The Status of Paddy Farming and Factors Affecting its Production Among Smallholder Farmers in Bahi District, Tanzania

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ABSTRACT

This study was conducted in Bahi District in order to assess status of paddy farming and factors affecting its production among smallholder producers. Interview, observation, focus group discussion and documentary review were used to collect data from a sample of 120 respondents. Descriptive statistics were used to analyse farm size under paddy, types of paddy farming, paddy yields, tools and/or machineries and type of household labour used in paddy production. Whereas Pearson correlation analysis was used to depicts relationship between paddy yields and farm size used in paddy production, education and age of farmer. A Multiple linear regression was used to analyse factors affecting paddy production in study area. Findings revealed that most (87.7%) farmers depend on irrigation scheme while 13.3% practicing rain-fed paddy farming. Average land used for paddy production was 2.75 acres with an average production of 3631 Kg per acre. Oxen were used by majority (54.9%) of farmers as a main tool for cultivation while adults labour is commonly used (45.4%) in production processes. Extension services, use of pesticides, land and labour significantly ($P<0.05$) influenced paddy production. It was concluded that smallholder paddy producers do not utilize agricultural inputs effectively while extension services are insufficiently provided. Also failure of farmers to get ample land impairs paddy productivity. Since Bahi wet land depends heavily on River Bubu, it is recommended that catchment areas for that river should be well protected. In addition smallholder paddy producers should be emphasised to adopt modern production techniques while government should provide transport facilities to extension staff for efficient transfer of production technologies.

Keywords: Bahi wet land, irrigation farming, paddy, smallholder farmers, semi-arid

1.0 INTRODUCTION

According to FAOSTAT (2011) paddy is grown on about 158 million hectares all over the world especially in Asia where approximately 90% of the world's rice is grown. The annual global production is about 678 million tons of paddy rice, of which 90% of the total was produced by Asian farmers, with two countries, the People's Republic of China (including Taiwan) and India, producing 55% of the total crop (FAOSTAT, 2011). According to Kadiri*et al*. (2014) rice farmers in Niger Delta region of Nigeria harvested 4713.25 Kg per hectare (1885.3 Kg/acre) of paddy rice in 2012 growing season. In sub-Sahara Africa, rice consumption increased by 5.3% from 1995 to 2001 while paddy production increased only by 2% during that period (African Rice Centre, 2006). Farmers in Sub-Sahara Africa produces average of only one ton of rice per hectare (400 Kg/acre) less than half of what an Indian farmers produces, less than a fourth of Chinese farmers production and less than a fifth of American farmers production (World Bank, 2007). East African countries thus need to draw on the experience of land scarce Asian countries where yield increases in crops were the defining characteristics of Green Revolution and transformation of rural sector between 1960s and 1990s.

Rice has being most important food and commercial crop in Tanzania after maize. It is among the major sources of employment, income and food security for Tanzania farming households. According to FAOSTAT (2010), Tanzania is the second largest producer of rice in Southern Africa after Madagascar with production level of 1.1 million tons. The rice cultivated area by 2012 was 720,000 hectares and the average yield per hectare from 2003-2012 is very low (i.e. 1.8 tons per hectare). Currently the Kilombero valley is a major rice production area supplying about 9% of all rice produced in Tanzania (URT, 2004). The central semi arid areas of Tanzania are endowed with a number of seasonal wetlands which have potential for agricultural development (Assenga, 2001). According to Liheluka (2014) in Kilombero district the average yield of output to smallholder paddy producers is 2.7 tons per hectare (1080 Kg/acre).

About 71% of the rice grown in Tanzania is produced under rain fed conditions; irrigated land presents 29% of the total with most of it in small village level traditional irrigation system (FAOSTAT, 2012).

In Bahi swamp, people stated paddy production by 1960s. Before trade liberalization sorghum and maize were a main source of income in Bahi district. Rice cultivation was basically for home consumptions since it was difficult for subsistence farmers to engage in paddy production as it required much capital. Due to onset of trade liberalization farmers expanded paddy production for

income generation in the district. In 2006, the Government of Tanzania started implementing the Agricultural Sector Development Program (ASDP) as an operational response to the Agricultural Sector Development Strategy (ASDS) which focusing on increasing agricultural productivity, profitability and farm incomes (URT, 2012). The National Agriculture Policy 2013, proposed National Rice Development Strategy to be in line with both national and international commitment. Tanzania through rice production has aimed at improving livelihood of the majority rural communities through enhancing household income and food security (URT, 2013). Thus the current study aimed at assessing the status of paddy production and examining factors affecting paddy production in Bahi district.

