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Perceptions and Willingness of Farmer-Field School (FFS) Participants to Adopt System of Rice Intensification (SRI) Practices in the Bakolori Irrigation Scheme, Zamfara State, Nigeria

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Abstract

Production of rice as a staple food in Nigeria, is still faced with challenges; rise in productivity can partly be achieved when farmers are ready to embrace innovations like System of Rice Intensification (SRI). The study assessed the perception and willingness of Farmer-field school (FFS) participants to potentially adopt the Systems of rice intensification (SRI) practices at the Bakolori irrigation scheme, Zamfara State, Nigeria. Multi stage sampling was used to sample 307 Farmer Field-School (FFS) participants for the study. Questionnaire was used to collect data and FGD was held with some of SRI FFS participants. Results from the study indicated the average age of the respondents was 43 years, average household size of 10 people, farming experience of 20 years and a farm size of 2 hectares. The high percentage (68%) of the respondents shows their willingness to adopt all the SRI practices. Innovation characteristics of SRI were perceived high (composite mean=3) Observability (4.469) Trailability (3.314) Relative advantage (3.158) Complexity (3.135) compatibility (2.860) was viewed low. Binary logistic regression analysis revealed that age (P<0.05:0.042) and knowledge (P<0.05:0.012) were significant, which further indicates an influence on the willingness to adopt SRI practices. In conclusion, the most severe challenge faced was inadequate SRI recommended tools and machines; therefore, the TRIMING project should make these tools and machines available to encourage adoption. Farmers should also make efforts to purchase the tools and machines especially through their cooperatives.

Keywords: System of Rice Intensification, SRI Practices, Farmer Field-School, Innovation Characteristics, Perception, Zamfara, Nigeria.

Introduction

In spite of oil, agriculture remains the base of Nigeria's economy, providing the main source of livelihood for most Nigerians (Thrive, 2020). Agricultural production has been the lifeline for meeting the demand for food and shelter, however, production of crops like rice is faced with many limitations ranging from human and materials resources. Rice is a commodity that is getting the world attention, a staple food for more than half of the world's population (Klynveld, 2019). Nigeria is also the largest producer of rice in Africa and was ranked 15th in the world with a total production of 7.2 million tons of paddy equivalent to 4.5 million tons

of milled rice as of 2018 (USDA, 2018). The yield was obtained from 3.2 million ha of land under rice cultivation with an average yield of 1.41 tons of milled rice/ha which is considerably low compared to the 2018 consumption rate of 7.5 million tons of milled rice per annum (USDA, 2018). According to Klynveld (2019) about 3 million metric tons of rice was imported into Nigeria with a bill of about $5 million daily. In addition, there is the current challenge of low rice yields which is less than 3 tons per hectare (FAOSTAT, 2020).
However, in an attempt to address this, improved farm practices like Systems of Rice Intensification (SRI)) was contracted through the Transforming Irrigation Management in Nigeria (TRIMING) project. TRIMING is a 7-year project funded by the World Bank (WB) and implemented by the Federal Ministry of Water Resources (FMWR).The SRI Project is under component 3.2 of TRIMING Project that is aimed at assessing agronomic, soil and water management practices leading to on-farm innovations and testing of better practices to improve land and agricultural productivity and profitability for rice (TRIMING, 2018).SRI practices were demonstrated to the farmers by TRIMNG project through Farmer Field School (FFS). As an extension methodology that is participatory in nature, FFS is an approach that is meant to disseminate and fine-tune production technology in such a way that adoption rate becomes high. In this approach, farmers are trained on practical/experiments and hands-on activities that would build their critical thinking ability to be able to make better decisions on the best bet practices for their enterprise (Braun *et. al*., 2006). Building the knowledge capacity of farmers can also translate into better attitude towards potential adoption and intention to use a technology.
Furthermore, Franzel and Scheer (2002) defined adoption potential as the uptake of a new technology or practice when required information and material are made available to farmers. It involves determining its biophysical performance, profitability and acceptability to farmers. Assessing the potential adoption of SRI innovations has been deemed necessary for determining the willingness or not to adopt the SRI innovations by the participants. According to Franzel and Scheer (2002) to assess the adoptability of technology, it must be analysed from the farmers' perspective, which means much more than its biophysical performance and profitability. In particular, it must be feasible for farmers to plant and maintain, and it must be considered acceptable and desirable. Adopting improved farm practices like SRI practices that uses fewer inputs to produce more, can translate to better environmental, water management, and overall crop health. According to Ramasamy (2013) SRI is an agro-ecological methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients, promote the growth of root systems, increase and diversity of soil organisms, more outputs from fewer inputs.
In trying to scale up SRI in west African states, an organization called RICOWAS was implemented, the largest SRI scaling-up project to date, implemented over four years in 13 West African countries, starting in January 2023. RICOWAS can be considered a follow-on project to the SRI-WAAPP project, which was implemented from 2014-2016 and reached 50,048 farmers growing rice using the SRI method at 1,088 sites on 13,944 hectares across

13 countries, with 56% and 86% SRI yield increases for irrigated and rainfed lowland (Erika, S.and Khaoula J., 2022)

Statement of the problem

Rice production has been constrained by many factors among which are water availability, seed quality, low yield, land, labour, nutrients, mechanization. However, human factors such as views, attitude or behaviour towards a technology could equally constitute a constraint to rice production by farmers. Successes on investments in human and material capital for adoption of SRI by farmers through the TRIMING project which aimed to attain sufficiency in rice production; could be partly dependent on farmer's views and intention to adopt the SRI practices. Over the years, studies have focused on the adoption of SRI practices by farmers (Zacharia *et. al.,* 2013), while other studies centered on reasons for dis-adoption of SRI by farmers (Arsil *et. al.,* 2019).

