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Social Factors Affecting Wetlands Utilization for Agriculture in Nigeria: A case study of sawah rice production

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Abstract: Wetlands have immense poverty-fighting potentials and in Nigeria, more and more people are dependent on wetlands for their livelihoods. To examine the social factors affecting the current status of the wetlands utilization for agriculture in Nigeria, a simple random sampling technique was used to select 200 farmers cultivating wetlands and a structured questionnaire was applied to elicit the information on the social factors. Data collected were described using frequency and percentage and a multiple regression analysis was used to identify significant variables that are determinants of wetland utilization. The results of the analysis showed that significant variables included crop preferences, farming system, culture, taste, land tenure, knowledge of wetland cultivation, perceived suitability, farmers' tribe, location of wetland, and farmers' age. It was concluded with suggestions for the right combination of policies, public awareness, and appropriate farming methods in order to improve wetland utilization in Nigeria.
Key words: social factors; current status; wetlands utilization; agriculture; sawah rice production

Wetlands are areas where the water table is either seasonally or permanently high. Wetlands may be used for agriculture, forestry or amenity purposes that can tolerate intermittent high water tables, and closely related wetlands are floodplains. Floodplains are areas through which watercourses run and over which floodwater naturally extends. The extent and depth of flooding over a floodplain will vary and depend on the severity of the flood. Human activity can have considerable impact on the local mechanisms of flooding within these areas during minor floods but the scale of major floods usually overwhelms artificial controls and natural processes then dominate.

Kangalawe and Liwenga [1] reported that wetlands contribute in diverse ways to the livelihood of many people in Africa. One of the major constraints to the wise use of African wetlands is lack of knowledge by planners and natural resource managers on the benefits that they provide and techniques by which they can be utilized in a sustainable manner. The FAO-Netherlands Partnership Programme (FNPP) project on sustainable development and management of wetlands in the Southern Africa Development Community (SADC) region focused on how to improve food security and environmental security of wetland dependent communities in a number of SADC countries through the increase of knowledge, the evaluation of wetland interventions and the building of local capacity.

According to Kangalawe and Liwenga [1], rice is the most prominent crop for the inhabitants of the Kilombero Valley of Tanzania. They utilize wetlands to grow rice either during the rainy season or in the dry season. Also, over the last two decades the use of wetlands for agriculture has increased because of increasing population and the resultant need to produce more food [2]. This highlights the importance of the wetlands to local livelihoods and economies. As such, the wetlands are very important for poverty reduction and/or wealth creation to the local communities. However, in order to harness this opportunity there is a need for sustainable management of these wetlands. West Africa Rice Development Association (WARDA) [3] reported that rice production dominates the inland valleys of Nigeria. It also portrays rice production as more productive than the upland production.

Sawah rice production system was introduced to the inland valley of Bida, Nigeria because it can overcome soil fertility problems through enhancing the geological fertilization process, conserving water resources, and the high performance multi-functionality of the sawah type wetlands. The term sawah refers to leveled and bunded rice fields with inlet and outlet connecting irrigation and drainage. Despite the predominance of rainfed agriculture in Nigeria, the sawah system uses of inland valleys will enhance continuous cropping and less disruption of the production activities. Fashola et al [4] noted that the sawah system offers the best option for overcoming constraints associated with rice production in Nigeria due to the utilization of the inland valleys which are reported to be high in fertility and enhances water management for rice production. Sawah-based rice production took off through the establishment of a demonstration farm (1.5 ha) at Ejeti village in 2002.

In this study, a case study of sawah rice production was conducted to determine the social factors affecting wetlands utilization for agriculture in Nigeria.

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RESEARCH METHOD

The study was carried out in Niger State, Nigeria. A list of rice farmers in the villages where sawah technology was disseminated was compiled with a total of 2064 farmers. The availability of inland valley is a prerequisite for the adoption of sawah rice production technology.

A simple random sampling technique was used to select 200 farmers and data were collected on their socio-economic variables and utilization of wetlands by using a structured questionnaire. Descriptive statistics was used to analyze the socio-economic features of the farmers while the probit model was used to capture the socio-economic factors influencing the use of wetlands among rice growing farmers. The probit model was used to analyze the use of wetlands. The choice of explanatory variables (socio-economic characteristics) was based on the literatures reported previously and the characteristics found among the respondents. The relationship between the probability of use variable P_i and its determinant q is given as: $P_i = \beta q_i + \mu_i$, where $P_i = 1$ for $X_i \geq Z$; i=1, 2…n; q_i is a vector of explanatory variables and β is the vector of parameters. The probit model computes the maximum likelihood estimator of β given the non-linear probability distribution of the random error μ_i. The dependent variable P_i is a dichotomous variable which is 1 when a farmer uses wetlands and 0 if otherwise. The explanatory variables are: X_1 = age in years; X_2 = dummy variable for educational level (educated = 1, not educated = 0); X_3 = dummy variable for membership of farmer group (member = 1, non-member = 0); X_4 = farming experience in years; X_5 = dummy variable for land tenure system (land owner = 1, others = 0); X_6 = tenancy period in years; X_7 = rent rate in Naira; X_8 = dummy variable for share cropping; X_9 = dummy variable for farming system; X_{10} = dummy variable for culture; X_{11} = dummy variable for taste; X_{12} = knowledge of wetland cultivation; X_{13} = dummy variable for perceived suitability; X_{14} = dummy variable for farmers' tribe; X_{15} = location/distance of wetland in kilometers, X_{16} = dummy variable for crop preferences; X_{17} = practice sawah; X_{18} = household size and X_{19} = power tiller use.

