram, with negligible zaid cultivation owing to declining groundwater availability. This rice based system supports regional food security and benefits from established procurement mechanisms, but it also concentrates farmers' exposure on a single crop and limits opportunities to improve farm income and resilience through expansion of suitable post-kharif cropping. Strengthening water resource management, improving irrigation efficiency and promoting suitable low water demand crops during the zaid season could enhance cropping intensity and reduce exposure to climatic, pest and market related risks. The constraint analysis indicates that institutional barriers like delayed input availability and seasonal labour shortages in particular reported more frequently than purely technical production problems. Addressing these constraints through timely input delivery, expanded access to mechanization via Custom Hiring Centres, improved irrigation management, and support for suitable rabi and water-efficient zaid cropping is likely to yield meaningful productivity and equity gains alongside technological innovation.

Given the cross-sectional, single district scope of the data, these conclusions should be interpreted as indicative rather than nationally generalisable. By documenting the socio-economic profile and production challenges of paddy farming households in a strategically important rice producing district, this study contributes to a more integrated understanding of the structural factors shaping sustainable rice production and offers practical guidance for policymakers, extension agencies and researchers working toward more resilient smallholder farming systems.

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Conflict of Interest

The authors declare no conflict of interest.

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