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Farmers' Perception of *Sawah* Rice Production Technology in Nigeria

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ABSTRACT This paper examined farmers' perception of *Sawah* rice production technology in Nigeria. Using a large sample size technique of n > 30, forty farmers were selected and interviewed. A structured questionnaire with a reliability coefficient of 0.85 was used to elicit information on socio-economic characteristics and farm characteristics. Farmers' perception of the various *sawah* activities was calculated using the five point Likert scale. Descriptive statistics was used to describe the data on the socio-economic characteristics of the farmers, while multiple regression analysis was used to isolate socio-economic characteristics influencing perception. The results shows that 74.5percent of the farmers fall between age 18 years and 50 years, 97.90 percent of the respondents are males, 93.60 percent married, 34 percent have no formal education, and 70.2 percent have *sawah* farm size between 1ha and 13ha. Significant determinants were age (t = 1.90), occupation (t = 1.71), farm size (t = 2.85), membership of association (t = 3.36) and knowledge of *sawah* technology (t = 2.93). It, therefore, implies that the farmers' perception of the *sawah* rice production technology must be viewed within the prevailing socio-economic and farming system milieu of farmers in order to enhance continuous adoption and sustained profit from *sawah* technology.

INTRODUCTION

Self- sufficiency in food production through well- developed agriculture has always been a very important component of the economy of any country. This apart from meeting the growing need for food and reducing the foreign exchange disequilibrium arising from food import also makes room for a possible fair income, better and sufficient productive resources for the farmers for a sustainable livelihood. In the first year of the 21st century, there existed regional differences clearly both in the importance of food, agricultural and environmental problems and the urgency of solving them. However, with the success of the "Green Revolution", most of the Asian countries achieved food sufficiency one after another by the 1980s and their agricultural production exceeded the pace of population growth (Hirose and Wakatsuki 2002). On the other hand, Sub- Saharan African countries, except for a few, suffered a decline in the average annual food production in the first half of the 1990s as compared with that in the 1960 and the 1970s. As a result, per capital food supply (kcal/ day) in developing nations in this region experienced a decrease of 20kcal every 10 years (Hirose and Wakatsuki 2002).

Consequently, a wide range of policies and approaches have been formulated in most of the countries (Nigeria inclusive) to reverse the worsening food and agricultural trend towards sustained agricultural growth. This necessitated putting in place a combination of factors comprising the right technology, effective extension, access to physical inputs, adequate market support services and some infrastructure to improve agricultural productivity and raise standard of living of rural dwellers (Aphunu and Otoikhan 2007). However, the approaches to the development of farming technology attach too much importance to soil exploiting upland agriculture. Consequently rice production in Africa has increased from 3.14million tons to 14.6 million tons in the past 50 years. During this period, the area of cultivated land has expanded

by 3.3 times, from 2.5 million hectares to 8.2 million hectares, whereas the yield per unit area achieved an increase of 2.2 times, from 1.86t/ha to 1.78t/ha (CARD 2008). In Nigeria, self- sufficiency in rice has been a major focus of food policy goal of Nigerian government in the last two decades due to deficit in rice production which has led to imports put at 1 million tons in 1999/ 2000 (Mbabaali 2000), 3.1 million metric tones in 2002 and an import bill of 160 million US$ in 2003 (FAO 2003). In response to this goal, upland production system which is the most common and accessible is being exploited for rice production (Longtau 2003). Though this approach has led to output growth, the increase is due to increase in land area rather than increase in productivity. Hirose and Wakatsuki (2002) observed that this system of farming characterized by shifting cultivation with a decreasing period for fallow due to population growth and pressure on land has led to a vicious cycle of farm land degradation and lowering of productivity, thereby making the realization of the Asian type of Green Revolution a mirage in these developing countries, even after the birth of NERICA (New rice for Africa) (WARDA 1999).

The inland valley ecosystem provides an opportunity for sustainable agricultural development. Soils in lowland ecosystems are the least fragile and best able to support continuous cultivation. They are more robust than the upland system and have good potentials for intensification but are largely unexploited. The soil in many valley bottoms retains residual moisture well after an initial flooded rice crop permitting two cropping season per year. Several millions of farmers are actually growing rice in lowlands but they are not *sawah* based, as commonly observed throughout Asia. Their system of farming is still traditional, with average yield of about 2tons/ha.

