

Farmers' perceptions and determinants of indigenous technical knowledge (ITK) use in ricebean production in Nyanza Region of Kenya

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ABSTRACT

This study examined the perceptions of farmers towards Indigenous Technical Knowledge (ITK) in ricebean (*Vigna umbellata*) production. It was guided by the perception-adoption mediation framework based on the diffusion of innovations and technology adoption theories. The survey design applied was a cross-sectional survey on ricebean-growing farmers in the Nyanza region. Purposive, systematic and snowball sampling was used to recruit 397 respondents. Data were collected through a structured questionnaire and key informant interview and analysed using descriptive statistics, the perception index and multivariate regression analysis. Farmers highly ranked ITK in terms of environmental friendliness (mean=4.49), low cost (4.33), accessibility (4.18), cultural acceptability (4.17) and human safety (4.16). Moderate ratings were given to effectiveness, and similarity to CK was the lowest (3.08). Education had a significant effect on the perceptions of effectiveness ($p \leq 0.001$), availability ($p \leq 0.013$) and affordability ($p \leq 0.020$); land size had an effect on the perceptions of effectiveness ($p = 0.058$) and environmental friendliness ($p \leq 0.005$); income level had an effect on the perceptions of effectiveness ($p \leq 0.001$) and affordability ($p \leq 0.041$). Differences in genders were significant with human safety ($p \leq 0.033$), environmental friendliness ($p \leq 0.033$) and ITK resembling CK ($p \leq 0.070$). The results indicate that ITK is significant in that it is cost-effective and environmentally friendly and culturally acceptable, and there is a need to tailor-create interventions according to the socio-demographic variables in order to make ricebean farming sustainable.

Keywords: Farmers' Perception, ITK, Nyanza Region, Ricebean Farming, Sustainability

I. INTRODUCTION

Indigenous Technical Knowledge (ITK), refers to general wisdom of practice-based information, cultural morals and natural knowledge gained and transmitted between generations of farming communities within a particular locality (Munawar & Khalid, 2025). Such knowledge systems are also characterized to flourish in a highly culturally specific context and they often take place on the agroecological ecofacts such as intercropping, crop rotation, agroforestry, and soil and water conservation practices (Melash et al., 2024). In the ricebean cultivation, ITK will combine the methods that will be compatible with the local soil and weather conditions as well as be sustainable in cases when the scarcity of resources and environmental risks are of primary significance.

ITK is becoming a prospective solution to sustainable agriculture among policy makers and scientists with shifting weather patterns and biodiversity loss (Intergovernmental Panel on Climate Change (IPCC), 2018; Chimakonam & Ogbonnaya, 2021). In the most recent overview analysis, the role of ITK in the realization of SDG 2 (Zero Hunger) is emphasized in the African context, with it being applicable to food security, ecological restoration, and community resilience (Kom & Nethengwe, 2024). Quantitative gains in yield stability, optimization of resource use and sustainability of the ecological basis have been achieved in smallholder systems that have intelligently weighing ITK into modernized practices (Patton et al., 2025; Melash et al., 2024).

It has also been pointed out that perception of farmers towards ITK is also a key determinant of how farmers adopt ITK and therefore sustainability of the ITK. An example is when a survey conducted by the researchers Gashu et al. (2025) in Ethiopia on the adoption of agroforestry, the variables that appear to have the strongest effect on the perceptions as well as the decision made by the adopters of the agroforestry include the level of education, access to extension, size of the family, and the slope of the farms. On the same note, the evaluation of ITK in multiple communities shows that the knowledge on ITK also exhibits strong correlation with the perceived resilience and food security impacts (Caviedes et al., 2024). Regardless of all these advantages, the communities engaged in farming will tend to undermine the application and transmission of ITK. Modernization, young people emigration and the modern trend of commercial agriculture are the contemporary forces that result in generational abandonment of the indigenous techniques (Achieng,

2023). In Kenya, a baseline study result had reported that the practice of national and county policy on indigenous knowledge was perceived most frequently, but the implementation and protection level was low (Forest Peoples Programme, 2025).