2.0 METHODOLOGY

The study was conducted in Bahi district which is 50 km west of Tanzanian capital city, Dodoma. It's located geographically at 5° 59' 0" South, 35° 19' 0" East. The district experience low and erratic rainfall which starts from mid-November to mid-April. Rainfall ranges between 500 mm to 650 mm per annum. Soil in the districts is generally characterized by shallow depth, moderate organic matter content, salinity in some parts and poor permeability that lead to higher surface run-off. All these physical and climatic characteristics determine agricultural productivity which is the major economic activity in the district. The district is dominated by rural economy which is based on subsistence rain-fed agriculture (URT, 2003). The selection of Bahi district to be the study area was based on fact that, it is the district where paddy production is among the major economic activities which are done by a number of farmers.

A cross sectional design was used to obtain data from the respondents.Simple random sampling was used to get 120 households dealing with paddy productions. The sampled household dealing with paddy production was obtained from registration books found in irrigation scheme blocks and through assistance from village executive officers and agricultural extension officers. Purposive sampling was used to get key informants such as extension officers, irrigation scheme leaders and village executive officers.

Data sources involved both primary and secondary sources. Primary data were collected through interview, Observation and Focus Group Discussion (FGD) from selected household sample dealing with paddy production while secondary data were collected from background information include research and documentation centers from district agricultural offices. Descriptive statistics were analyzed using frequencies, percentages and mean. While inferential

statistics analyzed were Multiple Linear Regression by using SPSS Version 20 and Pearson Correlation by using STATA Software. The following model was adopted for regression analysis.

$Y=\beta_0 + \beta_i X_{i+} \beta_n X_n + \varepsilon_i$
(i= 1, 2, 3…n)
Where;
Y= dependent variable (Paddy yield in Kg)
$\beta_{0=}$ Constant coefficient
$\beta_{i=}$ parameter/ coefficient

X_i -X_n=Independent or explanatory variables included in model (climatic condition, wild animals, extension services, credit accessibility, agricultural inputs, age of respondents, education of respondents, household size, marital status, tool/machinery used in production, land and labor).

ε_i= error term

3.0 RESULTS AND DISCUSSION

3.1 Status of Paddy Production in Bahi District

3.1.1 Farm size under paddy production and types of paddy farming

Farm size under production refers to the total areas in acres or hectares that the household was able to plant (URT, 2011). The mean average of cultivated farm owned by smallholder paddy producers is 2.75 acres. Most (51.5%) smallholder paddy producers has farm size of 3-4 acres while 35.4% has a farm size of 1-2 acres and the remaining 13.1% has 5 acres and above which has been allocated for paddy production (Figure 1). Through FGD most of smallholder paddy producers urged that they have a limited capital to expand their production areas. This consequently affects adoption of modernized equipments used in paddy production such as tractors and storage facilities. Farm size is a common variable in determining the adoption of an innovation in agricultural production practices (CIMMYT, 1993). According to NBS (2003) the major limitation on land holding size and production levels in Dodoma region was the use of hand hoe as a major cultivating tool.

Findings also revealed that majority (87.7%) of smallholder paddy farmers depends on irrigation scheme while 12.3% of them rely on direct rainfall.

According to URT (2011), irrigation referred to artificial application of water to the soil for the purpose of supplying the moisture essential for plant growth. The main source of irrigation water in study area comes from River Bubu attributes which originates from Mbuluand Babati highlands.

