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Socio-Economic Characteristics of Rice bean (Vigna Umbellata) Farmers in Nyanza Region, Kenya

Socio-Economic Characteristics of Rice bean (*Vigna Umbellata*) Farmers in Nyanza Region, Kenya

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Abstract
This study examined the socio-economic characteristics of rice bean farmers in Nyanza region to provide baseline information for agricultural project interventions. A cross-sectional survey employing multi-stage, purposive, proportionate, and snowball sampling techniques sampled 397 rice bean farmers from six purposively selected sub-counties. Data was collected using semi-structured and open-ended questionnaires and analysed using both descriptive and inferential statistics. Results showed that 70% of the farmers were female, with an average age of 44 years, and most lacked formal education. Household sizes ranged between 5-10 members, and farming was the primary income source. Most farmers had 1-5 years of rice bean farming experience and cultivated less than 2.5 acres. Over half were not part of any farmer groups, though market accessibility was not a challenge. Pearson Chi-Square analysis showed that certain factors significantly influence rice bean production at different levels of statistical significance. Specifically, gender, farming methods, farming experience, market accessibility, and land size were found to have a meaningful association with rice bean production, as evidenced by their respective p-values of 0.061, 0.038, 0.000, and 0.070. Key challenges included lack of government support, unavailability of viable seeds, and limited knowledge of the crop. The study recommends that government and development partners develop strategies to promote diversification through awareness, training, and sensitisation on emerging crops like rice bean to enhance resilience against climate change.

Introduction
Global population growth is driving up food consumption, leaving many people food insecure (United Nations, 2021). According to the World Bank (2023), approximately 783 million people are food insecure, and current projections indicate a potential global increase in this number. In Kenya, the agricultural industry is the backbone of the economy, contributing approximately 33% to the country's Gross Domestic Product (GDP) and employing over 40% of the population, with 70% of these workers hailing from rural areas (FAO, 2021). However, a substantial proportion of Kenyans remain food insecure, with the national food poverty headcount rate standing at 32%, meaning that around 14.5 million people live below the food poverty threshold (NCPD 2019). This situation is linked to factors such as drought, rising food prices, and inefficient agricultural practices, which exacerbate the high levels of food insecurity. This indicates that the farming sector, which is the primary source of most consumed foods, plays a critical role in ensuring food provision, necessitating diversification to enhance food availability.

Rice bean (*Vigna umbellata),* being one of the underutilised legumes, is a multipurpose crop whose potential also needs to be exploited in Kenya. This will enhance agricultural diversification among farmers in tropical regions. Rice bean is an indigenous tropical bean native to South and Southeast Asia that thrives very well as an intercrop, thus ensuring economic and maximum utilisation of available land, especially in areas where land is a limiting factor. In India, it is grown as an intercrop with maize, on rice bunds, or terraces. It is primarily cultivated on residual fertility and moisture in marginal and exhausted soils, with little attention given to it by farmers. This bean is one of many "underutilised crops" or "orphan crops" that have gained popularity in recent decades due to their limited genetic variety and use in the global food supply. Although overlooked, this pulse has commercial significance and market value, along with nutritional benefits, as well as applications in livestock feed and soil fertility improvement (Joshi *et al*., 2008; Katoch, 2020; and Singh & Onte, 2020). Additionally, the seeds exhibit anti-inflammatory, antioxidant, and antidiabetic properties due to their substantial content of bioactive compounds (Yao et al., 2012; Bhagyawant et al., 2019). This makes rice bean an important legume that needs to be promoted and exploited.

Rice bean is a highly nutritious and versatile crop with significant potential to enhance food security, nutrition, and rural livelihoods in Kenya. However, despite these benefits, its cultivation and utilisation remain largely under-researched, underutilised, and underexploited. This lack of attention has restricted its adoption by farmers and its integration into national agricultural and nutritional strategies. Consequently, communities that could benefit from the crop, particularly smallholder farmers and vulnerable rural populations, continue to experience food insecurity and limited income opportunities. The objective of this study is to assess the socio-economic potentials and challenges faced by rice bean farmers in the Nyanza region of Kenya. By identifying key barriers, opportunities, and livelihood dynamics, the research aims to generate baseline data to inform policy decisions, guide targeted agricultural interventions, and support the sustainable development and mainstreaming of rice bean cultivation, thereby enhancing food security and rural livelihoods.