In ricebean farming communities particularly, ITK is used to ensure soil fertility usually through intercrops with legumes or agro forestry improves management of pests and diseases in a natural setting and biodiversity is preserved by saving seeds and planting a variety of crops. Yet, the views regarding the usefulness, scalability, and compatibility of ITK differ across the board, depending on the socio-demographic characteristics (age, education level, landholding size, incomes, and market orientation) (Melash et al., 2024). Theoretical perspectives of technology adoption postulate that socio-structural factors interact with the perceived dimensions of complexity, with age, farm size, the intensity of information and the intensity of work being significant of the factors with adoption behaviour (Vecchio et al., 2022). It is through understanding these regions that we are able to reason why some farms are using ITK and others are applying input-intensive and modern methods of farming.

1.1 Statement of the Problem

Although ITK has a role in ensuring smallholder system sustainability, resilience, and food security (Kom & Nethengwe, 2024; IPCC, 2018), its usage in farming systems has not been given much importance and integration into policy and extension in Kenya (Forest Peoples Programme, 2025). ITK in the scenario of ricebean, a nutrient-containing, climate-resistant legume, includes activities such as the choice of seeds, planting schemes, soil fertility, pest and disease management, and post-harvesting practices. Local knowledge has been undermined by modernization, market forces and top-down agricultural interventions that tend to remove the traditional practices. This marginalization is not only a threat to the loss of biodiversity and adaptive practices but also the lower sustainability of the farming systems. According to previous research, indigenous and agroecological practices are perceived and adopted based on the socio-demographics and situations of farmers (Gashu et al., 2025). Hence, without a sense of how the farmers perceive it and the socio-economic, cultural and institutional factors that affect the incorporation of ITK, there may be a failure in the attempts to restore the farmers to the realities and enhance what they already have. This is why this study will be able to fill this gap.

1.2 Research Objectives

The study was based on the following objectives:

- i. To determine the levels of farmers' perception across eight ITK attributes: effectiveness, availability, affordability, ease-of-use, similarity to conventional knowledge, human safety, cultural acceptability, and environmental friendliness.
- ii. To evaluate the socio-economic factors (age, gender, education level, size of household, size of land, income, marital status, group affiliation and market access) that influence farmers' perceptions on ITK use.

II. LITERATURE REVIEW

2.1 Theoretical Framework

The model by which this research is to be constructed is Perception Adoption Mediation Framework.

2.1.1 Perception -Adoption Mediation Framework (PAMF)

PAMF is a hypothesis of the way the worldview of people affects their activity in its adoption. The study uses a perception-adoption mediation model that follows the Diffusion of Innovations and incorporates such attributes as relative advantage, compatibility and complexity, suggesting that mediating variables are perception variables that can be used to connect farmer characteristics with their adoption decisions (Montes de Oca Munguia et al., 2021). In Agriculture, willingness to continue using or applying Indigenous Technical Knowledge (ITK) together with Conventional Knowledge (CK) is attributed to numerous variables that encompassed the perceived availability, cost-effectiveness, ease of operation, safety to humans, cultural acceptability, sustainability to the environment, and the perceived effectiveness. It may be achieved through mixing or pragmatism of the quantitative perception estimates and the qualitative data in mixed-method pragmatism (Johnson & Onwuegbuzie, 2004).

2.2 Empirical Review

The existing research on agroecology shows the importance of Indigenous Traditional Knowledge (ITK) in boosting the fertility of soils, biodiversity and resilience, including intercropping, crop rotation, seed saving, and requiring less external input (Melash et al., 2023). Likewise, the policy frameworks and climate studies are increasingly becoming aware of the importance of Indigenous Knowledge as a means of adaptation and a guarantee of Sustainable Development Goal 2 (IPCC, 2018; Kom & Nethengwe, 2024), which is being implemented and maintained in minimal

amounts (Forest Peoples Programme, 2025), which is one of the reasons behind the loss of traditional practices to the influence of modernization and the migration of young people to the urban centres.

