WFL Publisher
Science and Technology
Meri-Rastilantie 3 B, FI-00980
Helsinki, Finland
e-mail: info@world-food.net

Journal of Food, Agriculture & Environment Vol.9 (3&4): 183-188. 2011 *www.world-food.net*

Knowledge and training needs of farmers adopting sawah rice production technology in Nigeria

C. I. Alarima [1*], A. Kolawole [2], E. Fabusoro [3], A. A. Ajulo [4], T. Masunaga [1] and T. Wakatsuki [5]

*[1] Faculty of Life and Environmental Science, Shimane University, Matsue, 690-8504, Japan. [2] i/c Hirose Project, International Institute of Tropical Agriculture, Ibadan, Nigeria. [3] Department of Agricultural Extension and Rural Development, University of Agriculture, PMB 2240, Abeokuta, Nigeria. [4] Nigerian Institute for Oceanography and Marine Research, Victoria Island, Lagos, Nigeria. [5] Faculty of Agriculture, Kinki University, Nara 631-8505, Japan. *e-mail: corneliusalarima@yahoo.com*

Received 18 April 2011, Accepted 6 July 2011.

Abstract

Data were collected from 124 sawah farmers purposefully selected using a well-structured interview guide to identify the knowledge and training needs in Nigeria. The study was carried out in Ogun, Ondo, Niger, Ebonyi, Kaduna and Abuja, the Federal Capital Territory. The results showed that respondents were predominantly male, married and had Quranic education, with mean age of 42.30 years. The mean household size was 14 persons, farm size ranged from 0.03 to10 ha (mean = 0.5 ha), the mean yield was 4.65 t/ha and mean income $1,041.38 ($1= ₦145.00). The farmers on average were knowledgeable of sawah technology. Water management, power tiller operation and management, sawah layout and design, surface levelling and smoothening, nursery management, harvesting, processing and nutrient management were the areas they need training and are willing to attend on-the-job training. Regression analysis showed that age (β = -0.540), years of experience in sawah (β = -0.534), training attended (β = -0.182) and knowledge of sawah (β = -0.044) were negatively related to training needs, while household size (β = 0.708) and farm size (β = 0.621) were positively related to training needs. The areas of priority for training are water management, power tiller operation and management and sawah plot layout. Farmers are willing to attend on-the-job training if given the opportunity.

Key words: Knowledge, sawah ecotechnology, training needs, farmers, Nigeria.

Introduction

Agriculture remains the main stake of the economy in most developing countries all over the world. Millions of farmers rely on land, which is too small and too poor to sustain the living of their families, but still they have to make ends meet on that land. In West Africa, the area of unplanted land resulting from desertification and urbanization grew in the last three decades by 9 million hectares, which is higher than in any other part of the world[1]. During this period, agricultural productivity in West Africa has not been improved but the population has continued to grow, combined with endless destruction of forests and farm land. Population growth has resulted in environmental disruption which reduced food productivity and promoted the destruction of the environment [1]. In Nigeria various interventions have been implemented to improve food production and farmers income through the provision of agricultural infrastructure, inputs and effective extension work, such as National Accelerated Food Production Project (NAFPP), National Fadama Development Project (NFDP), National Economic Empowerment and Development (NEEDS), National Special Programme for Food Security (NSPFS) [2] and National Rice Development Strategy (NRDS) aimed at increasing rice production in Nigeria. However, the successes of these interventions still remain invisible.

The impact of rice production, which contributed to a substantial reduction of poverty and the launching of broader economic growth in many Asian countries through a combination of biotechnology as manifested in the use of high yielding varieties of rice and sawah technology as a tool for Green Revolution [3] has not been optimally felt in Nigerian. This may be as a result of lack of knowledge, unfavourable policy environment, poverty, lack of training, and the method of training without taking into consideration the training need of each farmer for effective utilization of technology. Most farmers need specific training and information in order to effectively use sawah technology and thus improve their production. Sawah refers to levelled rice field surrounded by banks with inlet and outlet for irrigation and drainage. The basic elements of sawah system include improved irrigated rice basins, seedbed preparation, transplanting and spacing of seedlings, fertilizer application and most importantly, appropriate water management [4, 5]. Sawah rice production system was introduced to the inland valley of 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 [6]. In order to realize green revolution in Sub-Saharan Africa, it is essential to improve rice-growing environment by promoting lowland sawah eco-technology [7]. Fashola *et al.* [8] also noted that the sawah system offers the best option for overcoming the constraints of rice production in Nigeria, namely poor soil fertility, poor water management and poor varieties, because the sawah system utilizes the inland valleys which are high in fertility and through appropriate water management fertility can be sustained and enhanced for rice production.

