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Constraints to Adoption of Soil Survey Information by Owner-managed Arable Farmers of the Humid Tropics

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Abstract: This study was designed to identify obstacles to the adoption of soil survey information in Abia and Imo States of Southeastern Nigeria. A structured interview schedule was used in obtaining information from 450 respondents. Data were analysed using percentages, multiple regression and factor analysis. Results showed that age (t = 2.21), education (t = 2.00) and years of farming experience (t = 2.06) were significant in influencing the adoption of soil survey information. The major factors affecting adoption of soil survey information were management and economic and technical and structural

Key words: Adoption, arable farming, owner-management, socio-economy, soil information, Southeastern Nigeria

INTRODUCTION

Soil resource surveys provide factual information on the kinds of soil which cover the surface of the earth. Such resources surveys show spatial distribution of different kinds of soil on a map, their field characteristics, the physico-chemical properties, correlations and interpretations with many land uses. The quality of soil is fundamental in the determination of what crops and livestock products can be and therefore may be produced in a given region and on a given farm (Nerlove *et al*., 1996). Consideration of soil quality and information is vital to sustainable use in soil for arable farming (Holdren *et al*., 1995; Seybold *et al*., 2004). Non-use of soil survey information has resulted in soil and soil-related environmental problems (Onweremadu, 2006) and these problems are worsened by socio-economic pressures on soils caused by population increase (Ruecker *et al*., 2003).

In most developing countries of the humid tropics, including Nigeria, soil data are scarce available soil data are not usable (Lal and Ragland, 1993) and this is worsened by other constraining factors in natural resources management which include poverty, conflicting and uncoordinated policies, poor stakeholder involvement and shortage of technical manpower (Okedi, 2000). Where soil experts are available, language of delivery of soil survey information is complex (Akamigbo, 2002) and these attributes interact to reduce usage of soil data (Smith *et al*., 2004). Information services aim to build an offer in response to identified needs hence the need for information offer and not of document collection and management (Gachie and Ruault, 2006).

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Non-usage of soil survey information has resulted in plant nutrient depletion, nutrient toxicity, heaving of architectural structures, collapse of engineering structures, compaction, flooding, poor yield and general food insecurity. Marginal and derelict lands are erroneously converted to agricultural farmlands and pastures. Consequently, there is increased soil degradation, especially by soil erosion in the study area. In the light of the above, Wilson (2001) suggested the application of scientific information in solving sub-Saharan African food needs so long as such information are presented in customized forms (Kufoniyi, 2000) possibly using geographic information systems. Few studies have been conducted on the applicability of soil survey information by land users in the study area (Akamigbo, 2000; Onweremadu *et al*., 2007). This study was therefore designed to find out the major obstacles to the adoption of soil survey information by owner-managed arable farmers of central southeastern Nigeria. Adoption of soil information is demanding in this area since it is characterized by soil originating from different parent materials and under varying land uses amidst a teeming population.

MATERIALS AND METHODS

The study area is Abia and Imo State with an area of 13, 032 km^2 and lying between latitudes 4°40 and 8°15 N and longitudes 6°40 and 8° 15 E. Field surveys were conducted in 2005 and 2006. Six agricultural zones were identified in the two states and each agricultural zone consists of several local government areas. In all, 20 communities were purposively selected based on the large number of big farmers and accessibility. The communities and their geographical coordinates are shown in Table 1. A big farmer for the purpose of this study represented one registered and recognized by the agricultural unit of the local government area most of whom have sizeable farms. In each of the 20 communities, 30 big farmers were selected by simple random sampling, giving a total of 600 respondents in a target population of about 50,000 farmers.

A structured interview schedule was used in obtaining relevant information from the farmers (respondents). Interviewers were drawn from the localities for easy communication with respondents. The structured interview schedule was simple clear, logical and less ambiguous.

Validation of interview schedule was done, using content validity method, which is a way of determining the relevance and suitability of items included in the study (Chuta, 1992) following the