Another similar study is the analysis of the association between education and access to extension and the household features regarding the degree of knowledge and adoption of tree-based and indigenous-practices systems (Gashu et al., 2025). Cross-contexts discover that familiarity with the native practices is related to the perceived advantage of resilience and food security (Gomez-Baggethun et al., 2013). The experiment of using modern and indigenous system in experiments on the smallholder system found out that the 2 systems could be used together to stabilize output and enhance resource efficiency (Melash et al., 2023). Inequality in perceived effectiveness and scalability is also reported in literature, blamed on the market orientation, the degree of the land, and education (Manh & Ahmad, 2021).

III. METHODOLOGY

The research was held in Nyanza region of Kenya that has been the most ricebean farming region because it has the presence of favorable agro ecological conditions as well as its culture of farming ricebean. The study adopted cross-sectional research to obtain data at a selected time in a heterogeneous population of farmers involved in ricebean farming. Structured questionnaires, key informant interviews alongside focus group discussions were used to collect the information quantitatively and qualitatively respectively.

The sampling was done based on multi stage, purposive, systematic and snowball to maintain the representation on various farming households. This methodology made it possible to have a thorough insight into the indigenous practices and the prevailing conditions of ricebean production in the area. The multistage method of sampling was adopted because the target population was spread widely geographically and very few ricebean farmers were available. The initial step was to pick Nyanza region because it is the main area where the cultivation of rice beans is practiced in Kenya. The second stage consisting of Migori, county; Siaya, and Kisii counties was selected purposely because ricebean farming is mainly practiced in these counties and was therefore sure that the right and precise data would be collected. Purposive selection of sub-counties within each of these counties considering information that was received through the Ministry of Agriculture was the third stage. Lastly, snowball sampling was used to locate and obtain the necessary amount of farmers to participate in the study.

The sample size was calculated as Cochran (1963) formula of a population that is not known. There were 397 participants in the research. The statistics were based on inferential and descriptive statistics to analyze the data. The descriptive statistics adopted included mean, frequency and percentages on multi response analysis and crosstabs. The socioeconomic factors influencing the perception of the farmers towards ITK in ricebean farming were also carried out using the multivariate regression analysis.

IV. FINDINGS & DISCUSSIONS

4.1 Farmers' Perception on ITK in Ricebean Farming

Table 1 provides an overview of how Indigenous Technical Knowledge (ITK) is perceived in the following dimensions: effectiveness, availability, affordability, ease of use, safety, cultural acceptability, environment friendliness.

Table 1
Farmers' Perception on ITK in Ricebean Farming

Description	Mean	Std Dev.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			%	%	%	%	%
Effectiveness	3.63	1.451	5	32.5	2.5	14.1	45.8
Availability	4.18	0.926	3.5	2.8	5.8	47.6	40.3
Affordability	4.33	0.896	2	3.5	6.3	35.5	52.6
Easier to use	3.96	1.153	6.8	7.1	6.5	42.8	36.8
ITK same as CK	3.08	1.563	25.7	14.4	12.8	20.4	26.7
Human safety	4.16	0.868	2.8	1.8	9.1	49.9	36.5
Culturally acceptable	4.17	0.895	3	1.3	10.8	45.1	39.8
Environmentally friendly	4.49	0.747	0.5	2.3	5.5	31.5	60.2

From the results, 45.8 percent of respondents hold strongly the belief that ITK is effective, 32.5 percent disagree to the assertion, and 21.7 percent have no opinion. This signifies a divided decision but with a predilection towards the acceptance of the effectiveness of ITK. This is similar to other studies which imply the role that ITK plays in enhancing the resilience of agricultural systems in customary production schemes. The success of ITK can be explained by the fact

that they are localized according to local needs in a way that smallholder farmers can use this practice as a solution (Jha et al., 2020). However, the severe difference may indicate concerns regarding the feasibility past the threshold, competitiveness with the modern practice, which is a vulnerability noted in the literature (Bora et al., 2021).