Training farmers for development is one of the numerous activities that need to be carried out to sustain production of food and to enhance self-sufficiency in food production in the developing world. Training is mostly directed at improving the ability of individual to do their vocation more effectively and efficiently [9]. Generally, it involves acquiring information and developing abilities or attitudes, which will result in greater competence in the performance of a work. On the necessity of training and active participation for success in any rural development endeavour, Bari [10] noted that for effective rural development, participation of rural people in the development process is essential. However, people cannot participate unless they have been motivated or made aware about the changes they need for their welfare. As such training is playing a vital role to make the rural people aware and act as subjects in the development process [10]. Mengistu [11] highlighted the contributions of training to agricultural development as providing farmers with the basic skills, improving rationality and increasing inquisitiveness and thereby improving receptivity for new ideas, opportunities and methods and changing values and aspirations and strengthening the willingness to economize and facilitate the adoption of new techniques.

Ajayi [12] defined training as the acquisition of the best way of utilizing knowledge and skill. Goldstein [13] defines training as a systematic acquisition of skills, rules, concepts or attitudes that results in improved performance in another environment. Training is a circular process that begins with needs of identification and implementation and ends with evaluation of the training. A change or deficiency in any step of the training process affects the whole system and therefore, it is important for a trainer to have a clear understanding about all phases and steps of the training process: planning, implementation and evaluation. Owona *et al*. [14] defined training need as skill, knowledge and attitude an individual requires in order to overcome problem as well as to avoid creating problem situation. According to Adesoji *et al*. [15], training need is difference between what is and what ought to be. This means that for training to be needed, a gap or vacuum must be presented which needs to be filled. Farinde and Ajayi [9] stated that training needs exist anytime an actual condition differs from a desirable condition in the human or people aspect of organizational performances or more specifically when a change in present knowledge, skill and attitude can bring out the desired performance.

Past studies had earlier shown that it is important to determine the training needs of farmers for agricultural development. Adesoji *et al*. [15] assessed the training of fadama farmers for future agricultural extension development in Osun state, Nigeria. Farinde and Ajayi [15] investigated training needs of women farmers in livestock production in Oyo state, Nigeria, and Ajayi and Okoedo-Okojie [16] assessed the perceived training needs of cassava farmers in Ovia north east local government area of Edo state, Nigeria. Ajayi *et al.* [17] assessed the women farmers training need, which correlates for effective extension programme and poverty reduction in Oyo state, Nigeria. Similarly, Al–Shadiadeh [18] carried out a descriptive study of the training needs for men and women farmers in semi desert areas of South Jordan. All of these studies identified the training need as important in adoption of technology among their respondents.

Identification of training needs of the sawah farmers is a crucial element in sawah development process. Success of any training programme carried out depends greatly on the correct identification of needs. The needs assessment for training is the basis for extension process and its activities. All interventions that do not take these needs in consideration tended to be wasting valuable resources [18]. Hence a study of the training needs of farmers is essential for the successful dissemination and adoption of sawah technology. This study examined the socio-economic and farming characteristics of farmers, cropping pattern, information sources, knowledge and the training needs of the sawah farmers as they affect sawah development.

Methods

This study was carried out in Nigeria. Nigeria has 36 states and Abuja, the Federal Capital Territory (FCT). This study was carried out in five states and the FCT where sawah is being practiced. The states were Niger, Kaduna, Ondo, Kwara, Ebonyi and Abuja (i.e. the FCT). Data used in this study were collected in all the sawah sites in Nigeria namely: Bida, Zaria, Ilorin, Abakaliki, Abuja and Akure. A well-structured interview guide was used to elicit information from the farmers. A list of rice farmers in the villages where sawah technology was disseminated was compiled. One hundred and twenty four sawah farmers in the study locations were purposefully selected based on their participation in sawah rice production and interviewed in the course of the study. Descriptive statistics were used to analyze the socio-economic and farming characteristics of the farmers. Correlation analysis was employed to determine the interrelationships between the study variables, and regression analysis was used to determine the relationships between training needs and other study variables.