Sawah System of Rice Production

Sawah refers to man made improved rice fields with demarcated, leveled, bunded and puddled rice fields with water inlets and outlets which can be connected to various irrigation facilities such as irrigation canals, pond, springs or pumps. The term *sawah* originated from Malayo – Indonesia. The English and French terms, paddy or paddi also originated from Malayo- Indonesian term paddy which means rice plant. Therefore, in order to avoid confusion between upland paddy fields, and man-made, leveled , bunded and puddled rice field that is typically irrigated rice growing environment, the author propose to use the term *"sawah"* in SSA (Wakatsuki et al. 1998).

Soil and water management through bunding ensures the optimal use of available water. Therefore, for sustainable increase in rice yield and production, farmers have to control water in rice fields. If the degree of water control improves sustainable rice yield will increase (Hirose and Wakatsuki 2002). The geological fertilization and well- known biophysical – chemical processes under the submerged irrigated *sawah* enhances the sustainable productivity of *sawah* system. As a result, one hectare of *sawah* has sustainable productivity equivalent of 10 – 15 ha of upland fields. Therefore, development of 1 ha of *sawah* opens the way for the afforestation of degraded upland field in West Africa (Hirose and Wakatsuki 2002). The *sawah* system can be managed as multifunctional constructed wetland. Submerged water can control weeds and because of the reduction of ferric to ferrous ion phosphorous, availability is increased and both acid as well as alkaline soil pH is neutralized. Hence, micronutrients' availability is also increased. These mechanisms not only encourage the growth of rice plants but also the growth of various aquatic algae and other aerobic and anaerobic microbes which help increase nitrogen fixation in the *sawah* system (Issaka et al. 2009). *Sawah* technique leads to higher yield and sustainable production irrespective of fertilizer use. *Sawah*- based farming, in contrast to the upland rice farming, can be cropped with rice continuously for a decade or more without any need for fallowing (Asunboteng 2001) .

The *sawah* system was introduced through on-farm adaptive research in the two research sites of Gara and Gadza inland valleys, located in the Bida, Nigeria in 1986 (Hirose and Wakatsuki 2002). *Sawah*- based rice production development started with three individual farmers in three villages with 0.1ha in total area in 2001. The establishment of a demonstration field (1.0 ha) at Ejeti village in 2002 galvanized the project. In 2002 the number of farmers increased in the *Sawah* Package program and by 2003 the farmers increased to fourteen and in 2004 to eighteen farmers from four villages. In 2005, the farmers of the 'Sawah Package' have increased to 83

from five villages covering more than 20ha area (Fashola et al. 2006). This spread and adoption of sawah which grow in leaps and bounds spreading over additional five states between 2005 and 2010 lay credence to its wide acceptance due to its improvement over the traditional system of rice farming in terms of yield and sustainable land use.

To sustain sawah rice production technology, it is pertinent to consider the perceptions of the farmer who are the adopters of the various activities that make up the sawah package. Perception is metal organization and interpretation of sensory information and that perception is based on experience and knowledge (Kumar et al. 2008). Perception is the intuitive judgment formed about individuals, objects or events. It is the way people, view and hold certain issues in life which is not as enduring as attitude and so changes faster than attitude in either positive or negative directions (Gaze and Berliner 1984). Wossink and Boonsaeng (2003) opined that perception and knowledge is crucial for successful research and development strategies and that many promising agricultural policies have failed because they were inappropriate to farmers need and perception. It is therefore hoped that this study will help in clearing the uncertainties concerning the technology that may still linger in the heart of farmers in spite its enormous benefits as witnessed through its adoption.

METHODOLOGY

The study was carried out in Nigeria; covering states were sawah technology have been adopted. They are Niger, Kaduna, Ondo, Kwara and Ekiti. Nigeria in West farica is between latitudes 4^0 - 14^0 N and longitudes 2^0- 14^0 E. it has an area of 932,768 sq. km with a shoreline of about 900 km from east to west. The climate is hot and humid in the south, hot and dry in the north. Annual rainfall is about 4000mm from the coast to 250mm in the north (Ogbe 2001). The population of the study was all rice farmers adopting sawah rice production technology. Data used in this study were collected between January to February 2011 in sawah sites in Nigeria namely: Bida, Zaria, Ilorin, Akure and Ikoro Ekiti. Using a large sample size technique of $n \geq 30$, (Kerlinger and Howard 2000) forty farmers were selected and interviewed. A structured questionnaire with a reliability coefficient of 0.85 was used to elicit information on socio-economic characteristics and farm characteristics. Farmers' perception of the various sawah activities was calculated using the five point Likert scale. Descriptive statistics was used to describe the data on the socio-economic characteristics of the farmers, while multiple regression analysis was used to isolated socio-economic characteristics influencing perception.