Methodology

Study area

The study was carried out in the Nyanza region, which is one of the most significant rice bean growing areas in Kenya. According to the Ministry of State (2009), the main economic activities in this region include agriculture, fishing, manufacturing, and mining. The crops grown in the area consist of cassava, rice, sweet potatoes, maize, and beans. Livestock activities encompass fish farming, beekeeping, and a limited number of dairy and beef operations.

Additionally, handcrafts such as soapstone carvings, woven baskets, and pottery support the local economy. The region is situated in the southwestern part of Kenya, near Lake Victoria. It encompasses part of the eastern edge of the lake and is predominantly inhabited by the Luo and Kisii people.

Study design

A cross-sectional survey design was used in the study, focusing on all rice bean-growing farmers in the region.

Sample size and Sampling procedure

A total of 397 households were sampled using Cochran's (1963) formula, which is ideal when the population is unknown. A multistage sampling procedure was employed to select the study areas. This sampling technique is suitable because the population under study is diverse and involves a unique commodity. First, the Nyanza region was chosen, as it is the major rice bean growing region in Kenya. Secondly, Migori, Siaya, and Kisii counties were purposely selected, as these are the counties where rice bean farming is mainly practised in the area, thus providing appropriate information on

rice bean farming. Thirdly, the sub-counties growing rice beans in each of the selected counties were purposely chosen based on information from the Ministry of Agriculture in these counties, and proportionate sampling was used to determine the number of respondents to study per sub-county. A snowball sampling procedure was then adopted to obtain the required sample for the study.

Data collection and analysis

Data for the study were collected using both structured and semi-structured questionnaires. Trained enumerators, selected from local villages with the assistance of community leaders, administered the questionnaires to rice bean farmers. The tool was designed to gather detailed information on the socio-economic characteristics of the rice bean households. To facilitate efficient data collection, particularly among semi-literate respondents, the Kobo Collect tool was employed during oral interviews between the researcher and the respondent. This digital method allows the researcher to type in the responses as given by the farmers. This ensured a high response rate, improved time efficiency, and enhanced data accuracy.

A pilot study involving 10% of the total sample size was conducted to evaluate the effectiveness of the research instruments, in line with Connelly (2008). During the pretest, 40 common bean farmers from Busia County were interviewed. Additionally, the data collection tool was reviewed by subject matter experts to identify any gaps or necessary improvements. Feedback from the pilot and expert reviews was used to refine the final questionnaire. Data were analysed using the Statistical Package for Social Sciences version 20. Analysis for both descriptive and inferential statistics was applied. Descriptive statistics were illustrated through tables and figures presenting respondent frequencies. To identify the factors influencing rice bean production, Pearson's chi-square test was used. The significance of the relationships between variables and rice bean production was assessed at the 1%, 5%, and 10% significance levels.

Ethical considerations

To adhere to research ethics, an authorisation permit was obtained from Masinde Muliro University of Science and Technology, which facilitated the acquisition of a licence from the National Commission of Science, Technology and Innovation (NACOSTI). The respondents were assured of the confidentiality of the information obtained and that it would be used solely for the research.

Results and Discussion

Social characteristics

The average age of the respondents was 44 years, as shown in Table 1. This finding suggests that the typical rice bean farmer is middle-aged.

Table 1: Age of the Farmers

	Minimum	Maximum	Mean	Std. D
Age (in years)	20.00	90.00	44.2141	14.47837

Middle-aged farmers are vital to the small-scale agricultural productivity of Sub-Saharan Africa (Babangida, 2016). Their desire to ensure their family's food security, coupled with the experience gained from rice bean cultivation, may have driven their involvement.

Rice bean farmers were also asked to indicate their social profiles, and the results are presented in Table 2. Most of the results revealed that males comprised 29.7% and females accounted for 70.3% of the 397 study participants. This suggests that a larger number of women are involved in rice bean

farming. These findings align with those of Finid et al. (2022), who reported a variance in gender participation in rice bean cultivation, with women being more involved than men. This is also consistent with research by Milicent (2014) that female farmers were more likely to produce bambara, a crop that is similarly orphaned (neglected) yet contributes to household food security.