Table 1: Selected study sites

States	Communities	Geographical	Coordinates
Abia	Akwette	5°03'13"0. 540	7°39'45".310
	Arochukwu	5°46'15".601	7°59'52".480
	Bende	5°52'10".274	7°48'29".500
	Nneato	6°02' 55".327	7°37'23".400
	Isuochi	5°55'27".252	7°40'42".820
	Umuahia	5°47'58".047	7°37'26".120
	Abam	5°59'58".460	7°34'37".610
	Ututu	5°47'37".330	7°58'04".760
	Umuneise	5°44'12".350	7°33'39".340
	Nkporo	5°58'24".590	7°52'30".140
Imo	Amuzu	5°48'33".010	7°37'10".040
	Egbema	5°49'10".965	7°2'51".500
	Oguta	5°53'16".148	7°20'32".400
	Okigwe	5°56'35".513	7°44'06".500
	Owerri	5°43'14".623	7°37'34".490
	Umulolo	5°59'26".920	7°39'29".960
	Okpala	5°42'46".906	7°37'26".120
	Obizi	5°45'19".602	7°30'27".420
	Arondizuogu	5°59'58".450	7°34'37".610
	Mgbidi	5°52'48".310	7°2130".390

jury method as used by Ajayi (1996). Items contained in the draft interview schedule for the research were subjected to thorough examination and criticism by three lecturers in the Department of Agricultural Extension, Federal University of Technology, Owerri, Nigeria. The relevance and suitability of items determined by lecturer experts formed the basis for the development of final interview which was used to collect data for the study.

The variables considered under biodata of respondents included: age, gender, educational status, years of arable farming, farm size, household size and membership of social organizations. A 3-point Likert type scale was developed and used to determine the extent in which the constraining factors listed posed an obstacle to the adoption of soil survey information. The response options and values assigned were as follows:

Not a Problem (NP) = 0
Little Problem (LP) = 1
Much Problem (MP) = 2

Six major constraint variables, namely language of delivery shortage of trained personnel, lack of usable information, scantiness, of soil data, poverty and land tenure system were identified in the adoption of soil survey information. Specific issues bordering on each major constraint item were assessed and their grand mean was used to represent the major item. A varimax notated factor matrix was used to identify the most constraining obstacle to the adoption of soil survey information technology. Adoption scores were computed by using 7 stages in adoption, which were rated as follows:

Unaware = 0; aware = 1; interested = 2;
Evaluation = 3; trial = 4; adoption = 5 and discontinuance = 0

Data Analyses

Socioeconomic data were analyzed using percentages while factor analysis was used in measuring major obstacles hampering adoption of soil survey information. Adoption of soil survey information (dependent variable) was regressed to socio-economic characteristics (independent variables).
The above was expressed using a multiple regression model as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e \ldots (1)$$

Where, Y = Adoption of soil information
A = Intercept
b_1-b_6 = Regression coefficients
X_1 = Age
X_2 = Education status
X_3 = Years of farming experience
X_4 = Farm size
X_5 = Household size
X_6 = Membership of social organization
e = Error term

RESULTS

Only 75% (that is, 450) of the 600 questionnaire forms were returned. A greater number of the respondents were males (Table 2). Majority of the farmer respondents were aged 41 to 50 years and

Table 2: Percentage distribution of respondents according to their socio-economic characteristics (N = 450)

Variable	Percentage
Gender	
Male	78.2
Female	21.8
Age (years)	
11-20	6.8
21-30	9.2
31 -40	14.1
41 -50	58.2
> 51	11.7
Educational status	
No formal education	2.8
Primary school incomplete	12.0
Secondary school incomplete	13.5
Secondary school complete	54.2
Secondary school in complete	10.3
Tertiary education	7.2
Years of farming experience	
< 10	2.9
11-20	66.3
>21	30.8
Farm size (ha)	
< 1.0	65.0-20.1
11 -20	65.0
2.1-30	8.9
> 3.1	6.0
Household size	
1-4	35.0
5-9	65.0
Membership of social organization	
None	27.0
1-2	59.3
2-4	13.7

Table 3: Multiple regression analysis on the relationship between socio-economic variables and adopted on of soil survey information (n = 450)

Independent variables	Coefficient	SE	t-value	F-ratio	R^2
Constant	3.95	0.32	11.31	3.00	0.3
Age	- 0.03	0.01	-2.21*		
Education	0.01	0.05	2.00*		
Years of experience	0.07	0.02	2.06*		
Farm size	- 0.03	0.01	0.93	NS	
Household size	0.03	0.06	0.69 NS		
Membership of social organization	0.29	0.09	1.09 NS		

SE: Standard error; *Significant at $p<0.05$; NS: not significant

did not complete secondary school education (54.2%). Yet, 97.2% the respondents had formal education with many (66.3%) having 11-20 years of experience. The study further showed that a good number of the farmers (65%) were cultivating 1.1 -2.0 hectares of arable land while 65% of them had a household size of 5-9, with 59.3% belonging to one to two social organizations.