This study aimed to examine factors that determine the readiness of the farmers technically towards adopting the newly introduced SRI practices at the BIS. To be technically ready, the farmers need to look at the technology from their own point of view and evaluate its innovation characteristics (Relative advantage, compatibility, complexity, trialability and Observability) against their conventional farm practices for adoption. Moreover, technologies when introduced may have variations with the farmer's practices and these variations need to be evaluated by the farmer for them to be able to choose the best bet practices.

Objectives of the Study

The general objective of the study is to assess the perception and willingness of FFS participants to adopt SRI practices in BIS Zamfara Sate, Nigeria. The specific objectives of the study were to:

i. Describe the socioeconomic characteristics of the SRI FFS participants,
ii. Describe the innovative characteristics of SRI practices as observed by the FFS participants
iii. Identify the SRI practices the FFS participants are willing to adopt,
iv. Determine the socioeconomic factors influencing willingness of FFS participants to potentially adopt SRI practices,
v. Identify challenges to potential adoption of SRI practices among FFS participants.

Hypothesis of the Study

Ho_1: There is no relationship between the socioeconomic characteristics of the FFS participants and their willingness to adopt SRI practices.

Methodology

Description of the Study Area

Bakolori irrigation scheme (BIS) lies within the Sudan Savanna Agro-Ecological Zone of Nigeria. It spreads across 23,000ha of land and covers 3 Local Government Areas (LGAs) namely, Talata Mafara, Bakura and Maradun, hosting more than 22,000 farmers. It has a population of 3,278,873 as of 2006 census and a projected population of 5,833,500 (NPC, 2022). The location selected for the Bakolori dam and the associated BIS is about 110km upstream Sokoto. The seasonal distribution in the study area is dominated by a single short rainy period with sharp intermittent storms from June to September. It is located near Talata-Mafara, between latitude 12°30′ and 12°50′N and longitude 5°50′ and 6°20′E. The Bakolori reservoir has a storage capacity of 450 million m^3 and covers an area of 8,000 hectares, extending some 19km upstream from the dam (TRIMNG, 2018).

The climate in the study area is dominated by a single rainy period, ranging from 500 to 1300 mm, with intermittent storms from June to September. The average air temperature is 30 ◦C with a peak at 35 ◦C between March and May (Siewe *et al.,* 2023). The main soil types in the area range from sandy loam to loamy sand, classified as Typic Haplustalf according to USDA classification, or as Haplic Luvisols/Lixisols in FAO-UNESCO nomenclature. Their pH varies between 5.4 and 6, making them moderate to slightly acidic (TRIMING-SRI, 2020). These soils are dominant on the slopes, while the floodplains in the area are predominantly black soils, originally lateritic with abundant iron; this element has become reduced rather than oxidized. Organic matter was high in some sectors, while it was moderate to low in others. Available phosphorus and exchangeable potassium are both low across the sectors. More than 80% of the cultivated irrigated area in this region is used for growing rice (Siewe *et al.,* 2023).

Multi stage sampling technique was used to select participants for the study. The first stage involved a purposive selection of ten intakes (intakes are structures that helps in drawing water from the source and then discharge this water to the withdrawal conduit, it is the entrance of water from the field channel to the farmer's field) that were engaged in the SRI practices within the BIS. The second stage involved a random selection of five FFSs within the selected intakes. The third stage of the sampling involved the random selection of participants at (43%) proportionate to size from the sample frame of 702 to make up the sample size of 307.

The study covers the farmer field school participants at the Bakolori irrgation scheme in Zamfara state only, the major language of the participants was Hausa, therefore the FFS facilitators were employed to administer the Questionnaire by translating the questions.

Data Collection

Data for the study were collected through administering a structured questionnaire containing questions on perception of SRI attributes, willingness or not to adopt SRI practices, challenges to adoption in an open and close-ended questions format, a 5 Likert type scale. A checklist was developed to guide Focus Group Discussions (FGD) held with

two groups of participants (12 Males and 12 Females) on 23th March, 2025. The consent of the participants were sought prior to the FGD and they were informed that the research was purely for academic purpose and that their responses will be treated with utmost confidentiality, therefore their candid responses will be greatly appreciated. The participants were given a token for transportation, snacks and drinks were served to motivate the respondents.