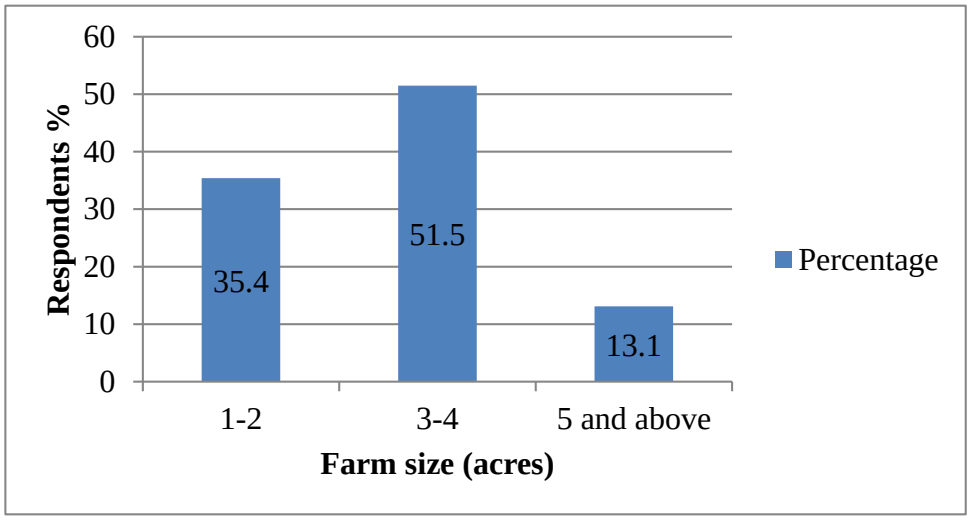

Figure 1: Acreage under paddy production

3.1.2 Paddy yield

Findings from current study revealed thatmean average quantity of paddy produced was 3631.5 Kg per acre. This a little bit different from findings by Lyamunda and Kurz (2010) who disclosed that farmers reported to harvest up to 4000 Kg per acre in the same study area. However this mean yield vary considerably with the one reported by Liheluka (2014) in Kilombero district. Probably low yield observed in this study comparing with that reported by Lyamunda and Kurz (2010) can be attributed to decline in soil fertility. Through FDG and key informants interview it was revealed that most famers do not use industry fertilizers and improved seeds in their fields, few uses farm yard manure and majority cultivate local seeds. According to URT (2004) and Rutasitara (2002), continuous uses of cultivated land without replenishment it with soil nutrients has contributed to a decline in soil fertility in Tanzania rural areas.

Also results indicated that 66.9% of smallholder farmers produced 5100 Kg of paddy and above, 10.8% of respondents produced 3100-4000 Kg while 10.0% produced 4100 -5000 Kg (Fig. 2).

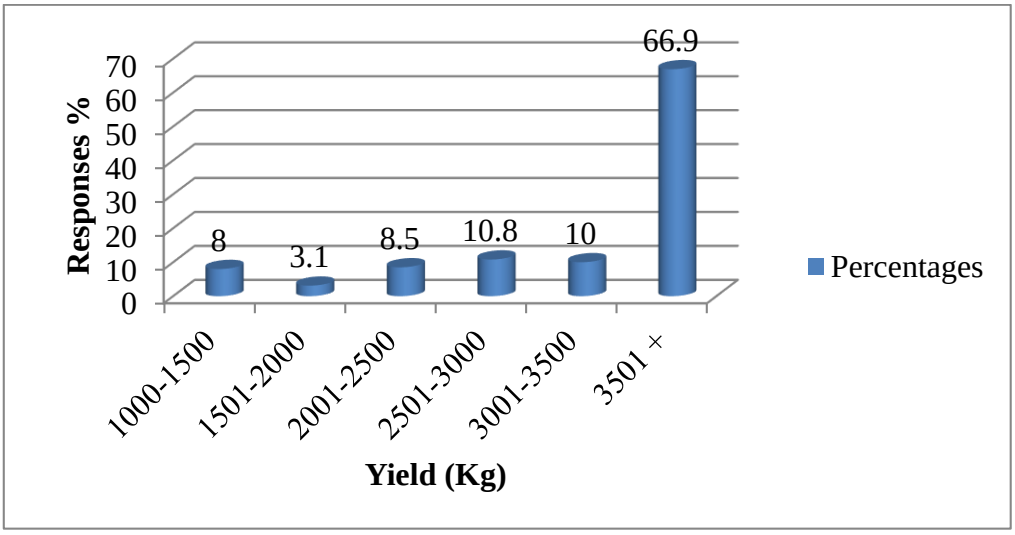

Figure 2: Paddy yield in Kg

3.1.3 Tools and/or machineries used during paddy production

Results in Figure 3 revealed that oxen plough was used as a main tool for cultivation by majority (54.9%) of smallholder paddy producers while 27.6% used tractors and 24.5% used hand hoe. The current findings are dissimilar by that of NBS (2006) which found that about 66 percent of planted land in Dodoma region was cultivated using hand hoe, while for oxen ploughs and tractors it was 24% and 10%, respectively. This implies that there is advancement from using traditional hand hoes and adopting oxen ploughs and tractors by smallholder paddy producers. The current findings is similar with RLDC (2009) which reported that in most of central corridor farms where farmers are also livestock keepers, the dominating farming equipments are oxen ploughs and in few instances hired power tillers as well as tractors are used, which are however too few.