47.6 percent of farmers believe or strongly believe that ITK is available. The positive sentiment of high availability can probably be attributed to the fact that it is the ITK that is transferred across the generations and is readily accessible in the farming communities. It was stated that ITK is already widely embedded in many rural communities and can be a readily available source of agro-knowledge (Lenka & Satpathy 2020). The small percentage of people who disagree or are neutral to its availability indicates that it is easy to access at the local level.

Most of the respondents 52.6 percent strongly agree and 35.5 percent agree that ITK is affordable. This may be a clue to the low maintenance requirements of conventional types of agriculture, which are typically resource-efficient and make use of materials available locally (Phakathi & Sinyolo 2025). It is also widely associated with reduced externalities, which is an advantage by the smallholder farmers who are not as financially endowed. The 6.3 percent perceived neutral and 5.5 percent in disagreement, however, could indicate that to some farmers, adoption of practices involving ITK as an element may involve more investments, which could have a bearing on the affordability factor.

ITK got 42.8 percent rated easy to use and 36.8 percent rated strongly easy to use on its ease of use rating. ITK is simple and familiar, which aids in its ease of use. Studies like Mudekhere et al. (2023) also show that ITK may be very easy to use as it can be integrated with knowledge regimes with centuries or even generations of practice by farmers, therefore, involving no new training or skills. However, it is a possibility that 6.8% who strongly disagree include farmers who experience difficulty in adopting ITK on the larger farms or more established infrastructures.

There are mixed reactions in the study as the number that strongly disagree is 25.7 percent, and the number of those who strongly agree is 26.7 percent that ITK is almost the same as CK. This indicates variability in perceptions, with some farmers recognizing ITK's distinctiveness from CK, as it incorporates local knowledge, biodiversity, and sustainability principles (Chaudhary et al., 2022). Others may treat ITK as supplementary or alternatives to CK, likely due to the growing trend toward combining both traditional and new cultivating methods.

Almost half of the respondents (49.9%), and a third (36.5%) agree very strongly that ITK also makes human safety possible, and this statement may be connected with the idea of human benefits and safety of organic farming practices that are not supported by the use of artificial chemical and result in human safety and health. This is in agreement to the findings of Johnson and Onwuegbuzie, (2004) who stated that ITK as an organically oriented technology is associated with fostering human friendly farming methods. In the present context, though, there could be reservation regarding certain aspects of traditional practice as is currently put in high-intensity farming as can be seen in the 9.1 percent respondents who relate neutral and 4.6 percent who relate unfavorably to the safety concerns.

Cultural acceptance of ITK Responses to this question reveal very high cultural acceptance with 45.1 percent agreeing and 39.8 percent strongly agreeing. The closely connected aspects of cultural practice and heritage to TK are also an advantage of its own, as it becomes acceptable to many farmers. A conclusion made by Chaudhary et al. (2022) is that ITK will in all likelihood, be intuitively aligned with the local cultural norms, which would tend to stimulate a wide usage. This cultural integration ensures that ITK would remain not only current but also acceptable regardless of the generational changes.

The perception of the respondents is quite high that the respondents are very environmental friendly, with 60.2 percent with strong agreement and 31.5 percent with agreement. The traditional practices are expected to supplement the environment in protecting the biodiversity and maintain sustainability. According to Nepal (2023), ITK is not as reliant on artificial inputs, and the method is concentrated on natural processes that precondition making the approach one of the contributions to the environment sustainability.