Likert type scale

A 5 points Likert type scale was used to rate the views of the participants on SRI innovation characteristics, they were asked to respond to each statement based on their degree of agreement or disagreement; 5 points for strongly agree SA; 4 points for agree A; 3 points for undecided U; 2 points for disagree DA; and 1 point for strongly disagree SD. The values on the 5 points Likert -type scale were added to obtain 15 and divided by 5 which are the highest score, to obtain a midpoint of 3. Any farmer having a score greater than 3 was regarded as having a favourable view on SRI practices, those with 3 were regarded as having moderate view while those with scores less than 3 were regarded as having unfavorable view on SRI practices. According to Likert (1931) the specific responses to the items will be combined so that individuals with the most favorable attitude will have the highest scores while individuals with the least favorable or unfavorable attitudes will have the lowest scores. According to Egwu (2016) in a study conducted to assess communication methods of disseminating agricultural information to farmers, Likert scale was used to assign nominal values to rate responses.

Reliability and Validity of research instrument

Testing for reliability is important as it refers to the consistency across the parts of a measuring instrument (Huck, 2007). A scale is said to have high internal consistency reliability if the items of a scale "hang together" and measure the same construct (Huck, 2007, Robinson, 2009). According to Wu (2012) in their study of an empirical research Poor Rural Agricultural Information Technology to adopt, asserted that, they adopted Cronbach's α coefficient generally for scale reliability. The results show that Cronbach's α of each factor has met the Hair' proposed standard, the threshold limit of 0.7, so scale's internal consistency is acceptable. The result of the internal consistency reliability on the 5 points likert type scale statements depicted a value of Cronbach alpha 0.7 which according to many researchers could be described as an acceptable range or value.

Table 1: Reliability statistics for the research instrument

	No of items	Alpha coefficient	Percentage	Remark
SRI Innovation characteristics	24	.733	73.3	Reliable
Socioeconomic characteristics	4	.706	70.6	Reliable

Source: Field survey, 2025

Validity tests of the research instrument

The validity of the questions on the 5 points likert type scale were checked for comprehensibility and consistency by the team of supervisors and the agreement of the items was confirmed. In a pretest, the questionnaire was checked for comprehensibility and clarity of the questions within the study group, after which some items were changed to improve clarity and comprehension.

Data Analysis

Data obtained in the study were analyzed using descriptive statistics (frequencies, percentages, and mean) for objectives 1 and 3. A 5 point likert- type scale was used to achieve objective 2 while objective 4, which determined the socioeconomic factors influencing the willingness of FFS participants to adopt SRI practices, was achieved using a Binary logistic regression model and to test hypothesis H_o. Opinion ranking was employed for objective 5, which identified the challenges to adoption of SRI practices. The study also used a mixed method of research design where information gathered during FGD was transcribed and used to discuss reactions of the participants. In this method, quantitative data and qualitative data were collected and analyzed separately. The responses from the FGD was analysed using narrative method The information and findings from the FGD was compared/related (triangulation) at the discussion stage of the research results (Creswell, 2012).

The perception of SRI practices by the respondents was measured based on the composite means derived from the responses to the statements on innovation characteristics of SRI (relative advantage, compatibility, complexity, trialability and observability). The dependent variable for this study was the willingness or not willing to adopt the SRI practices and was measured based on farmer's decision to adopt all the practices or not. The independent variables for the study were the socio-economic characteristics of the respondents such as; *Age:* Measured in actual age of respondent, *Sex:* Male 1 and female 2; *Marital status:* Measured as married 1, single 2, and widowed 3; *Educational status:* This was computed based on level of education attained and it was measured as: Quranic = 1, adult = 2, primary = 3, secondary = 4, tertiary = 5; *Household size:* Measured in number of people per household; *Farm size:* Measured in number of hectares dedicated to rice farming; *Farming experience:* Measured in years spent in rice farming; *Membership of Associations:* was measured as the number of associations a farmer belongs to. The higher the number

of associations a farmer belongs to, the more enlightened he becomes to build his social capital and make better decisions.

Challenges to potential adoption of SRI practices: These were measured by ranking the challenges according to severity as identified by the respondents.

The study applied a Binary logistic regression model to analyze the socio economic factors influencing the willingness to potential adoption of SRI practices by FFS participants. When faced with a decision regarding an innovation, a farmer adopts or rejects the technology (Nyanga, 2012, and Agresti, 2007). According to Worster *et al* (2007) in Binary logistic regression, the dependent variable must be categorical with two possible outcomes. The dependent variable Y is the probability of having the willingness to potential adoption (P) divided by the probability of not having the willingness to potential adoption of SRI practices (I-P) and it takes the value of 1 for potential adoption and 0 for no potential adoption of SRI practices.