Table 2: Social Characteristics of Rice Bean Farmers

social characteristics	Percent (%)
Gender	
Male	29.7
Female	70.3
Education level	
Middle College	4.8
No Formal Education	10.1
Primary	57.2
Secondary	27.2
Undergraduate	.8
Household size	
Between 11-15	.8
Between 5-10	47.1
Less than 5	51.9
More than 15	.3
Farming experience	
Less than 1year	30.0
1-5 years	59.4
6-10 years	6.0
More than 10 years	4.5
Group membership	
Yes	**24.9**
No	**75.1**

This implies that, given males are typically associated with cash crops, which focus on generating income, women are more active in developing crops that directly contribute to household food security. This is why women farmers need to be empowered in agricultural production sectors, as this would ensure their households remain food secure. This could be achieved through training, the provision of subsidies, and affordable credit facilities.

The findings also indicated that many of the farmers had a primary education (57.2%), followed by secondary education (27.2%), those with no formal education (10.1%), middle college education (4.8%), and undergraduate education (0.8%). This suggests that rice bean farmers primarily relied on their own experience and knowledge, as the majority lacked formal advanced education. Limited formal education among farmers can hinder the adoption of advanced agricultural techniques and reduce engagement with extension services. Educated farmers are generally more adept at understanding and implementing innovative farming practices, leading to increased productivity and income. Households had fewer than five members (51.9%). This implies that smaller, rural households cultivate rice beans. Smaller household sizes may limit the available labour force for farming activities, potentially affecting the scale and efficiency of rice bean cultivation. However, smaller households might also be more agile in decision-making and resource allocation, which can be advantageous in adopting new farming practices or diversifying crops to enhance food security. This is because underutilised crops with lower yields per unit area, such as rice bean, are crucial in maintaining food and nutrition security for households and communities by offering nutritious substitutes if the primary crop fails or during the interim between harvests (Mabhaudhi *et al.*, 2011).

Regarding farming experience, the largest proportion of farmers (89.4%) have cultivated rice beans for less than five years. The recent adoption of rice bean cultivation suggests a growing interest in this underutilised crop, possibly due to its nutritional benefits and adaptability. However, the limited experience may also indicate a need for targeted training and support to ensure sustainable farming practices and maximise yields. Khadka and Acharya (2009) highlight the importance of understanding local cultivation practices and farmer knowledge to promote underutilised crops, such as rice bean, effectively. The results further showed that 75.1% of rice bean farmers did not belong to any farmer groups, with only 24.9% affiliated with a farmer organisation. Low participation in farmer groups can limit access to shared resources, collective bargaining power, and information exchange. Farmer organisations often play a vital role in facilitating training, accessing markets, and advocating for farmer interests, which are crucial for the success of crops like rice bean. Walingo (2006) underscores the role of social and economic empowerment through collective action in agricultural projects, suggesting that increased participation in farmer groups can enhance the effectiveness of such initiatives.

Economic characteristics

The results indicated that most of the farmers (55.4%) earned less than KES 35000 annually, with very few (4.8%) earning above KES 65000 (Table 3). This implies that most of the rice bean farmers are economically disadvantaged.

Table 3: Economic Characteristics of Rice bean Farmers

Economic characteristics	Percent (%)
Income (Ksh)	
Below 35000	55.4
36000-45000	18.1
46000-55000	15.1
56000- 65000	6.5
Above 65000	4.8
Land ownership	
Community Land	50.9
Individual Ownership	45.8
Rented	3.3
Land size (Acres)	
Below 2.5	80.9
2.5-12.5	18.9
Above 12.5	.3
Distance to market	
Less than 30 min	26.7
30-60 min	58.2
60-90 min	11.1
90-120 min	2.8
More than 120 min	1.3

The results also showed that the majority (50.99%) of the rice bean farmers cultivated on community-owned land. This finding explains the choice to grow rice beans among the farmers. This is because farmers tend to grow food crops and undervalued crops such as rice beans on community and family-owned land, with a preference for commercial high-value crops being reserved for rented or individually owned land. Mdoda & Gidi (2023) assert that since land is the primary and critical component of agricultural production, having secure access to and ownership of land is essential for enhanced productivity and output across the board in agricultural production. The results further illustrate that most of the farmers (80.9%) had less than 2.5 acres of land. This indicates that rice beans are predominantly cultivated in small landholdings. The predominance of small-scale farming

suggests that subsistence farmers primarily undertake rice bean cultivation. This scale of operation may limit the adoption of mechanised farming techniques and access to financial services, thereby affecting productivity and income levels. However, smallholder farming can also promote efficient land use and crop diversification, which are crucial for achieving food security.