Results and Discussion

Socio-economic and farming characteristics of the respondents: As shown in Table 1 majority of the respondents were male (98.9%). This shows that sawah farming in Nigeria is dominated by male farmers. The mean age of the respondents was 42.30 years and 65.40% fall within the productive age of 15-45 years. Most of the respondents were married (98.80%) and 62.70% of the farmers had Quranic education and were Nupes. The results of this study was corroborated by the findings of Fu *et al.* [19] and Oladele and Wakatsuki [20] in studies on sawah farmers in Nigeria. Household size of the farmers ranged between 1 and 40 persons with a mean of 14 persons. Fifty-five percent of the farmers had household size of 11-20 persons. The relative large household size could serve as a source of farm labour. According to Erenstein [21] labour is one of the major constraints affecting several agrarian systems. The considerable large size of the farming households could reduce the labour demand. The mean size of farm devoted to sawah was 0.5 ha. However, the majority of the farmers had farm size less than 0.5 ha and the mean farmers' income is ₦151,000 ($1041 at an exchange rate of ₦ 145 to $1 at the time of data collection). Mean farmers' years of experience in rice production and sawah production were 32 and 6 years, respectively. This implied that the respondents had considerable experience in rice production and hence were capable of using sawah technology. Also, farmers' experience in rice production will be of great importance in developing the skills required for sawah rice production. In all, yield of sawah field among the sawah farmers was 4.65 t/ha with majority of the farmers (77.30%) having yield of less than 2 t. The

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

Attributes	Definition	Distribution
Sex	Sex of the respondents as male or female	Male (98.9%); Female (1.1%)
Age	Actual age of respondents	Average age =42.3
Educational level	Highest educational attainment	Quranic (62.70%); No formal education (3.60%); Primary (12.0%); Secondary (18.10%); Tertiary (3.60%)
Marital status	Marital status of the respondents	Married (98.8%); Single (1.20%)
Household size	Number of persons in the household	Average=14 persons
Yield	Yield from the sawah farm	Average = 2.5tonnes
Farm size	Area of land used for sawah	Average=0.53ha
Income	Income generated from sawah production	Average=₦151,110
Years of experience in rice production	Number of years spent on rice farming	Average=32 years
Years of experience in sawah rice production	Number of years spent on sawah rice farming	Average=6 years
Distance	Distance of farm to the house	Average=0.7km

yield corresponds to the size of the field. This also shows an improvement in the yield of farmers of about 1.5 t/ha before the introduction of sawah technology. The average distance covered from the farmers' house to the farm was 0.7 km.

Cropping pattern and use of sawah technology among respondents: The result showed that majority (84.10%) of the farmers practiced mono cropping (Table 2). They grow only rice on the sawah field. However, discussion with the farmers revealed that during the dry season vegetables were planted on the field and harvested before the following rice planting season. As part of the sawah technology package, all the farmers (100%) raised their rice in the nursery before transplant as against the old method of broadcasting. The farmers, however, complained about the stress of transplanting with hand and hoped that it can be solved by using a rice transplanter. All the farmers bund their sawah fields which helps in water management and is effective in nutrient use and management in the soil. The result further showed that 62.50% of the farmers puddled their fields. Non-availability of power tiller for use in the puddling restrained other farmers. It was also revealed that the average yield per hectare would have been increased if all the farmers have access to power tiller at the right time. This also reflects the fact that an appreciable number of farmers could not level and smoothen their sawah field (69.50% and 79.70%, respectively). Levelling and smoothening improve water and nutrient distribution in the sawah basin thereby increasing the yield of rice.

Knowledge of sawah technology among the respondents: Identification of the knowledge level of the farmers will help in determining where trainings are necessary to be conducted to the farmers to improve sawah development in Nigeria. The results showed that farmers have average knowledge on sawah (Table 3).

Table 2. Cropping pattern and use of sawah technology among respondents.