Binary Logistic regression model

The binary logistic regression for this study is expressed as follows:

$Y = \ln [Pi / (1-P)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_{3+} \beta_4 x_4 + \beta_5 x_{5.+} e$

Where: Y = Potential adoption and is measured in terms of willingness to adopt all SRI practices as 1 and not willing to adopt as 0,

β_0 = Intercept,

β_i = Estimated parameters (coefficient of X_i),

$_i$ = Explanatory variables

X_1 = Age (years)

X_2 = Household size (number of people per)

X_3 = Farming experience (number of years spent in farming)

X_4=Farm size (ha)

X_5= Educational status

$\beta 1 - \beta 5$ = Logit coefficient

e = error term

Results and Discussion

Socioeconomic Characteristics of the Respondents

Age of the SRI farmers

The result from table 2 reveals that (41.7 %) of respondents are between the ages of 39 -40, about (27.3%) are between the ages of 50 - 59, while (4.0%) are between the ages of 19- 29 years old, whereas the mean age of the respondents was 43.5 years. This implies that most of the participants were still in their active years which could be a significant attribution when it comes to making decisions to either adopt a new idea or not; young and active persons tend to experiment more with new technologies compared to older persons that are risk averse. The finding suggests that the respondents were in their productive years,

which could be instrumental to the adoption of improved technologies as suggested by Sheik *et al.* (2003).

Aliyu *et al.* (2020) further stated that, as far as age is concerned one set of studies postulate a positive relationship between age and adoption (Meshram *et al*, 2012; Kassie *et al*., 2013) while the other postulates a negative relationship (Manda *et al*., 2015). Those who postulate a positive relationship argue that older farmers are more experienced and might have accumulated greater physical and social capital (Kassie *et al*., 2013). There are studies that have however, found positive relationship between age and adoption decisions (Langyintuo and Mungoma, 2008; Meshram *et al*., 2012) while 'negative relationship between the two has also been noted by other researchers (Teklewold *et al*., 2013).

Sex of SRI Farmers

The results from table 2 revealed that majority (62.3%) of the respondents were male, it also revealed that an appreciable percentage (37.7%) were female. The implication of this finding is that women are beginning to make impact on agricultural activities; they are no longer viewed as alternative farmers or those in the other modes of value chain.

This study's finding is also in contrast with some literature; as cited in Varma (2018) posited by AFDB (2000) and FAO (2011) that the combined time burden of household chores and farm work may have been too rigorous for women and affirmed that some traditions weakens women's rights to land and their position in accessing financial resources where collaterals are needed.The study is in agreement with the findings of Aliyu *et al* (2020) who in their study on farmers adoption of SRI postulated that, majority of the farmers they studied were male (81.5%) probably because of the tedious work of managing rice farms from land preparation to processing. The result was also in agreement with the findings of Carr (2008) that implied male domination of farming activities.

Marital Status of SRI farmers

Results from table 2 revealed that majority (96.0%) of the respondents were married. This indicates that marriage confer responsibilities on individuals such as food security, shelter, hence the need to embrace life changing technologies like SRI becomes a better option.However, (2.0%) of the participants in the SRI FFS were single. This indicates that agriculture is beginning to take its place as the best bet option for poverty reduction and curbing restiveness among the unmarried population.

Aliyu *et al.* (2020) found out in their study of SRI adoption, that a larger proportion of the farmers were married (68.5%). Akinbile (2007) also agreed that marriage confers responsibility on respondents to cater for their households through the various livelihood activities they are engaged.

Educational Status of SRI farmers

Examining the educational level of the participants, the result from table 2 revealed that majority (70.7%) of the participants had acquired Quranic education and an appreciable

number (15.0%) had primary education. This indicates that the participants have been exposed to rudiments of learning in the past; this could have invariably helped to prepare their minds for the learning experiences during SRI FFS sessions, which could result in behavioral change.

Kurnia *et al*. (2015) similarly reported that most of the farmers they studied (58%) had secondary education, 35% completed primary education. Education is expected to have a positive impact on adoption decisions (Moser and Barrett, 2003; Pender and Gebremedhin, 2008; Langyintuo and Mungoma, 2008; Meshram *et al*., 2012). The study of by Haldar *et al*. (2012) in Bardhaman district of West Bengal showed that educational level is important in adopting SRI. Similarly, the study by Manda *et al*. (2015) observed a positive relationship between education and the adoption of sustainable agricultural practices.

Household Size of SRI FARMERS

Result from table 2 revealed that (72.0%) of the respondents had a household size of 1-10 and about (29.0%) had 11-20 members per household. The mean household size of the respondents was 10 this could translate into availability of family labor on farms, which can have positive influence on adoption decisions.

This finding is in agreement with the findings of Pender and Gebremedhin (2008) who posited that household size is used as a proxy to capture labour endowment. The number of household members had a positive and significant impact in some studies on adoption of sustainable agricultural practices in general (Teklewold *et al*., 2013) and in some studies on SRI adoption in particular (Noltze *et al*., 2012). Akinnagbe and Adesina (2018) reported that majority (71.7%) of the farmers in their study area had a household size of 5-8 persons. This implies that the respondents had a fairly large household size. A study conducted by Onumadu, and Osahon, (2013) further indicated that 43.37% of the farmers had household size of 6 to 10 people, this implied that the farmers had a fairly large household size which might serve as an insurance against shortfall in supply of farm labour. Household size has a great role to play in family labour provision in agricultural sector in developing countries where manual labour is mainly used.