RESULT AND DISCUSSION

Socio-economic and Farming Characteristics of the Respondents

Table 1 showing the age distribution of respondents revealed that 74.5% of the farmers fall between age 18 years and 50 years. A development that signifies that majority of these farmers were still young and energetic which is a good development for agriculture. The reason may be the mechanization of some of the agronomic activities like ploughing and puddling which reduce drudgery in land preparation in lowland rice production, Also, the high yield from *sawah* rice production gives good returns for the investment in production. Also, 97.90 percent of the respondents were males and 2.10 percent female farmers. It is interesting to know that women not only complement men's roles in rice production but are major players in the production of rice. Marital status of the farmers revealed that 93.60 percent of them are married while 6.40 percent of them are single. This further buttresses the fact that young men are involved in *sawah* rice production. This also underscores the fact that wives and children of the married serve as labour source for production activities. As opined by Garba et al. (2011) the significance of the variable could be due to the fact that as family size increases farmers tend to have and use more family labour which invariably reduces cost of production. The result of the study further revealed that all the respondents interviewed had farming as their primary occupation with rice farming as a culture. Thirty- four percent of the respondents have no formal education, about 11% had primary education, and 34% had secondary school education and about 21% had tertiary education. This negate the usual sweeping generalization that makes farming synonymous to illiteracy. It would also enhance

agricultural development because improved practices, as they unfold from researches would be better disseminated, understood and adopted. This was corroborated by Amaza and Tashikalma (2003), that the literacy level of farmers enhances the rate of adoption of improved technology. Findings also revealed that 29.8% of the farmers have less than 1ha of their land put under *sawah* system of rice production while the remaining 70.2% have *sawah* farm size between 1ha and 13ha. This trend reveals that a great percentage of the farmers committed sizeable area of land for *sawah* system of rice production. This may be as a result of their acknowledgement of the enormous benefits in terms of weed control, in-built land rejuvenation elements and increase in yield per unit area that characterizes *sawah*. Findings show that 70.20% respondents acquired their land through inheritance, while 21.3% got theirs through rent, 6.4% of the respondents bought their land and 1 of them got his through leasehold. Land tenure by inheritance which is the predominant pattern of land ownership ensures security and sustainable use of land which is essential to maximizing returns for investment in *sawah*. As asserted by Oladele and Wakatsuki (2009), the probability of adopting *sawah* technology increases if the plot is acquired through inheritance, by purchasing and having long tenancy period. The result of the study shows respondents' membership of association, 43 percent belong to the rice farmers association while 4 belong to the cooperative society. Member-ship of association is of paramount importance in that resources could be pooled together to buy farm machines like the power tiller whose price may not be within the reach of an average farmer. Rahji et al. (2009) posited that membership of association is expected to assist farmers to get easy access to credit and other production inputs. Group membership serves as a cohesion that brings them together to exchange ideas and tackle problems common to them. In some of the villages visited in Bida, the group strength come handy in the construction of canals which was communally done.

Table 2 revealed the responses of respondents on a five point likert scale on their perceptions of agronomic activities of the *sawah* system of rice production, namely land clearing,bunding, canal construction, puddling, leveling, and transplanting. The respondents

Table 1: Socio-economic and farming characteristics of the respondents

Characteristics	*Percentage*
Age	
18-30	44.70
31-40	12.70
41-50	17.10
51-60	14.90
Greater than 60	10.60
Gender	
Male	97.90
Female	2.10
Marital Status	
Married	93.60
Single	6.40
Major Occupation	
Farming	100.0
Educational Level	
No formal education	34.00
Primary	10.60
Secondary	34.00
Tertiary	21.30
Farm Size(ha)	
Less than 0.50	14.90
0.50-1.00	27.70
1.01-2.00	23.40
Greater than 2.00	34.00
Land Tenure	
Inheritance	70.20
Rent	21.30
Purchase	6.40
Leasehold	2.10

agreed that clearing the land before the introduction of the power tiller either by herbicides or manually is very important and will aid efficient puddling of the soil by the machine. They indicated that it is easy and cheap when herbicide is used. They maintained that land clearing is an inevitable task before introducing the machine. The farmers also agreed that bunding helps in retaining water, help in checking pests, control flood, form an easy runway to get to their plots and enhances efficient use of fertilizer. Respondents agreed that canal construction help in water management on the field. On puddling they agreed that the soil is pulverized better and this makes transplanting easier and that well puddled soil encourages tillering. They felt if properly trained, level of education is no barrier to operating the power tiller. The farmers believe leveling ensures equitable utilization of fertilizer by rice plant and that water is uniformly distributed in the basins.