The average scores are inclined to demonstrate that they see ITK as the least interconnected with the affordability (4.33) and availability (4.18) factors, and most closely with the environmental friendliness (4.49) as the people have the idea that it is a more environmentally friendly and cost-effective technology with advantages of accessibility compared to the current practices. There is also a high score on cultural acceptability (4.17) and human safety (4.16), which further supports ITK in the context of affiliation with local tradition and low health risk. What could have been often the case is that ITK was found easy to use yet somehow ineffective by farmers depending on the variance in the context of the application. The lowest score ITK indicates the same thing as the traditional knowledge, which means that farmers primarily tend to think of ITK as a standalone entity that will not merge with the conventional farming systems unless it is changed or substantiated.

4.2 Socioeconomic Characteristics of Ricebean Farmers

Table 2 shows that the mean age of respondents is 44 years old, 70.3 percent of the respondents are women to 29.7 percent being male. Most respondents (57.2) hold primary education, the least held an undergrad (0.8) and majorities are married (80.1). A household has smaller size with more than half (51.9%) falling below five. A fifth (20.8%) is enrolled in groups, and more than half (55.4%) earns less than Ksh 35,000 indicating low income. Land

ownership is limited, as 80.9% own less than 2.5 acres, and while most have market access within 30–60 minutes (58.2%), a small proportion (1.3%) travel over two hours, reflecting challenges in accessibility. These characteristics have some influence on farmers' perceptions towards integrating ITK with modern farming practices as discussed.

Table 2
Socioeconomic Characteristics of Ricebean Farmers

Social Economic Characteristics		
Age	Average (44 years)	
Gender	Frequency	Percent (%)
Male	118	29.7
Female	279	70.3
Total	397	100.0
Education level	Frequency	Percent (%)
Middle College	19	4.8
No Formal Education	40	10.1
Primary	227	57.2
Secondary	108	27.2
Undergraduate	3	.8
Total	397	100.0
Marital status	Frequency	Percent (%)
Married	318	80.1
Separated	19	4.8
Divorced	1	0.3
Widow/widower	59	14.9
Total	397	100
Household size	Frequency	Percent (%)
Between 11-15	3	.8
Between 5-10	187	47.1
Less than 5	206	51.9
More than 15	1	.3
Total	397	100.0
Group membership	Frequency	Percent (%)
Yes	77	24.9
No	298	75.1
Total	397	100.0
Income level(Ksh)		
Below 35000	220	55.4
36000-45000	72	18.1
46000-55000	60	15.1
56000- 65000	26	6.5
Above 65000	19	4.8
Total	397	100.0
Land size (Acres)	Frequency	Percent (%)
Below 2.5	321	80.9
2.5-12.5	75	18.9
Above 12.5	1	.3
Total	397	100.0
Market Access (Distance to market)	Frequency	Percent (%)
Less than 30 min	106	26.7
30-60 min	231	58.2
60-90 min	44	11.1
90-120 min	11	2.8
More than 120 min	5	1.3
Total	397	100.0



4.3 Factors Influencing Farmers' Perception of ITK in Ricebean Farming

Table 3 illustrates how various socioeconomic variables can influence the attitude of various farmers toward Indigenous Technical Knowledge in Ricebean farming.

Table 3

Multivariate Regression Analysis of Factors Influencing Farmers' Perception of ITK in Ricebean Farming