Farming Experience of SRI Farmers

Farming experience is denoted as the number of years spent in farming business. The result from this study in table 2, revealed that (41.0%) of the participants had 1-10 years of farming experience, the mean years of farming experience was of 20.1 years. With this number of years of experience, the participants might have been exposed to innovations and improved practices in the past, which will help build up a positive change in attitude towards adoption of SRI.

This finding is in agreement with Akinnagbe and Adesina (2018) who had an average farming experience of 15 years. Onumadu and Osahon (2013) found that 33.3% of rice farmers they studied had 11 to 15 years of that farming experience. It implied that farmers

were well experienced in rice farming. Kumar *et al*. (2020) however observed that, while longer farming experience generally induces farmers to obtain more information about improved technologies and practices from informal and formal sources and is associated with greater exposure to demonstrations or training and membership of farmers groups or cooperatives.

Farm Size of SRI Farmers

The result in table 2 shows that majority of the participants (82.0%) had 0.2-1.0 farm size, with a mean of 1.3 hectares, this could be due to land fragmentation acquired largely through inheritance. Large farm size could however play a positive role in the adoption decision of a farmer; this therefore implies that the smallness of land holding for rice farming could be a limiting factor in adoption decision of the participants.

Akinnagbe and Adesina (2018) agreed with Langyintuo and Mungoma (2008); Teklewold *et al*. (2013); and Manda *et al*. (2015) that total farm size is also important in adoption decisions of farmers. Onumadu and Osahon (2013) however, reported that majority (55.3%) of the farmers in their study area had farm size of 1.0 to 2.0 ha while 31.7% had 2.0 to 3.0 ha.

Membership of Associations

Membership of association was measured based on a farmer belonging to a cooperative or not. The higher the number of associations a farmer belongs to, the more enlightened he becomes to build his social capital and make better decisions. The result in table 2 shows that all the farmers (100%) belong to a cooperative society. It should be noted that cooperative membership is a prerequisite for belonging to a FFS platform.

According to Onumadu and Osahon (2013) in their study area found that majority (73.3%) of the farmers were members of Farmers' Organization. It is expected that membership of farmers' organization would influence their adoption of improved rice technologies and easy access to farm inputs.

Table 2: Socioeconomic characteristics of respondents (n=300)

Variable	Frequency	Percentage	Mean
Age			
19 - 29	33	4.00	**43.5**
30 - 49	125	41.7	
50 - 59	82	27.3	
>59	60	20.0	
Sex			
Male	187	62.3	
Female	113	37.7	
Marital status			
Married	288	96.0	
Single	6	2.00	
widowed	6	2.00	
Household size			
1 - 10	208	72.0	10
11 - 20	87	29.0	
21 - 30	3	1.00	
>30	2	0.20	
Educational level			
Quranic.	212	70.7	
Adult	12	4.00	
Primary	45	15.0	
Secondary	16	5.30	
tertiary	15	5.00	
Farming experience			
1 -10	123	41.0	**20.1**
11 -20	92	30.7	
21 - 30	35	11.7	
> 30	50	16.7	
Farm size			
0.2 – 1.0	252	84.0	**1.3**
1.1 – 2.0	34	11.3	
2.1 - 3 .0	6	2.00	
Above 3.0	8	2.70	
Membership of cooperatives			
Yes	300	100	
No	0	0.00	

Source: Field Survey, 2025

SRI practices innovation Characteristics

Table 3 shows the scores obtained on the perception of SRI innovation characteristics by the respondents on a five point Likert type scale

Relative Advantage

The results in table 3 revealed that the construct of relative advantage is having a high (3.158) score which implied that the respondents viewed SRI practices as having superiority over farmers practice. It is also in line with findings of the FGD that was held with some of the respondents where they agreed that so much benefit was derived from SRI practices. When asked to comment on some of the major advantages of SRI practices over traditional practice, the two groups of participants were unanimous on the fact that the SRI practices, had a greater advantage over farmers practice. Some of the participants lauded that:

"the power tiller puddle and leveler are better than the tractors we used because it allow one to level each corner of the field accordingly whereas with the tractors or manual operation some sand lumps may not be broken".

On the aspect of acquiring seeds for planting, majority of the participants commented that they were usually sell their animals, borrow money or even collect their wives' savings to buy large quantity of seeds for planting, 50g or 100g of paddy rice seed were used in planting one hectare of land. But under SRI a measure of one or two plates of rice seed were used to plant one hectare which can be conveniently purchased without borrowing. Another advantage was observed according to the participants:

"we were mocked by other farmers that transplanting one seedling per hill and of just 8 – 11 days old under SRI practice will cause loss to us, "we will feed you when you lose everything", they said, but after 20 days the SRI farms were greener, fresher and more vibrant which made other farmers to ask whether we replanted our farms again". Another observation that was made by the participants was that:

"the number of tiller produced from a single seedling under SRI is about 98 while in the farmers practice was 34, at booting stage, the head could produce up to 300 spikes while under farmers practice was about 150". A participant also indicated that *"it is always hard to get 20 bags during harvest under farmers practice, but under SRI we use to realize up to 45 bags per hectare".*

A participant categorically mentioned the advantages they observed in respect of the harvested rice under SRI and the farmers practice:

'"The weight of seed under SRI is greater than that of farmers practice, the ratio of milk (chalkiness) to husk or cover is more under SRI, and the amount needed per serving is lower when using SRI transplanted rice than that of farmers practice".