Variable	Frequencies	Percentage
Cropping pattern		
a. Mono cropping	104	84.10
b. Mixed cropping	20	15.90
Nursery preparation for sawah	124	100
Bunding of the field	124	100
Puddling of field	78	62.50
Levelling of field after puddling	37	29.50
Smoothening after levelling	25	20.30

Majority (86.40%) of the farmers correctly identified the first operation carried out in sawah development. Majority (96.60%) of the farmers identified the place where seedlings are grown before transplanting to the sawah field as nursery and the type of land used for sawah as lowland. However, the farmers could not correctly explain the process of moving soils on the basin for levelling. This also affirms that most of the farmers have not been levelling their field. In addition, majority (75.00%) of the farmers could not explain the point of introducing water into the sawah basin as the inlet and drainage as outlet. Effective water management is an important component of sawah and determines to a greater extent the success of sawah.

Information source about sawah among respondents: Table 4 shows the sources of information about sawah among the farmers. Majority of the farmers got information about sawah from sawah contact farmers (98.23 %) and their colleagues (79.03%) in rice farming in their locality. These variables indicate the intensity of contacts with contact farmers and other farmers. Farmers who do not have contacts with extension agents may still be informed about new technologies by their colleagues. Other got their information from their village head (55.32%), group meeting of the farmers group (39.52%), training attended (10.16%), radio (2.26%), researchers (2.26%) and the extension agent (1.13%).

Training needs among the respondents: Table 5 shows the training needs of the sawah farmers in Nigeria in order of priority. Water management (95.50%), power tiller operation and management (93.20%) and sawah layout and design (88.60%) were the most important areas where farmers need training. This may be due to the fact that an effective water management is the 'back bone' of sawah development. Sawah is a levelled rice field surrounded by banks with inlet and outlet for irrigation and drainage. Improved irrigated rice basin is a basic element of sawah system development [6]. Therefore, there is need for the farmers to be acquitted with the basic training on water management in sawah development. Surface levelling and smoothening (74.60%), nursery management (74.60%), harvesting, processing and adding value to produce (65.30%) are other areas of training need. Farmers still rely on traditional methods of harvesting and processing using drums. Farmers sell their yields during harvest glut in the market which affects the price system. Fertilizer usage and nutrient management (61.40%) is also one of the areas of training need. Sawah fertilizer usage is a critical aspect of the development process. Sawah

Table 3. Knowledge of sawah technology among the respondents.

Variables	Frequencies	Percentage
1. Identification of first operation in sawah technology	107	86.40
2. Levelling of plot	70	56.80
3. Flooding of plot	78	63.60
4. Nursery	120	96.60
5. Lowland/fadama	101	81.80
6. Water inlet and outlet	31	25.0

Table 4. Information source about sawah among respondents.

Sources	Frequency*	Percentage
Contact farmers	122	98.23
Farmers	98	79.03
Village head	69	55.32
Group meetings	49	39.52
Training attended	13	10.16
Radio	3	2.26
Researchers	3	2.26
Extension agent	1	1.13

* Multiple responses provided.

Table 5. Areas of training needs among the respondents in order of priority.

Training Areas	Frequency	*Percentage
1. Irrigation technique	118	95.50
2. Power tiller operation	116	93.20
3. Sawah layout	110	88.60
4. Surface levelling	93	74.60
5. Nursery management	93	74.60
6. Harvesting	81	65.30
7. Processing	81	65.30
8. Fertilizer usage	76	61.40
9. Disease and pest control	67	54.0
10. Weed control	64	52.0
11. Purchase of farm inputs	52	42.0

* Multiple responses provided.

system encouraged not only the growth of rice plant but also the growth of various aquatic algae and other aerobic and anaerobic microbes, which increase nitrogen fixation in the sawah system through increase of photosynthesis as functional wetlands. This eventually increased the yield of sawah rice [22, 23]. If in an attempt to improve the fertility of the soil, excess fertilizer is applied, it will be in disadvantage to the crops. Disease and pest control (54.00%), weed control (52.00%) and purchase of farm inputs for sawah development (42.00%) are the other areas where training is needed by the farmers.