Moreover, the results showed that most rice bean farmers (58.2%) are located within a 30- to 60-minute drive from the output market, with 26.7% situated less than 30 minutes from the market. The relatively short distance to markets presents an opportunity for farmers to engage in commercial agriculture. Proximity to markets can reduce transportation costs, minimise post-harvest losses, and improve access to market information, thereby enhancing profitability. However, transitioning to market-oriented farming requires adequate infrastructure, effective market linkages, and the development of value chains. Enhancing market access and value chain development to transform subsistence farming into commercial enterprises is fundamental (The Kenya Agricultural Extension Policy, KASEP, 2023)

According to the results presented in Table 4, most rice bean farmers (77.6%) face challenges in accessing extension services. This suggests that rice bean farmers are hindered in obtaining the technical support necessary for the improvement and commercialisation of rice bean farming. Limited access to extension services is a common issue across all agricultural value chains. Nkurumwa et al. (2023) report that insufficient funding for public extension services, combined with a growing disparity between the number of extension employees and the number of farmers, has impeded the provision of extension services.According to the results as shown in Table 4. most of the rice bean farmers (77.6%) have difficulty in accessing extension services. This indicates that rice bean farmers constrained in accessing technical support that could facilitate the improvement and commercialization of rice bean farming. Limited access to extension services is synonymous to all agricultural value chains. Nkurumwa et al. (2023) reports that insufficient funding for public extension services and a growing disparity between the number of extension employees and farmers have hindered the provision of extended services.

Table 4: Access to Agricultural Support Services

Support services	**Not easy**	**Easy**	**Very easy**
	Percent	Percent	Percent
Extension services	77.6	11.6	10.8
Farm inputs	76.3	15.6	8.1
Marketing services	78.3	11.8	9.8
Credit facilities	82.6	9.8	7.6

Most rice bean farmers (76.3%) reported finding it difficult to access farm inputs. This lack of easy access to farm inputs hinders rice bean farmers from intensifying their production. This supports Gichangi et al. (2019), who stated that the utilisation of inputs that increase productivity is still a significant obstacle for smallholder farmers in Kenya. Regarding access to marketing services, the majority of rice bean farmers (78.3%) struggle to access these services. This limitation indicates that rice bean farmers are prevented from meaningfully participating in and benefiting from the rice bean value chain. According to Birch (2018), institutional marketing barriers and transaction costs associated with market knowledge and marketing procedures restrict farmers' market output. Similarly, most farmers (82.6%) lack access to credit. Limited access to credit restricts farmers from obtaining the necessary farm inputs needed to increase and intensify their rice bean production. It is widely believed that credit constraints significantly contribute to the low productivity of smallholder farmers (Assouto & Houngbeme, 2023).

Rice bean production

As illustrated in Figure 4.2, most of the rice bean farmers (75%) produced less than one bag of rice beans.

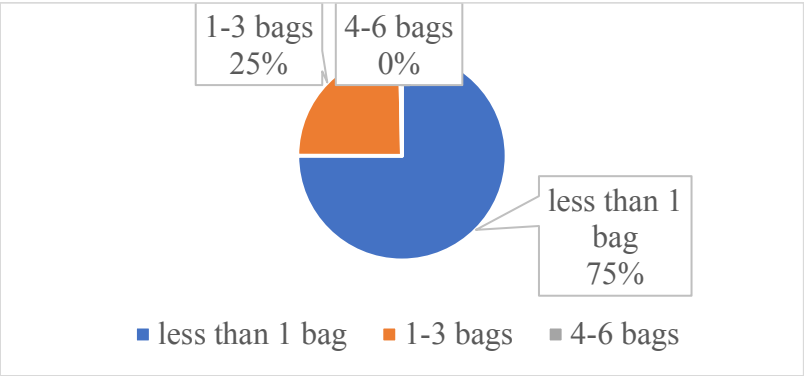

Figure 1: Rice bean production

This indicates that rice bean production has not been commercialised and is, to a large extent, merely subsistence. This limited scale of production reflects the crop's underutilisation and the challenges encountered in its commercialisation. This is supported by Finid et al. (2022), who reported that the productivity of rice beans in Kenya is low, relegating farming to a small number of farmers and even confining it to tiny areas of land where they are grown as intercrops.

Farmers' Perception of Rice bean

Table 5 presents the results of the perception factors considered necessary for rice bean farming.