This also confirms the findings of TRIMING, (2020), in their final report, that there was a high return on investment (with an estimated yield of 12,735 kg per hectare) on SRI practices when compared to farmers practices. A female participant lauded that among the major achievements they had during SRI FFS was the Improved Pest Protection Management (IPPM) practices, she said:

"we were taught how to produce insecticides by using Neem seeds extracts and also how to produce herbicides from donkey dung extracts, when you spray these on your farms you hardly see harmful insects or weed infestation".

Compatibility

Looking at results in table 3, the construct of compatibility is having a low (2.860) score, this implies low compatibility to farmers experiences. SRI practices such as alternate wetting and drying of fields are improved methods of farming being introduced and expected to be adopted by the farmers, these practices are new and alien to the farmers. However, it is likely that with enough training through platforms like FFS where farmers learn by doing, they may lower their expectations based on compatibility of the SRI practices and embrace its high relative advantage over the farmers practices.

Similarly, some studies have reported that compatibility has a positive relationship with the decision to adopt an innovation (Gupta, Seetharaman, and Raj, 2013; Luqman and Abdullah, 2011).

Complexity

The construct of complexity is having a high composite score (3.135) from the findings of this study. An innovation that is viewed as complex by clients is likely to have a low adoption rate. The implication of this finding to the study is that, SRI practices may likely not be adopted by the respondents due to this perceived attribute of complexity. SRI is a practice that involved series of complex practices; operating the power tiller machine which is not a traditional practice of the farmer, hence the farmers find it difficult to calibrate the machine and operate, during the FGD with the female participants; they were categorical about the difficulty in handling and operating the power tiller.

Marking point on field before planting is another complex operation as the farmer will have to calculate the distance (25cm by 25cm) before marking. Similarly, transplanting very young seedlings of 8-11 days old and alternate wetting and drying of fields were other practices that may seem complex to carry out by the farmers.

Moreover, a participant is expected to be able to carry out the SRI practices even in the absence of the facilitators. However, with more awareness and trainings on SRI practices, the farmers may have a positive mindset and favorable view about SRI practices. In a study conducted by Farmers stated that they were sometimes on a waiting list to use a tractor but needed to plant younger seeds. As SRI is a new farming technique, some technical instructions are difficult for farmers to adopt, such as planting seeds in a tray, shallow planting and land preparation. The SRI practices involves cultivating rice with wide spacing between plants, organic fertilizer and less water, and these results in rapid growth of weeds and snails. Farmers may need to use labor to reduce weedy plants and manage snails, causing an increase in production costs.

Arsil, *et al*. (2019) reported that a participant mentioned that rice farming faces a lack of machine operator skills.

Trialability

The construct of trialability had a high score (3.314), this implied that participants could be able to experiment the practices on a small scale before making decisions on what constitute the best bet practices for potential adoption.

According to Vagani and Volpe (2017); the availability of the innovation on a trial basis allows decision makers to experiment with the new innovation, exploring in advance its potentialities, and even to identify and resolve ex-ante problems associated to the innovation before committing to fully adopting it.

Observability

The variable of observability of SRI practices also had a high score (4.469) implying that demonstrations of SRI practices through the FFS sessions enabled the farmers to see and observe developmental stages of the practices as they unfold which would prepare them to make informed decisions in respect of adoption behavior.

In a technology products study, Vishwanath and Goldhaber (2003) found observability to significantly impacted intention. Arts *et al*. (2011) in their meta-analysis on drivers of intention and behavior, showed a partial support to the notion that observability will have a stronger effect on intention stage.

Table 3: Composite score (mean = 3) of SRI practice characteristics (n=300)

SN	SRI Innovation Attributes	Mean	Rank
1.	Observability	4.469	1
2.	Trialability	3.314	2
3.	Relative advantage	3.158	3
4.	Complexity	3.135	4
5.	Compatibility	2.860	5

Source: Field Survey, 2025

Willingness of Farmers to adopt all the SRI practices

To ascertain willingness of the farmers to potentially adopt SRI practices, the respondents were asked if they were willing or not to adopt all the SRI practices. From the table it could be deduced that majority (68.4%) of the farmers were willing to adopt all the practices. These practices were observed by the farmers to produce good results when compared to farmers' practice, as contained in the TRIMING project, final draft (TRIMINIG, 2020).

Table 4: Respondents willingness or not to adopt all the SRI practices (n=300)

Willingness	frequency	Percent
Yes	**205**	**68.4**
No	**95**	**31.6**
Total	**300**	**100**

Source: Field survey, 2025

SRI practices that farmers are willing to adopt

Table 5 shows results on the SRI practices respondents were willing to adopt; across table, majority of the practices recorded high percentages; transplanting young seedlings of 8 – 11 days old (100%) this practice however allows the roots of the plant to quickly adjust to the new environment due to the succulent nature of the roots at this age, profuse tillering is observed by the farmers, this informed their decision potentially adopt the practice.