The results (Table 3) indicated that three independent variables, namely age (t = - 2.21), education (t = 2.00) and years of experience (t = 2.06) were significant in explaining 25% of variation in adoption. The estimated value of adoption (Y) is shown as follows.

$$Y = 3.95\text{-}0.03\ X_1 + 0.01X_2 + 0.07\ X_3\text{-}0.03\ X_4 + 0.03\ X_5 + 0.29\ X_6$$

Where these terms are already defined in Eq. 1.

Based on the item loadings, factor I was named management and economic constraints while factor 2 was referred to a technical and structural constraints (Table 4). Thus these two factor

Table 4: Main obstacles to the adoption of soil survey information (N = 450)

	Factor 1	Factor 2
Constraint variables	Management and economic constraints	Technical and structural constraints
Language of delivery	0.78	0.09
Shortage of trained personnel	0.18	-0.86
Lack of usable information	0.36	0.69
Scanty soil data	0.88	-0.52
Poverty	0.68	0.26
Land tenure	0.16	0.66

classifications represent the main obstacles to adoption of soil survey information. Specific items which worsen management and economic factor were scanty soil data (0.88), land tenure (0.81), language of delivery (0.78) and poverty (0.68) while Factor 2 was influenced by shortage of trained personnel (0.86), lack of useable soil information (0.69) and scanty soil data (0.52).

DISCUSSION

Many of the respondent-farmers did not complete secondary education, implying difficulty in understanding scantly available complex soil data. This stresses the relevance of education in increasing adoption of modern agricultural technologies (Madukwe, 1995), who reported that level of education is one of the variables affecting adoption of improved farm practices. A majority of the farmers had more than 11 years of experience (97.1%), suggesting that they have been cultivating arable crops for a reasonable number of years without much information. This implies that farmers still hold tenaciously to traditional farming practices, which is consistent with the findings of Onweremadu (1994). This is possibly aggravated by poverty due to large household size of 5-9 direct dependents and many un-recorded dependents since the culture promotes extended family system. Yet, majority of farmers have farms less than 2.0 hectares (85.1%) indicating that arable farming is still at subsistence level. Again, majority (59.3%) belonged to one to two social organizations, which according to Onu (1991) serve as a forum through which farmers could exchange ideas about new farm practices.

Age related greatly with adoption of soil survey information in this study, in consonance with findings of Ajala (1992), who reported a strong relationship between age and adoption of technologies. Educational status was another variable that influenced adoption of soil survey information and this is consistent with previous studies (Onu, 1991; Ajala, 1992) which established a good relationship between education and adoption. Education informs and leads to understanding of complex soil data and innovations. In the same manner, years of experience had a positive relationship with adoption of soil survey information, implying that farmers are likely to adopt more modern technologies especially when subjected too many crop failures.

Among the technical and structural constraints (Factor 2), shortage of personnel related significantly and negatively (-0.86) with adoption of soil survey information while lack of usable soil information had a good significant positive association (0.69) with adoption of soil survey information. Most graduates of agricultural extension study agriculture which may not give them enough preparations to solve soil based technical constraints and this reduces their efficacy in convincing farmers to adopt soil survey information. A well trained extension worker in soil survey information can transform such complex soil data to customized or user-friendly forms (Kufoniyi, 2000; Okedi, 2000). Farmers do not agree with complex scientific explanations (Barr and Cary, 1992) but act quite rationally by preferring to adopt simple innovations. Land tenure (0.66) is another technical constraint, which is in line with the findings of Onweremadu (2006) that land tenure system had a relatively high rating (39%) on the applicability of soil information in two lowland states or Southeastern Nigeria. Tenants in Africa refuse to undertake improvements on land that does not belong to them (Spore, 1994). These farmlands they believe are temporarily owned and communal

decision may change with time. Yet, these decisions are not easily influenced by women who feel greater pains from lower soil productivity but have low voice (21.8%). In most areas of the study site, women are culturally inhibited to answer questions on some socio-economic issues and this could by why a greater number of the respondents were males (78.2%). This result is consistent with the findings of similar studies in the area (Angba, 2003; Oladele and Adu, 2003).

CONCLUSIONS

The study examined obstacles to adoption of soil survey information in southeastern Nigeria of the humid tropics. The study revealed that majority of the respondents were males and fall between the ages of 41-50 years. Results showed that some socio-economic characteristics, namely age, education and years of experience had a significant relationship with the adoption of soil survey information. It further revealed that management and economic constraints as well as technical and structural constraints immensely influenced adoption of soil survey information.

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