Table 5: Farmers' Perception on Rice bean

	Mean	σ	SD	D	N	A	SA
			Percentages				
It thrives very well as an intercrop	4.01	1.228	2.5	19.4	1.3	28	48.9
It is a highly profitable crop	4.13	0.956	1.3	9.3	4.3	45.1	40.1
Availability of market for the crop	4.18	0.992	0.8	10.6	5.5	36.5	46.6
High value of the crop as family food	4.32	0.842	1.5	2.8	7.1	39.3	49.4
It has low cost of production	3.67	1.203	6	14.9	13.1	37.8	28.2
It is a drought resistant crop	3.44	1.271	9.6	17.9	12.8	38	21.7
It is good livestock fodder	3.57	1.363	9.8	17.4	12.1	27.2	33.5

The identified factors, ranked by mean from highest to lowest, are: value of the crop as family food (4.32), Availability of a market for the crop (4.18), Profitability of the crop (4.13), thrives well as an intercrop (4.01), and the least being drought resistance (3.44). The high value of the crop as a family food, considered the most crucial perception factor for rice bean farming, suggests that the crop is predominantly cultivated for household consumption; thus, there is a need to promote it. This is corroborated by Nanda et al. (2022), who reported that rice bean is predominantly grown by subsistence farmers on a minimal scale, with most of the produce intended for home consumption.

Source of Rice bean seed

As illustrated in Figure 2, the majority of rice bean farmers (67.8%) obtain their seeds from local markets. This indicates that rice bean farmers have limited access to improved planting materials offered by the government, NGOs, and private agribusiness service providers.

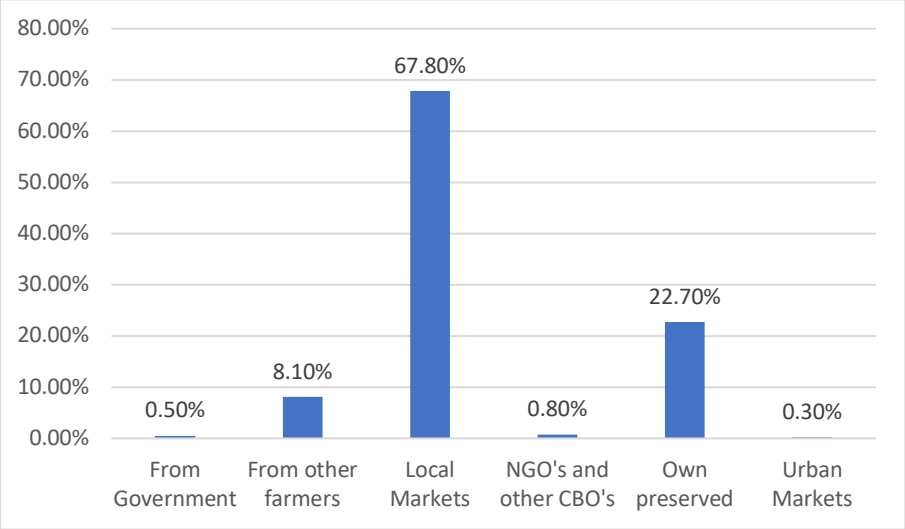

Figure 2: Source of rice bean seed

This finding aligns with the study by Ayieko et al. (2024), which revealed that more than half of rice bean farmers in western Kenya obtained seeds from farmers within their social networks. This occurs because farmer-based seed systems are characterised by individual farmers harvesting and storing seed, trading seed with neighbours, or purchasing grain from the local market and using it as seed (Munyi & De Jonge, 2015).

Source of knowledge on Rice bean

The majority of farmers (92.1%) learnt about rice beans from personal experience and their neighbours. This indicates that government knowledge and promotion of the crop remains minimal. As discussed by Liu and Yan (2024), while digital media can theoretically enhance information dissemination, its actual adoption and impact remain low unless there are strong pre-existing social networks that facilitate this transition.