Transplanting single seedling per hill (100%) and plant spacing of 25x25cm (100%) were ranked first; the results was not beyond the fact that farmers were able to observe the effectiveness of the practice during FFS sessions and were willing to adopt the practices.The high scores could be a function of the participatory hands-on practical that were carried out during FFS training session which gave the farmers the opportunity to see, evaluate and ask question regarding concepts and methods demonstrated to them; this has however enhanced their capacity and ability to make better judgments in choosing the best bet practices.

According to TRIMING (2020) yield increase due to transplanting seedlings of 11 days old compared to the yield under farmers' practice was (88.8%). they also affirmed that transplanting rice seedlings at row to row and plant to plant spacing of 25 cm x 25 cm enabled acquisition of significantly higher yield (10.16 t/ha) than the other spacing practices did.

Table 5: Distribution of the respondents based on SRI practices they were willing to adopt (n=300)

SRI Practices / inputs	Frequency	Proportion	Mean	Rank
Transplanting young seedlings of 8 – 11 days old	300*	100	1.00	1
Transplanting single seedlings per hill	300*	100	1.00	1
Wider spacing	300*	100	1.00	1
Alternate wetting and drying of rice fields	280*	93.3	0.93	4
Aerating the soil using power tiller and implements	273*	91.0	0.91	5
Use of organic fertilizer to the extent possible	237*	79.0	0.71	6

Source: Field Survey, 2025. * Multiple responses.

Reasons to Adopt SRI Practices

Table 6: depicts the reason for the respondents to potentially adopt the SRI Practices were that it uses less resources (46.6%) this was confirmed by the response of SRI FFS participants during FGDs, they commented that small quantity of seeds were used under SRI practices compared to farmers practice where large quantity of seed is required to plant a small farm plot.

Furthermore, rice under SRI produces high yield (27.1%) which according to Triming (2020) rice yield of 10.5 t/ha was recorded to exceed that of the crop under farmers practice by 128.3%. Any technology that proves to increase productivity with less demand on resources

will invariably be preferred by the client, these characteristics as indicated by the respondents signifies SRI practices' relative advantage over farmers practices.

This is also in agreement with the findings during FGD held with some of the participants that, the benefits and advantages SRI practices has over farmers practice were overwhelming which further confirmed the findings of TRIMING, (2020) that shows all the six components of SRI practices has produced better results when compared to farmers practice.

Furthermore, Swarnali, *et al.* (2021) asserted that, as an alternate rice cultivation methodology, SRI developed to increase rice productivity with less input use. SRI is the application of certain management practices those include changes in nursery management, time of transplanting, water and weed management which provide better growing condition in the root zone of rice plants compare to plants grown under conventional practices. As a result of the organic fertilizer application, SRI improves soil structure and increases nutritional value, as well as environmental benefits including reduced water usage due to intermittent flooding.

Siéwé, F. *et. al.*(2023) in their research suggested that the best-bet SRI combination, the one most suitable for improving productivity and also sustainably raising income levels in the study area, would be 11 DOS with 25 × 25 cm spacing, AWD, and application of 5 tons of compost ha−1. SRI management of irrigated rice cropping shows great potential for Nigeria, a production strategy more advantageous than the current methods used by resource-poor farmers.

Table 7: Distribution of the respondents based on reasons for adoption of SRI practices (n=300)

Reasons	Frequency	Percent	Rank
SRI uses less resources	190	63.33	1
High yield	43	14.33	2
Better than farmers practice	42	14.00	3
SRI practices are easy to implement	25	8.33	4
Total	**300**	**100**	

Source: Field survey, 2025.

Factors Influencing the Willingness of the FFS Participants to Adopt SRI Practices

The results in table 8 indicated that age of the respondents (P<.000:0.042) and knowledge (P<.000:0.012) are significant; this denotes that these factors influence potential adoption of SRI innovations. The result further indicated that household size is not significant at (P<0.000:0.138) though, large family size denotes responsibility in provision for upkeep, the added responsibility of purchasing recommended SRI equipment may pose as a limiting factor in adoption decision of the farmers. Furthermore, farming experience (P<0.000:0.656) was equally not significant, this denotes that the years of farming experience gained by the farmers was able to pre- dispose them to various innovations that

might have failed, thus becoming skeptical in embracing new ideas like the SRI practices. The variable of Farm size was not statistically significant at (P<0.000:0.839), this finding was an indication that the variable does not play a significant role in adoption decision of SRI practices by the farmers, this may also mean that, the trialability of the practices in small plots has become a welcome idea disregarding the farm size (mean=1.0) of farmers.