Types of training respondents are willing to attend: Table 6 shows the type of training the farmers are willing to attend. For training to meet the aspirations of farmers, their status and conditions must be taken into consideration. The training types farmers are willing to attend in order of preference are on-the-job training (OJT) (92.70%), field visitation and observation (58.00%) and farmer field day (28.23%). On-the-job training (OJT) is one of the best training methods because it is planned, organized and conducted at the farmers' field. On-the-job training will generally be the primary method used for broadening farmer's skills and increasing productivity. It is particularly appropriate for developing proficiency skills unique to farmers' job. However, morale and productivity will be high in organizing and conducting an on-the-job training as its success is determined by how it is planned. Visiting of model sawah site by farmers can also help as a source of training. Farmers' regular visit to model sites around their field can go a long way to improve their knowledge on sawah. During visits, questions on the grey areas can be asked the sawah leader thereby improving farmers knowledge. In addition, attending field day in sites of successful adoption by farmers can improve their knowledge of sawah. Farmers' field days (FFD) provide an opportunity for hands-on learning. Farmers from across various locations have a chance to learn practical skills, get answers to their questions and meet other likeminded folks during farmers' field days (FFD)

Relationship between the study variables: Table 7 shows the detailed analysis with correlation matrix significant at 0.05 and 0.01. The results of the study shows that there was a significant negative correlation ($r = -0.54$, $p < 0.01$) between the training needs of the farmers and years of experience in rice farming. This implies that as the years of experience increases, the training needs are reduced. Also, there was a significant negative relationship ($r = -0.26$, $p<0.05$) between training needs and years of experience in sawah rice production. This implies that as the years of experience in sawah increases, training needs decrease. These results agree with the saying that 'experience is the best teacher'. The years of experience gathered in rice production and sawah production over the years may lower their training needs in some aspect of sawah technology. The experienced sawah farmers might have come across some problems and those they were able to solve will add to their experience which they can share among their peers. The inexperienced farmers will show higher affinity for training and willingness to participate in trainings. The result of this study is supported by Adesoji *et al.* [15]. There is also a significant negative correlation ($r = -0.23$, $p<0.05$) between knowledge of the farmers and training needs. The implication of this is that as the knowledge of sawah increases among the farmers, training needs decrease. Correlation analysis also showed that there is a significant positive relationship between the years of experience in sawah rice production and age ($r = 0.36$, $p<0.01$), educational level ($r = 0.37$, $p<0.01$), years of experience in rice production ($r = 0.49$, $p<0.01$) and the yield of farmers. This implies that as the age, educational level and experience in rice production increase, the experience in sawah also increases. There also exists a positive significant relationship between sawah rice experience and the yield of sawah. The implication of this is that, as the experience gathered by farmers increase, their yield also increases. A positive significant relationship exists between yield of sawah rice and household size ($r = 0.25$, $p<0.05$), farm size ($r = 0.90$, $p<0.01$) and income ($r = 0.41$, $p<0.01$) of the farmers. This implies that increase in farmers' household size, farm size and income of farmers will increase the yield of the farmers. There is also a significant correlation ($r = 0.60$, $p < 0.01$) between information sources and the knowledge of sawah among the farmers. This implies that as the farmers get more information, their knowledges will be improved. Also there is significant positive relationship ($r = 0.25$, $p<0.05$) between information sources and experience in sawah rice production.

Table 6. Types of training respondents are willing to attend.

Training types	*Frequency	Percentage
On the job training (OJT)	115	92.70
Field visitation and observation	72	58.0
Farmers field days (FFD)	35	28.23

* Multiple responses provided.

Table 7. Correlation matrix showing relationship between study variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	1.00											
2. Educational level	0.515**	1.00										
3. Household size	0.548**	0.214	1.00									
4. Farm size	0.075	0.008	0.251*	1.00								
5. Income	0.378**	0.248*	0.364**	0.418**	1.00							
6. Years of experience in rice production	0.896**	0.667**	0.490**	0.001	0.344**	1.00						
7. Yield of sawah rice	0.118	0.023	0.245*	0.901**	0.414**	0.041	1.00					
8. Years of experience in sawah rice production	0.361**	0.378**	0.385**	0.205	0.043	0.492**	0.246*	1.00				
9. Distance from farm to house	0.067	0.123	0.111	0.053	0.043	0.131	0.128	0.111	1.00			
10. Knowledge of sawah	0.040	0.267*	0.110	0.057	0.078	0.096	0.012	0.244*	0.012	1.00		
11. Information source	0.017	0.222	0.059	0.126	0.030	0.123	0.114	0.250*	0.013	0.596**	1.00	
12. Training needs.	0.045	0.079	0.104	0.074	0.064	-0.542**	0.042	-0.261*	0.057	-0.229*	0.03	1.00

Table 8. Results of regression analysis showing relationship between study variables.