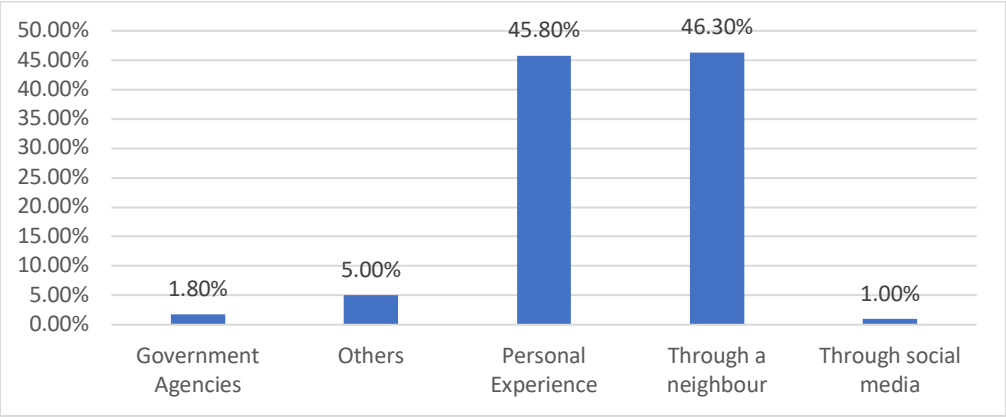

Figure 3: Rice bean Knowledge source

Given that personal and social networks continue to dominate information dissemination in rural farming communities, there is potential for greater integration of digital tools and formal sources, such as government agencies, which could help address knowledge gaps if adequately supported by existing social systems.

Relationship Between Farmers' Socio-economic Characteristics and Rice bean production

The results presented in Table 6 illustrate the Pearson Chi-Square analysis, which examines the relationship between various socio-economic characteristics of farmers and rice bean production. The findings indicate that certain factors significantly influence rice bean production at different levels of statistical significance. Specifically, farming experience and the farming method employed are the most influential factors affecting rice bean production, as demonstrated by their statistically significant p-values of 0.000 and 0.038, respectively. These results suggest that enhancing rice bean productivity requires targeted support for farmers with greater agricultural experience and the promotion of effective, modern farming techniques. Additionally, variables such as gender ($p = 0.061$), land size ($p = 0.074$), and market accessibility ($p = 0.070$) exhibit marginal significance, indicating a potentially meaningful association with rice bean cultivation. This suggests that gender roles, access to markets, and the size of landholdings may influence the level of rice bean production and should not be overlooked in policy formulation and intervention design.

Table 6: Chi-Square Test of the Relationship between Farmers' Socioeconomic Characteristics and Rice bean production

Variables	Pearson Chi-Square (χ^2)	Df	N	Asy Sig (2-sided)
Gender	5.593	2	397	0.061*
Education level	4.170	8	397	0.841
Land size	8.539	4	397	0.074*
Income level	4.535	8	397	0.806
Farming Experience	58.156	6	397	0.000***
Market access	14.489	8	397	0.070*
Farming method used	6.518	2	397	0.038**
Group membership	0.496	2	397	0.780
Access to extension Services	2.225	4	397	0.694

* = 10% significance level, **= 5% significance level and ***=1% significance level

These results suggest that enhancing rice bean production requires targeted interventions focusing on these key factors. For instance, gender differences may play a role in access to resources, decision-making, or labour availability, which could impact productivity. The farming method used, whether traditional or improved, influences overall efficiency, input utilisation, and output levels. Additionally, farming experience significantly affects productivity, as more experienced farmers are likely to possess better agronomic knowledge, risk management strategies, and adaptability to changing conditions.

Market access also emerged as a critical factor, indicating that farmers with better market linkages are more likely to achieve higher yields due to improved price incentives, input availability, and information exchange. Similarly, land size plays a role in determining yield potential, as larger plots may facilitate diversified cropping, mechanisation, and better resource allocation.

Findings from previous studies, such as those by Dama-Balima et al. (2018) and FARA (2023), align with these results, emphasising the importance of land size and farming methods, particularly the contrast between traditional and improved systems in influencing the productivity and market viability of underutilised crops like rice beans. These studies highlight that access to improved technologies, modern agricultural practices, and efficient market channels can significantly enhance the yield and commercial potential of these crops.

Conclusion

The study highlights a significant gap in rice bean research within the African context, with much of the existing literature based on findings from other continents that may not reflect the unique socio-economic realities of Kenyan farmers. Notably, rice bean cultivation in Kenya is predominantly undertaken by women and young farmers, most of whom possess limited formal education and minimal farming experience. These characteristics indicate a pressing need for targeted educational and capacity-building initiatives.

The analysis further indicates that key factors influencing rice bean production include gender, farming methods, farming experience, land size, and market accessibility. Despite its potential, the crop faces several production challenges, such as limited government support, poor access to quality seeds, and low farmer awareness.

To address these issues and unlock the full potential of rice bean in Kenya, it is recommended that the government develop and implement comprehensive policies that prioritise farmer education, training, and awareness, especially on emerging crops. It should also provide subsidised access to essential inputs such as certified seeds and fertilisers, and introduce incentive programmes to promote modern farming practices, particularly among women and youth, who make up the majority of rice bean growers.

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