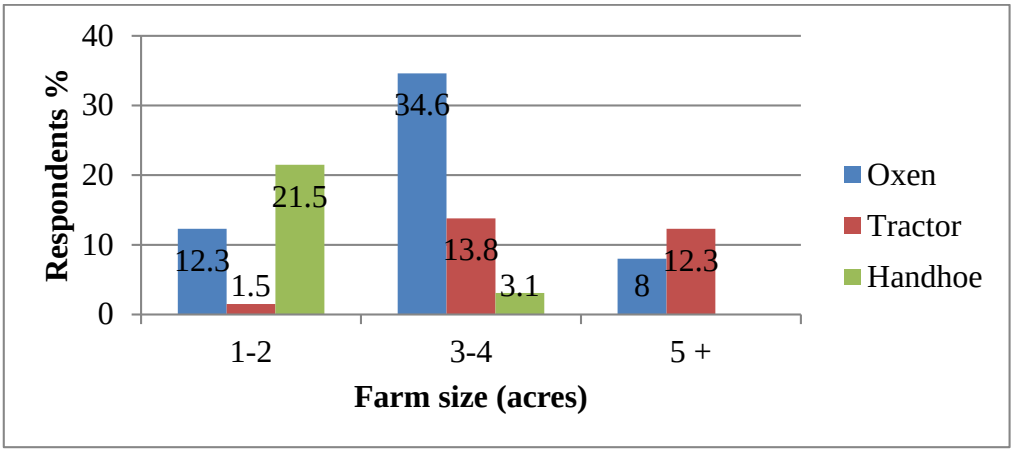

Figure 3: Tools/machinery used in paddy production

3.3.4 Type of household labour used in paddy production

Results fromFigure 4 shows that 45.4% of households used adults as source of labour in paddy production, 36.9% used hired labour while 17.7% used children labour. Through FGD with respondents and key informants interview it was revealed that majority of smallholder farmers do not have enough capital to hire labour during paddy production processes. They argued that this is caused by the fact that most smallholder producers get inadequate returns (funds) from their traditional occupations like farming, livestock keeping and non farming activities. However, Kadiri et al. (2014) cautioned that it is not technically efficient to continue hiring labour without provision of appropriate labor-saving technologies such as mechanization and bird scarring mechanism at subsidized rate in order to reduce labour cost in paddy production in Nigeria.

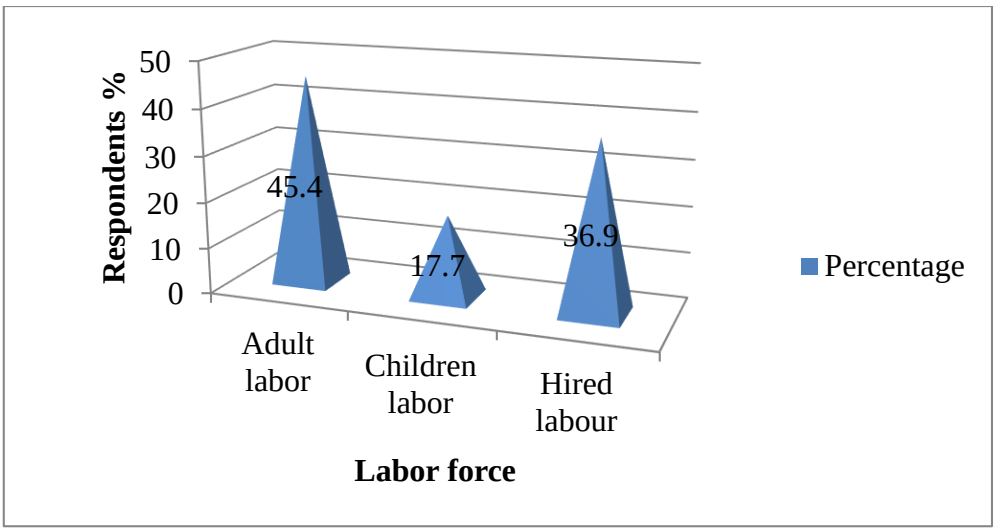

Figure 4: Household labour used in paddy production

3.2 Relationship Between Paddy Yield and Farm Size Used in Production, Education and Age of Farmer

Pearson correlation was used to analyse relationships between paddy yields, acreage under paddy farming, education and age of farmer. The findings are indicated in Table 1.

