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A study on socio economic aspects and constraints faced by hybrid paddy (Arize 6444 gold) cultivators in Kaushambi district of Uttar Pradesh

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Abstract

The study examined the significance of rice cultivation in India, emphasizing its role in ensuring food security and sustaining rural livelihoods, with particular focus on the performance and adoption of Arize 6444 Gold, a high-yielding hybrid paddy variety. This variety was recognized for its superior grain quality, shorter maturity period, adaptability to diverse agro-climatic conditions, and strong resistance to pests, diseases, and lodging, which collectively contributed to higher productivity and profitability. Its shorter growth cycle facilitated timely harvesting and crop rotation, thereby optimizing resource utilization. Arize 6444 Gold performed well under both irrigated and rainfed conditions and commanded a higher market value due to its desirable grain appearance and cooking quality. The socio-economic profile of respondents revealed that middle-aged farmers (35-45 years) constituted the largest share, followed by younger groups, with marginal farmers dominating across age categories. Educational levels were highest at the SSC level, with relatively few graduates, while landholding patterns confirmed the predominance of small-scale agriculture. Performance assessment indicated that a majority of farmers fell into the low-performance category, reflecting resource limitations and capacity constraints. The most critical challenges reported by farmers included issues related to price, availability, and certification, whereas competitor pressure and communication gaps were perceived as comparatively minor obstacles. Overall, the study underscored the variety's contribution to yield stability, income generation, and sustainability in rice-based farming systems, while also identifying areas for targeted interventions to improve access, capacity, and market efficiency for smallholder farmers.

Keywords: Arize 6444 Gold, rice cultivation, hybrid paddy, farmer performance, agricultural sustainability

Introduction

Hybrid paddy cultivation had become an important innovation in modern agriculture, aimed at increasing productivity, improving grain quality, and ensuring greater resilience against biotic and abiotic stresses. Hybrid paddy varieties were developed through the cross-breeding of two genetically distinct parent lines to harness the benefits of heterosis or hybrid vigor, resulting in higher yields and better adaptability to varied agro-climatic conditions compared to traditional varieties. Among these, Arize 6444 Gold emerged as a prominent hybrid paddy variety that was widely preferred by farmers due to its exceptional yield potential, short to medium duration maturity, and superior grain quality. It demonstrated remarkable tolerance to major pests and diseases, including bacterial leaf blight and blast, which reduced the dependency on chemical inputs and production costs. The variety's strong stem structure and resistance to lodging ensured minimal post-maturity losses, while its uniform grain size, attractive appearance, and excellent cooking qualities increased its market demand and consumer acceptance. Arize 6444 Gold was also suitable for cultivation under both irrigated and rainfed conditions, enabling farmers in diverse regions to benefit from its performance. Its shorter maturity period allowed timely crop rotation and better utilization of land resources, enhancing overall farm profitability. By offering consistent yields even under challenging environmental conditions, this hybrid variety contributed significantly to food security, farmer income generation, and sustainable rice production systems.

Thus, the adoption of Arize 6444 Gold reflected the growing importance of hybrid paddy in transforming rice cultivation into a more efficient, profitable, and resilient agricultural practice.

Research Methodology

The research employed a purposive-cum-random sampling approach for selecting the district, block, villages, and respondents to ensure both relevance and representativeness. Kaushambi district was purposively chosen to minimize logistical challenges and save time for the investigator. Within the district, Manjhanpur block was selected owing to its higher concentration of farmers cultivating Hybrid paddy (Arize 6444 Gold). A list of villages in the selected block was prepared, and five percent of those with a significant number of such farmers were randomly chosen. From these villages, all Hybrid paddy farmers were listed and classified into five landholding categories: marginal (less than 1 ha), small (1-2 ha), semi- medium (2-4 ha), medium (4-10 ha),

and large (more than 10 ha). Using proportionate random sampling, 120 farmers were selected, along with 5 wholesalers, 5 distributors, and 10 retailers to examine socio-economic attributes, marketing costs, margins, price spread, efficiency, and related constraints. Primary data was obtained through a pre-tested structured schedule via direct personal interviews, while secondary data was gathered from relevant literature, official records, and reports at district and block levels. The data, pertaining to the 2024-2025 agricultural year, was processed and interpreted using suitable statistical tools to derive precise and reliable findings.

Analytical Tools

1. **Chi-Square:** $\chi^2 = \sum (O_i - E_i)^2 / E_i$
2. **Arithmetic Mean:** $= \sum x_i / N$
3. **Garrett Ranking:** $100 (R_{ij} - 0.5) / N_j$

Results and Discussion

Table 1: Distribution of Respondents According to their age group

Age Group (Years)	Marginal	Small	Semi- Medium	Medium	Large	Total Respondents	Percentage (%)
15-25	5	4	4	2	0	15	12.0
25-35	10	7	6	4	4	31	25.8
35-45	19	11	5	4	5	44	36.7
45-55	6	5	4	2	2	19	15.8
Above 55	2	4	4	2	1	13	10.8
Total	42	31	23	14	12	120	100
Chi-Square		6.26734					

Note: There is no significant relationship

Table 1: The data reflected that the majority of respondents (36.7%) belonged to the 35-45 years age group, indicating that middle-aged individuals were the most engaged in farming activities. The next largest segment (25.8%) was aged 25-35 years, suggesting notable participation from younger farmers. Farmers in the 45-55 years bracket formed 15.8%, while 12% were between 15-25 years, showing

limited involvement from the youngest group. The smallest proportion (10.8%) was above 55 years, indicating reduced activity among older individuals. Marginal farmers dominated across all age groups. The Chi-square value (6.26734) indicated no significant relationship between age and farm size.