Considering the negative coefficient of age, it implied that for every additional increase in age it reduces the potential adoption of SRI practices among the participants by (-0.033), this further implied that younger farmers are likely to adopt SRI; this could be due to their receptiveness and readiness to venture into innovations whenever it is presented to them. According to Ingebire *et al.* (2018) in a study they conducted reported that aged farmers rely on traditional production methods which have no significanyt effect on productivity.

Household size (0.048) farming experience (0.007) farm size (0.026) and knowledge (0.138) have positive coefficients which indicate that an increase in each of the variables will lead to corresponding increase in the potential adoption of SRI innovations. Increase in farming experience means that the farmer has had contact with other innovations over the years and can be able to make deductions on the best practice to potentially adopt. An increase in household size will signify added responsibility to taking care of its members, consequently, increase in knowledge of SRI practices will prepare the farmer to fully understand the potentials of SRI practices hence adoption may take place.

The result of the regression model estimation gave an R^2 value of 0.4721 which implies that the variables included in the model were able to explain about 47 percent of variation in the participant's willingness to adopt SRI. The unexplained variation can be attributed to random errors and other uncertainties.

Table 8: Factors influencing the willingness of the FFS participants for adoption of SRI

	B	SE	Wald	Df	P- values
Constant	2.347	0.745	9.931	1	0.002
Age	-0.033	0.016	4.118	1	0.042**
Household size	0.048	0.032	2.205	1	0.138
Farming experience	0.007	0.015	0.119	1	0.656
Farm size	0.026	0.128	0.041	1	0.839
Knowledge score	0.138	0.055	6.264	1	0.012**

Source: Field Survey, 2025.

Psuedo R^2 = 0.4721,

-2Loglikelihood 403.140, ** P<0.001

Challenges to Adoption of SRI Practices

Table 9 shows that the major challenge to adoption of SRI as identified by the respondents was lack of tools to carry out the SRI practices (94.3%), other challenges that equally had high percentages includes; Non availability of organic manure (88.7%), Requirement of

skilled labor (87.3%) and Difficulty in using ropes for marking and spacing of fields (79.7%). The implication of this finding was that, the farmers may likely not adopt the identified challenges due to the percentage of the severity recorded, it also means that for SRI practices to be adopted, ways to solving these problems should be sort.

According to Regassa *et al.* (2003) they mentioned that, the most important demerits of SRI relate to its extremely high demand for labor, problems of weed control, and organic matter availability.

This is also in agreement with the responses of the SRI FFS participants during FGD; while asking them about the major constraints to adoption of SRI practices, they indicated that; the major constraints to adoption of SRI practices is the inadequacy of power tiller machine, untimely release of water for irrigation and unavailability of water pumping machine. According to a participant:

"we need this power tiller in our community so that we can use it as when due on our farms', another participant also lamented that 'most of the time water is being released in the night, we have go to the farm during that time to water our crops which is not convenient".

Another participant said that:

"because we do not have pumping machine readily available we have to wait for water to be released from the dam before we can irrigate our farms, which could be disastrous to the crop".

This is in conformity with the finding of Aliyu *et. al.*, (2020) who found out that, among the constraints to adoption of SRI practices was high labor cost, non-awareness of SRI, inadequate understanding of SRI technologies, and non-availability of funds.

Table 9: Challenges to adoption of SRI practices by respondents (n=300)

Challenges	Frequency	Percent	Mean	Rank
Lack of tools to carry out SRI practices	283*	94.3	7.97	1
Requirement of skilled labor	262*	87.3	6.99	2
Non availability of organic manure	266*	88.7	6.21	3
Difficulty in using ropes for making and spacing	239*	79.7	2.83	4
Weed infestation due to alternate	110*	36.7	2.20	5
Difficulty in transplanting young seedlings 8-11 days on the field	119*	39.7	1.98	6
Lack of good knowledge of SRI practices	115*	38.3	1.53	7
High of cost in carrying out SRI practices	172*	57.3	1.15	8
Labor requirement is high	139*	46.0	0.46	9

Source: Field Survey, 2025. *Multiple responses

Conclusion

The SRI FFS participants viewed SRI practices as better option to farmers practices based on its innovation attributes, they also show willingness to adopt all the SRI practices which could translate into a change from farmers practices to newly introduced SRI. The participatory nature of Farmer field school has effectively impacted the knowledge of SRI practices to the participants; this may however lead to potential adoption of the practices

by the farmers. The farmers presented insufficient SRI recommended tools which may pose a challenge potential adoption.

Recommendations

1. It is recommended that the SRI practices as a technology should be re-demonstrated by the TRIMING project to the farmers to improve on its compatibility and also reduce its complexity as viewed by the farmers for ease of adoption.
2. Participatory platforms like FFS should be utilized when introducing a technology / improved farm practice that may seem complex to carry out by the participants.
3. Tools and machines should be made available either by the TRIMING project, NGOs, or Private organizations on lease or on loan to the farmers to ease the advocated challenge of non-availability of recommended SRI tools and machines by the respondents. Farmers as a group should also make efforts to purchase the tools and machines through their cooperative membership.
4. The high number of women farmers (37.7%) at BIS should form a basis for provision of interventions by Government and NGOs to further encourage their participation in agricultural practices.

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