Analysis shows that there is a statistical significant ($P<0.001$) relationship between paddy yields and farm size used in paddy production. This implies that as farm size increases by 1 acre output increases by 62%. These findings are in line with that by Jules (2011) in rural areas of Rwanda who reveled that farm size has a positive effect on rice production since average output produced increases as the farm size increases.

Education did not had statistically significant ($P>0.05$) relationship with levels of paddy yield. However, the findings revealed that as education level increases, output also increase by 10%. According to Carney (1998) education is important as it increases skills levels which are required for some rural farm activities and can set in train processes that increase confidence, establish useful networks or contribute to productive investment. Hence smallholder paddy producers with large cultivation area (acres) and higher education levels tend to have more yields than their counterparts. Age of farmer insignificantly ($P>0.05$) influenced paddy yield. However the findings imply that increase in age decreases output by 3%.

Table 1: Pearson correlation analysis on paddy output and farm size, education and age of farmer

Variable	Coefficient	Significant
Farm size	0.62	0.000
Education	0.1026	0.2454
Age	-0.0315	0.7221

3.3 Factors Affecting Paddy Production in Bahi

Pesticides as an agricultural inputs has a statistical significantly affected ($P<0.05$) paddy production (Table 2). Through FGD most farmers argued that they tend to have more outputs from the fields after applying pesticides. These findings are similar to that of Majule and Mwalyosi (2003) who reported that pests are among major problem affecting paddy production in many parts of the country in Tanzania.

Findings revealed that extension services statistically significantly (P<0.05) influenced paddy production. During interview with farmers, this study found out that only 22.3% of respondents accessed extension services during various production stages while 77.7% of respondents did not access extension services. The main reason raised by farmers was the limited number of extension officers who on top of that lack working facilities such as motor cycles and bicycles which might enable the smooth conduct of offering technical assistance to farmers accordingly. However extension officers revealed that due to limited resources they are conducting farmer field school one day per week in each irrigation scheme office but they disclosed that most of smallholder paddy producers are reluctant to attend until they are promised to be provided with meal allowance. According to URT (2012) the transformation of agricultural extension services is important in order to impart the right tools, knowledge and skills as well as ensuring farmers adhere to good agriculture practices.

The results in Table 2 indicated that land (P<0.05) and labour (P<0.001) significantly influenced paddy production in the study area. These findings are in agreement with Karmini (2017) who testified that land and labour significantly affected paddy production, consequently leading to lower income among smallholder farmers in Indonesia. Also Nguyen et al. (1996) reported that there was a statistically significant and positive relationship between plot size and output of maize, wheat and rice.

From the regression analysis it shows that climatic condition in Bahi district has a negative effects on paddy production though it was not statistically significant (P>0.05). This implies that probably unfavorable climatic condition (which leads to low levels of rainfall) where River Bubu attributes originated has significant relationship with paddy production in Bahi district.

Findings in Table 2 indicates that the effect of accessing credits for paddy production was not significant (P>0.05). However, from the findings there is a positive association between credit accessibility and paddy production. From interview with farmers this study found out that only 16.9% of respondents had access to credit from informal and formal financial micro financers i.e. Village Community Bank (VICOBA) and Savings and Credit Cooperatives (SACCOS). This implies that most of smallholder producers do not depend much on loan to grow paddy. During FGD most farmers said that they failed to secure loan because they lack collateral as most of their properties including land has no legal right of ownership. These findings are in line with that of IFC (2013) which pointed out that poor access to credit is among common challenge facing smallholder farmers since financial institutions often view smallholders as

unattractive clients due to insufficient collateral (such as formal land title), lack of written records, and the small size of loans requested by farmers.