RESULTS

Farming characteristics of farmers

The socio-economic characteristics of the respondents covered in this study are presented in Table 1. This combines their personal and farm characteristics. Table 1 shows that the majority of farmers were about 42 years of age with Quranic form of education, belonging to at least one farmer group and had been farming for about 12 years. The land tenure system was predominant through inheritance, while the hire of the land had an average period of about 3 years as the tenancy period with a rent rate of 2000 Naira per month.

Kangalawe and Liwenga [1] reported that in the Kilombero Valley of Tanzania the access to wetland plots was through a number of means such as clearing of fields freely, asking for permission from the village government, inheriting from parents, buying from other villagers and hiring plots. Concerning the dynamics of wetland utilization, most of the respondents (95%) pointed out that it was much easier to obtain access for cultivation in the wetlands in the past than at present. Respondents were predominantly Nupe with high knowledge of wetland cultivation. Rice was the most preferred crop for production in the wetlands as rooted in their taste preferences and the adoption of sawah rice production technology. The distance of the wetlands to farmers' settlements was averagely 3.5 km.

Table 1. Socio-economic characteristics of respondents.

Socio-economic/farming characteristics	Description
Age	Mean = 41.96 years
Educational level	Predominantly Quranic
Membership of farmer group	Predominantly members
Farming experience	Mean = 12 years
Land tenure system	Predominantly inheritance
Tenancy period	Mean = 2.92 years
Rent rate	Mean = 2000 Naira
Share cropping	Predominantly owners
Farming system	Rice based
Culture	Nupe based
Taste	Rice preferred
Knowledge of wetland cultivation	High knowledge
Perceived suitability	Predominantly suitable
Farmers' tribe	Predominantly Nupe
Location/distance of wetland	Mean = 3.5 km
Crop preferences	Rice
Practice sawah	Predominantly sawah based
Household size	Mean = 4.6
Power tiller use	25 percent of respondents usage

Parameter estimates of farming factors

From the results of the probit model presented in Table 2, the Chi-square value was used to determine the goodness of fit of the model. The value is statistically significant at 1% level. The result also shows that 13 variables are statistically significant at 5% level. These are age (t = 9.22), educational level (t = 2.32), membership of farmer group (t = -2.57), farming experience (t = 10.63), tenancy period (t = -5.96), farming system (t = -4.84), taste (t = 14.74), farmers' tribe (t = 3.29), location/distance of wetland (t = -5.03), crop preferences (t = 19.02), practice sawah (t = -14.00), household size (t = -1.98), and power tiller use (t = 16.51).

It can be deduced that the older the farmers, the more they realize the usefulness of wetlands in their vicinity. Also the higher the level of education among farmers, the more the realization of the potentials of the wetlands for productive purposes. There is a positive relationship between the membership of farmers association and the probability of cultivating wetlands. This indicates that farmers who are

Table 2. Parameter estimates from probit regression model.

Variables	Regression coefficient (Coeff.)	Standard error (SE)	Coeff./SE
Age	0.00910	0.00099	9.22508
Educational level	0.01464	0.00629	2.32757
Membership of farmer group	-0.08208	0.03182	-2.57946
Farming experience	0.00838	0.00079	10.63483
Land tenure system	-0.00112	0.01318	-0.08517
Tenancy period	-0.08414	0.01410	-5.96870
Rent rate	-0.00010	0.00127	-0.08220
Share cropping	0.00168	0.00368	0.45631
Farming system	-0.07141	0.01473	-4.84892
Culture	-0.00017	0.01061	-0.01618
Taste	0.00054	0.00004	14.74771
Knowledge of wetland cultivation	0.03373	0.02951	1.14313
Perceived suitability	-0.00013	0.00013	-1.01701
Farmers' tribe	0.00302	0.00092	3.29664
Location/distance of wetland	-0.00887	0.00176	-5.03317
Crop preferences	0.76676	0.04031	19.02273
Practice sawah	-0.59128	0.04223	-14.00068
Household size	-0.00591	0.00298	-1.98289
Power tiller use	0.67348	0.04079	16.51159
Intercept	-0.96402	0.05306	-18.16852
Pearson Goodness-of-Fit Chi-square	8309.263		
DF	185		
P	0.000		

members of the farmers association have higher probability of cultivating the wetlands. This is because of high level of interaction among members of the same group as a mean of disseminating. As the years of farming experiences increases, the probability of cultivating wetlands also increases as farmers would have been able to explore the different possibilities of farming in several locations. On the other hand, there is an inverse relationship between tenancy period, farming system, distance to wetland and the practice of sawah and the probability of cultivating wetlands. This indicates that an increase in any of these variables will lead to a decrease in the probability of cultivating wetlands. This may be due to the fact that short tenancy periods do not encourage farmers to cultivate wetlands since they have to put an amount of labor in the first year of cultivation. Also, farming systems that are not based on crops being cultivatable on wetlands as well as long distances from household settlements will reduce the chance of cultivation of wetlands among farmers. Similarly, the availability of wetlands is a prerequisite for the adoption of sawah technology. Therefore if farmers are not adopting sawah technology, then the probability of cultivating wetlands is low.

DISCUSSION

This study has confirmed that the wetlands in Bida area, Nigeria are highly beneficial in supporting the livelihoods of communities inhabiting the areas. The landscapes in the area are diverse and provide a number of livelihood options through the cultivation of different crops with rice as the most prominent and rewarding. The intensity and pattern of utilization of wetland resources has considerably changed over time. The use of wetland resources has increased and intensified mainly as a result of internal population growth and influx of people from other areas. To ensure a sustainable use of the wetlands, important social variables identified in this paper based on the case study of sawah rice production should be given policy consideration.

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