They are of the perception that transplanting as an exercise in *sawah* ensures adequate plant population, ensures better establishment of

seedlings and ensures efficient use of land, though they were also of the opinion that transplanting is labour intensive and costly. Though the respondents posited that some of the operations like, bunding, canal construction, leveling and transplanting are laborious and costly, they rank the non -affordability of the power tiller because of its cost as a major problem. They submitted that they have devised some approaches to lessen the energy demand, namely the use of herbicide to control weed, communal effort in the construction of canals in some of the villages visited. This communal approach to canal construction observed submitted in some of the villages visited has lessened the burden. In spite of these problems as identified by the farmers, it is a general belief among them that the numerous advantages as experienced in the growth performance of rice as manifested in the yield differential between the *sawah* and the non- *sawah*, outweighs the drudgery identified to be associated with some of the activities.

Table 2: Farmers perception of *sawah* technology

Activities	*SA*	*A*	*U*	*D*	*SD*
Land clearing	45 (20.3%)	93 (42.1%)	03 (1.4%)	44 (19.9%)	36 (16.3%)
Bunding	198 (37.6%)	142 (27%)	0 (0%)	68 (12.9%)	118 (22.4%)
Canal construction	54 (23.9%)	105 (46.5%)	0 (0%)	18 (08%)	49 (21.7%)
Puddling	146 (34.7%)	60 (14.3%)	05 (1.2%)	101 (24%)	109 (25.9%)
Levelling	79 (21.1%)	102 (27.3%)	10 (2.7%)	102 (27.3%)	81 (21.7%)
Trans-planting	119 (38.5%)	150 (48.5%)	05 (1.6%)	25 (8.1%)	10 (3.2%)

The result of multiple regression analysis of relationships between rice farmers' socio-economic characteristics and perception of *sawah* rice production technology are presented in Table 3. The independent variables were significantly related to perception of *sawah* rice production technology with F value of 4.48, $p < 0.05$. Also, R value of 0.78 showed that there was a strong correlation between independent variables and perception of *sawah* rice production technology. The result further predicted 61 percent of the variation in perception of *sawah* rice production technology by farmers. Significant determinants were age (t = 1.90), occupation (t = 1.71), farm size (t = 2.85), membership of association (t = 3.36) and knowledge of *sawah* technology (t = 2.93). It implies that as farmers' age, and farm size increases, along with the continual membership of *sawah* rice association, the more positively disposed they would be towards *sawah* rice production technology. Also, as the knowledge of *sawah* technology increases, the more positive their perception would be towards *sawah* rice production technology.

Table 3: Multiple regression analysis of socio-economic characteristics and perception of *sawah* rice production technology

Explanatory variables	*B*	*Std. Error*	*Beta*	*t*	*p*
(Constant)	207.175	25.993		7.970	.000
Age	.495	.261	.495	1.899	.066
Gender	-7.727	12.090	-.072	-.639	.527
Marital status	-8.282	8.440	-.132	-.981	.333
Family size	-2.077	2.479	-.173	-.838	.408
Occupation	10.936	6.404	.205	1.708	.097
Education	2.496	1.993	.189	1.253	.219
Farm size	2.605	.915	.326	2.847	.007
Land acquisition	-.770	2.504	-.035	-.307	.761
Farming experience	.011	.258	.010	.041	.967
Membership of association	27.060	8.067	.491	3.355	.002
Types of association	-2.067	1.710	-.205	-1.209	.235
Knowledge of *sawah*	-13.541	4.619	-.439	-2.931	.006
F	4.48				
P	0.00				
R	0.78				
R square	0.61				

CONCLUSION

It is vividly clear from the foregoing that farmers understand and agree with the reasons behind the agronomic activities as packaged in the *sawah* technology, which is an indication that sustainable adoption of *sawah* is achievable. However, there is a need to address some of the problems as identified by the farmers to ensure sustained adoption of the package. Means should be devised to ensure farmers or farmers' group own their own power tiller, the federal government should be brought into the procurement and distribution of power tillers to farmers on loan and at subsidized rates. Farmers should be encouraged to organize themselves

into groups to jointly carry out difficult tasks like canal construction, bunding and leveling. This can be made possible since rice production is a culture in areas where *sawah* is adopted.

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