		Age	Gender	Education years	Marital status	Hholdsize	Income level	Land size	Group membership	Market time	_cons
Effectiveness	Coef.	-0.00098	0.040493	0.252243	0.077325	0.4189734	-0.19912	-0.1715	0.437455	-0.03568	2.068038
	P>t	0.848	0.799	0.001**	0.443	0.002*	0.001*	0.058*	0.007***	0.494	0.003
Availability	Coef.	-0.00328	-0.05205	0.128089	0.116882	-0.1324414	-0.00824	-0.14388	-0.01237	-0.08782	4.537563
	P>t	0.331	0.619	0.013**	0.078*	0.141	0.777	0.016*	0.908	0.011*	0
Affordability	Coef.	0.001749	-0.10337	0.11651	0.056974	-0.1002644	-0.05807	-0.11481	-0.05257	-0.03359	4.682803
	P>t	0.595	0.312	0.02**	0.379	0.253	0.041*	0.048*	0.615	0.316	0
Easier to use	Coef.	0.001669	0.087781	0.047036	0.163749	-0.0996686	-0.00585	-0.14495	0.16709	-0.1693	3.980376
	P>t	0.69	0.5	0.459	0.047*	0.372	0.871	0.05**	0.209	0***	0
ITK sameas CK	Coef.	-0.01467	0.315259	-0.04122	0.130538	0.0851954	-0.14205	-0.17975	0.137929	-0.20975	4.205699
	P>t	0.009***	0.07*	0.627	0.236	0.568	0.003***	0.069*	0.438	0***	0
Human safety	Coef.	-0.00258	0.212265	0.01453	0.073958	-0.215805	0.003148	-0.05484	-0.00358	-0.05808	4.559631
	P>t	0.42	0.033*	0.764	0.24	0.012**	0.909	0.33	0.972	0.075*	0
Culturally acceptable	Coef.	0.004683	-0.14166	0.004902	-0.02097	-0.0069224	-0.0029	0.077269	0.142908	0.024517	3.777386
	P>t	0.16	0.171	0.923	0.749	0.938	0.919	0.188	0.177	0.47	0
Environmentally friendly	Coef.	0.003506	-0.18179	0.053085	-0.07025	-0.2053246	-0.0213	-0.02822	-0.05315	-0.00347	5.258502
	P>t	0.201	0.033**	0.202	0.193	0.005***	0.367	0.559	0.542	0.901	0

Based on the outcomes, education has a significant and positive effect on the perceptions of the use of ITK in terms of efficacy, availability and affordability ($p \leq 0.02$). This can be correlated with the results that education can increase the ability of farmers to sense, receive, and apply innovations in agricultural operations (Melash et al., 2023).

The size of the land occupied is of great importance in enhancing the effectiveness and environmental friendliness perceptions ($p \leq 0.005$). Similar tendencies have been created by agroecological research in which the magnitude of a farm can moderate the impact of an ecological plan; farm size can influence an ecological plan more favorably within the smaller to the middle size farms that have the ability to eagerly utilize the local knowledge that does exist (Moretti & Benzaquen 2025). In the same manner, Income is also positively related with perceptions, especially the effectiveness and affordability ($p \leq 0.001$ and ≤ 0.05 , respectively). The increased higher income has a higher resource capacity to implement ITK, and they can observe the fact that ITK is a resource (Rwema et al., 2025).

Gender also has a role on the perceptions whether ITK area is identical to conventional knowledge (ITK same as CK) and human safety and environment-friendliness ($p \leq 0.07$ to ≤ 0.033). Gender differences in the abilities and knowledge related to farming are reported and indicate culturally and experience-based roles of farming communities (Ramirez-Santos et. al, 2023).

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The research concludes that farmers in the area tend to have positive attitudes towards Indigenous Technical Knowledge (ITK) in ricebean production, especially in respect to its friendliness to the environment, affordability, accessibility, cultural acceptability, and its safety for human consumption. ITK is generally freely available and sustainable but the perceptions of its effectiveness were moderate and the perceptions about its similarity with conventional knowledge were mixed. Notably, education and size of land, income and gender proved as important socioeconomic factors that influenced these perceptions, and thus demographic and economic diversity played a major role in determining the prospects of ITK adoption.

5.2 Recommendations

Policy makers to come up with strategies and policies that formally recognize and safeguard ITK without weakening its incorporation in scientific studies. Extension Services to offer the training programs that authenticate ITK with scientific demonstrations to the concerns of farmers on its role and to enable the participation of everyone in the process whether based on gender or socioeconomic divisions to enhance equal sharing and adoption of knowledge. Agriculturalists and the agricultural community to facilitate farm to farm exchange platforms that can consolidate the passing down of ITK practices through generations as they exploit the ITK advantage of low costs, cultural depth, and ecologically friendly farming and selectively adopt effective features of modern technologies.

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