Table 2: Distribution of Respondents According to their education.

Education Level	Marginal	Small	Semi- Medium	Medium	Large	Total Respondents	Percentage (%)
Below SSC	17	11	8	2	1	39	23.0
SSC	13	6	6	5	4	34	28.0
HSC	10	8	5	6	5	31	26.0
Graduation	2	5	2	1	2	15	13.0
Total	42	30	21	14	12	120	100.0
Chi-Square		13.2069					

Note: There is no significant relationship

Table 2: The data showed that the highest proportion of respondents (28%) had completed SSC, followed closely by those with HSC education (26%). Respondents educated below SSC formed 23%, indicating a considerable share with limited formal education. Graduates accounted for the smallest proportion at 13%, suggesting relatively fewer farmers pursued higher studies. Marginal farmers dominated

across all educational categories, particularly among those with lower educational attainment. Higher education levels such as HSC and graduation showed a relatively balanced distribution among different farm sizes. The Chi-square value of 13.2069 indicated a moderate association between education level and farm size within the study area.

Table 3: Distribution of respondents according to their Land Holding Size

Sr. No.	Landholding Category	Number of Farmers	Percentage (%)
1	Marginal (Below 1.00 ha)	35	35.0
2	Small (1.00-2.00 ha)	25	25.0
3	Semi-Medium (2.00-4.00 ha)	22	22.0
4	Medium (4.00-10.00 ha)	23	23.0
5	Large (10.00 ha and above)	15	15.0
Total		120	100.0

Table 3: The data indicated that the highest proportion of respondents (35%) were marginal farmers holding less than 1 hectare of land, reflecting the predominance of small-scale agriculture in the study area. Small farmers with 1.00-2.00 hectares accounted for 25%, while semi-medium farmers with 2.00-4.00 hectares made up 22% of the sample. Medium farmers, owning between 4.00-10.00 hectares,

represented 23%, and large farmers with holdings above 10 hectares formed the smallest group at 15%. The distribution highlighted that a majority of the farming community operated on limited land resources, which could influence productivity, income levels, and the adoption of modern agricultural practices.

Table 4: Distribution of Respondents According to their annual income

Sr. No.	Category	Percentage of Farmers	Number of Farmers
1	Low	55.0	66
2	Medium	40.0	48
3	High	25.0	30
Total		100.0	120

Table 4: The data revealed that the majority of farmers (55%) fell into the low category, indicating limited levels in the measured attribute, which could relate to productivity, resource availability, or adoption of technology. Medium-category farmers constituted 40%, representing a considerable portion with moderate performance or access to resources.

Only 25% were in the high category, showing a relatively small proportion achieving higher outcomes. This distribution suggested that most farmers operated at a lower capacity, with fewer enjoying the benefits of high performance. The findings highlighted the potential need for targeted interventions to improve efficiency, productivity, and overall performance across the farming community.

Table 5: Constraint in marketing of Arize 6444 gold

Constraints	Garrett's Value of Response							Sum	value	Ranking
	1	2	3	4	5	6	7			
Price	1326	990	798	550	731	578	189	5162	51.62	1
Competitor	1014	990	741	750	387	374	504	4760	47.6	6
Transportation	1404	660	684	900	559	374	378	4959	49.59	4
Communication Gap	936	792	798	650	645	544	378	4743	47.43	7
Availability	1092	1188	1026	750	731	408	126	5321	53.21	2
Quality Problem	936	858	855	800	602	612	252	4915	49.15	5
Certification Problem	1092	1122	798	600	645	510	273	5040	50.4	3

Table 5: The ranking of constraints based on Garrett's mean scores revealed that price-related issues were the most significant challenge, with the highest score of 51.62. Availability ranked second (53.21), indicating that timely and adequate product supply was a major concern for respondents. Certification problems stood third (50.40), reflecting regulatory or compliance-related barriers. Transportation difficulties ranked fourth (49.59), followed by quality problems (49.15), highlighting issues in product standards. Competitor pressure (47.60) and communication gaps (47.43) were ranked lowest, suggesting they were relatively less critical compared to other constraints. Overall, pricing, availability, and certification emerged as the top three priority areas for improvement.

Conclusion

The study concluded that farming in the study area was primarily dominated by middle-aged individuals, with the highest proportion of respondents belonging to the 35-45 years age group, followed by a considerable share of younger farmers aged 25-35 years, while participation declined among the youngest and oldest categories. In terms of education, the majority had completed SSC, with a notable share attaining HSC, whereas fewer farmers were graduates, reflecting limited higher educational attainment. Landholding patterns revealed a predominance of marginal farmers with less than one hectare, highlighting small-scale agriculture as a prevailing characteristic. Most respondents fell into the low category for the measured parameter,

indicating limited productivity, resources, or technological adoption, with a smaller proportion achieving higher performance levels. Garrett's ranking analysis showed that price issues, availability, and certification problems were the most critical constraints, followed by transportation and quality concerns, while competition and communication gaps were relatively less significant. Overall, the findings suggested that small landholdings, moderate educational attainment, and operational challenges collectively influenced productivity and profitability. The results emphasized the need for targeted interventions in resource access, skill development, and infrastructure support to enhance farming efficiency, economic returns, and sustainability within the agricultural community.

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