Credit plays essential role in development. It helps farmers to undertake new investments and adopt new technologies to increase agricultural yield. Therefore Lack of access to the smallholder farmers to institutional loan has negative impact for crop productivity, rural growth and wellbeing (Nwaru et al., 2004). In addition, findings in Table 2 indicated that wild animals insignificantly ($P>0.05$) affected paddy production. From interview with farmers the current study revealed that only 3.8% of the respondent had affected by wild animals during paddy production while 96.2% did not experienced wild animal effect. The findings similar to that observed by Majule and Mwalyosi (2005) that only 2.2% of crop producers have conflict with wild animals in Bahi district. Therefore the effect of wild animals commonly bird in Bahi district during paddy production is considered to be very small. A discussion with respondents revealed that cultivated area (acres) are small hence birds can be easily controlled by traditional methods.

Furthermore, results in Table 2 show that household size and tools/machinery used in production positively influenced paddy production but were not statistically significant ($P>0.05$). These findings corroborate with Keenja (2004) who reported that using improved tools and proper crop husbandry practices can enhance production and productivity of land, labour and production inputs. Finally, findings in Table 2 revealed that age and education of respondents were also statistically insignificantly ($P > 0.05$) affected paddy production. However these variables were observed to have positive relationships with paddy production. From a discussion with respondents and key informants, it was pointed out that farmers belonged to the group aged between 28-52 years old are productive labour force compared to elder and children and are considered to be more experienced in paddy production. This is concur with finding with Mmasa et al. (2012) that farmers with high experience tend to increase productivity as compared to one with less experience. The age of a person usually is a factor that can explain the level of production and efficiency (Basnayake and Gunarantne, 2002). Also Makauki (1999) pointed out that knowing how to read and write is sufficient in adoption of technologies to improve crop productivity.

Table 2: Results from regression analysis on factors affecting paddy production in Bahi

Variables	Coefficients	Standard Error	Sig
Climatic condition	-0.3552621	0.2221571	0.112
Wild animals	-0.1534849	0.586719	0.794
Extension services	0.4224558	0.2048113	0.041*
Age of respondents	0.1074292	0.577909	0.066
Education of respondents	0.3180733	0.170069	0.064
Credit accessibility	0.4291739	0.2 525927	0.092
Labour	0.9825347	0.122202	0.000**
Pesticides	0.3947787	0.187579	0.037*
Household size	0.0313277	0.1048045	0.899
Marital status	-0.2143927	0.1971196	0.279
Tools/machinery used	0.0819886	0.0760257	0.283
Land	0.583747	0.1689221	0.001**

R squared = 0.7583 & Adjusted R squared = 0.7058

*= Significant at 0.05 significance level **= Significant at 0.1 significance level

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

- Most of paddy farmers in Bahi depend on irrigation schemes while few are practicing rain-fed paddy farming. The source of irrigation water comes from river Bubu attributes originates from Singida and Manyoni regions.

- Smallholder paddy producers own small farm size and most of them indicated that limited capital is a major challenge to their interest to expand production areas.

- Low yield reported in this study was probably contributed to reluctance of farmers to apply industry fertilizers and improved seeds in their fields and inability of famers to access those inputs.

- There is significant relationship between paddy yields and acreage under paddy production. The larger the land allocated, the higher the output.

- Most farmers use oxen ploughs in cultivating paddy fields. However, few of them tend to use tractors. This is a considerable step towards agro mechanizing agriculture in the study area. In addition most household use adults as source of labour in paddy production.

- Extension services provided to smallholder paddy producers are insufficient due to limited number of extension officers and inadequate working facilities including.

4.2 Recommendations

- Government in cooperation with environmental conservation partners including CSOs and local government authorities within river Bubu catchment areas should ensure catchments are well protected and conserved through tree planting and prohibiting human socio-economic activities like agriculture. This will ensure reliable water supply for irrigation at Bahi.

- Bahi district council in cooperation with other development partners like NGOs should capacitate farmers through training to adopt modernized agricultural production practices including use of modern and affordable cultivation implements, industry fertilizers and improved seeds in production processes.

- Government should employ more extension officers and provide adequate working facilities. This will expand extension services to enable efficient transfer of technologies during production starting from farm preparation stage to post harvesting handling and storage of paddy produces to smallholder paddy production

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