Variables	B	SE	Std β	t-ratio	Sig
Constant	2.76	1.23		2.24	0.03
Age	-1.48	0.61	-0.540	-2.41	0.02
Sex	0.20	0.31	0.104	0.63	0.53
Educational level	0.00	0.11	0.001	0.00	0.99
Marital status	0.16	0.58	0.056	0.28	0.78
Household size	1.44	0.50	0.708	2.88	0.01
Farm size	1.37	0.62	0.621	2.20	0.03
Experience in sawah	-0.84	0.45	0.534	-1.87	0.07
Income	0.12	0.08	0.232	1.38	0.18
Training attended	-0.08	0.07	-0.182	-1.08	0.29
Areas of training	-0.05	0.11	-0.070	-0.43	0.67
Information sources	0.02	0.04	0.090	0.55	0.58
Knowledge of sawah	-0.08	0.33	-0.044	-0.26	0.80
Training constraints	-1.29	0.85	-0.39	-1.52	0.14

$R = 0.576$, $R^2 = 0.332$, Adjusted $R^2 = 0.135$, $F = 1.682$, standard error of estimate = 0.88.

Regression analysis showing relationship between training needs and other study variables: Regression analysis (Table 8) showed that there were negative relationships between training needs of farmers and age ($\beta = -0.540$), years of experience in sawah ($\beta = -0.534$), training attended ($\beta = -0.182$) and knowledge of sawah ($\beta = -0.044$). The results implied that the older the farmers are the less training they need. This may be as a result of resistance and adamant to change by older farmers as the younger farmers may want to learn more. This agrees with the findings of Adesoji *et al.* [15] and Ajayi [12]. In addition, experience the older farmers have gathered in rice production may also stand as an obstacle for them to be interested in other training in rice production. The regression coefficients relationships between training needs and household size ($\beta = 0.708$) and farm size ($\beta = 0.621$) were positive. This implies that the larger the household size the more the need for training and the higher the farm size the more the training required. With increase in the household size, there may be need to increase the size of the land cultivated, and in an attempt to increase the size of the farm, there will be need to ensure a success and high yield from the farm, so there will be more need for the farmer to search for a mean of improving their knowledge through trainings. Also, as the farm size increases, farmer will be desired to maximise the profit from investment and thereby to have training on the new ways of doing things.

Conclusions and Recommendations

Based on the findings of the study, married farmers are engaged in sawah rice production and have Quranic education. Also, few old farmers are engaged in sawah farming. Majority of sawah farmers practiced mono cropping, nurse their rice and bund their sawah field. The major sources of information about sawah are contact farmers and other rice farmers. The areas of priority for training are water management, power tiller operation and management and sawah plot layout. Farmers are willing to attend on-the-job training if given the opportunity. Base on the findings, the study recommends that on-the-job training should be organised for the farmers. Also, extension agents in the areas where sawah has been disseminated should be trained on the rudiments of sawah development to serve as the change agent in their areas, assist the trained contact farmers and to be able to train other farmers since they are close to these farmers. Training content must be in line with the priority of the farmers in areas of water management, power tiller operation and management and in plot layout and design. Also, when organising training, the age, location, knowledge and experience of the farmers should be considered.

Acknowledgements

This study was supported by Japan Society for the Promotion of Science (Grant-in-Aid Scientific Research No. 19002001).

References

[1]Hirose, S. and Wakatsuki, T. 2002. Restoration of inland valley ecosystems in West Africa. Association of Agriculture and Forestry Statistics, pp. 21-37.

[2]Jibowo, A. A. 2005. History of agricultural extension in Nigeria. In Adedoyin, S. F. (ed.). Agricultural Extension in Nigeria. Agricultural Extension Society of Nigeria (AESON), pp. 1-12.

[3]Otsuka, K. and Kijima, Y. 2010. Technology policies for a Green Revolution and agricultural transformation in Africa. Journal of African Economies **19**(2):60-76.

[4]Padoch, C., Harwell, E. and Susanto, A. 1998. Swidden, sawah, and in-between: Agricultural transformation in Borneo. Human Ecology **26**(1):3-19.

[5]Wakatsuki, T. and Buri, M. M. 2009. General concept of "Sawah" system. In Buri, M. M., Issaka, R. N. and Wakatsuki, T. (eds). The Sawah System of Rice Production. CSIR-Soil Research Institute and Kinki University, Kumasi, Ghana, pp. 6-27.

[6]Buri, M. M., Issaka, R. N. and Wakatsuki, T. (eds) 2008. The Sawah System of Rice Production. CSIR-Soil Research Institute and Kinki University, Kumasi, Ghana, 147 p.

[7]Oladele, O. I. and Wakatsuki, T. 2008. Social Factors Affecting Wetlands Utilization for Agriculture in Nigeria: A case study of sawah rice production. Rice Science **15**(2):150–152.

[8]Wakatsuki, T. 2008. Materialization of African rice green revolution by sawah ecotechnology (in Japanese). In Matsuzono, M., Nawata, H. And Ishida, S. (eds). Human Development of Africa: Practice and Cultural Anthropology. Akashi Shoten, Tokyo, pp. 173-219.

[9]Fashola, O. O., Oladele, O. I., Aliyu, J. and Wakatsuki, T. 2006. Dissemination of sawah rice technology to farmers cultivating inland valleys in Nigeria. Proceedings of the Asian Pacific Extension Network, 6-8th March 2006, Australia.

[10]Farinde, A. J and Ajayi, A. O. 2005. Training needs of women livestock production: Implications for rural development in Oyo State. Journal of Social Science **10**:159-164.

[11]Bari, M. A. K. 1987. Training and Education in Rural Development. Bids, Dhaka.

[12]Mengistu, F. T. 2009. Problems and Prospects of Farmers Training Centers: The Case of Ada'a Woreda, East Shewa, Oromia Region. M.Sc. thesis Haramaya University.

[13]Ajayi, A. O. 1995. Identification of Training Needs of Women Farmers in Oyo State. Unpublished M.Sc. thesis, Agricultural Extension and Rural Sociology, O. A. U, Ile-Ife.

[14]Owona, N. P. A., Nyaka, N. A., Ehabe, E. E., Chambon-Poveda, B. and Bruneau, J. C. 2010. Assessment of training needs of rubber farmers in the south-west region of Cameroon. African Journal of Agricultural Research **5**(17):2326-2331.

[15]Adesoji, S. A., Farinde, A. J and Ajayi, A. O. 2006. Determinants of training needs of fadama farmers in Osun State, Nigeria and implication for extension work. Journal of Applied Sciences **6**(15):3082-3088.

[16]Ajayi, M. T. and Okoedo-Okojie, D. U. 2008. Perceived training needs of cassava farmers in Ovia north-east local government area of Edo State, Nigeria. Bowen Journal of Agriculture **5**(1):128-134.

[17]Ajayi, A. O., Farinde, A. J. and Laogun, E. A. 2003. Women farmers training needs and their correlates for effective extension programme and poverty alleviation in Oyo State Nigeria. Journal of Extension System **19**:91-102.

[18]Al–Shadiadeh, A. N. H. 2007. Descriptive study of the training needs for men and women farmers in semi desert areas a case study of South Jordan. World Applied Sciences Journal **2**(1):12-21.

[19]Fu, R. H. Y., Maruyama, M., Oladele, I. O. and Wakatsuki, T. 2009. Farmers adoption and propensity to abandoned adoption of sawah-based rice farming in inland valley of Central Nigeria. Journal of Food, Agriculture and Environment **7**(2):379-382.

[20]Oladele, O. I. and Wakatsuki, T. 2009. Effect of land tenure on the adoption of sawah rice production Technology in Nigeria and Ghana. Journal of Agricultural Science and Technology **3**(10):47-53.

[21]Erenstein, O. 2003. Smallholder conservation farming in the tropics and sub-tropics: A guide to the tevelopment and dissemination of mulching with crop residues and cover crops. Agriculture, Ecosystems and Environment **100**:17–37.

[22]Kyuma, K. 2004. Paddy Soil Science. Kyoto University Press, Kyoto, 280 p.

[23]Greenland, D. J. 1997. Sustainability of Rice Farming, CAB Int., U.K. and IRRI, Los Banos, The Philippines, Wallingford, UK, 273 p.