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Factors Influencing Mechanized Farming and Farm Size Ownership in Nigeria

Amadi, D.C.A[1]; G.O. Onogwu[2]; Orisakwe K.U.[3] and S.S. Zaku[1]

[1]Department of Forestry and Wildlife Management, Federal University Wukari, Taraba State, Nigeria

[2]Department of Agricultural Economics, Federal University Wukari, Taraba State, Nigeria

[3]Department of Surveying, Modibo Adama University of Technology, Yola Nigeria

Corresponding author: G. O. Onogwu, Department of Agricultural Economics, Federal University Wukari, Taraba State, Nigeria

Abstract. Agricultural Extension services in Nigeria had been making concerted efforts to make farmers adopt improved technology in their farm operations. If the country is to achieve increased food production for her teeming population, adoption of improved technology and increased farm size is inevitable. According to Amao *et al*, (2003) rural farmers cultivating an average of one hectare each still characterize the Nigerian agricultural sector. This paper examined the factors that influence the adoption of mechanized farm technology and farm size increase among rural farmers in Nigeria. Data on methods of farm land preparation, farm size and Agricultural Development Program (ADP) inputs to rural farmers were randomly collected from 435 rural farmers between 2006 and 2009. The instrument for data collection was a set of structured questionnaire cum oral discussion. The oral discussion focused on methods of farmland preparation, need for increased farm size as a means of improving farm output and sustainability. The data generated were subjected to t-test and regression analysis. Result show that farm size increased as irrigational facilities and loan to farmers were increased while farm technology is positively influenced by irrigation facilities, loan and presence of extension agents. The implication is that increased food production will be achieved if farmers are provided irrigation facilities and loans as these motivates the adoption of mechanized farm technology.

Key words: Farm size, improved technology, increased food production, rural farmers.

Introduction

Increase in population demands increase in food production on sustained yield basis. The importance of improved farm technology in the agricultural sector cannot therefore be emphasized. However, it has been reported that rural farmers are sluggish in adopting improved technology as sold by various extension agents. This may be due to the sophisticated technologies which some rural development institutions promote. Hence the projects have no chance of benefiting the generality of the rural poor. (Beckman 1982, Nzimiro 1985, Oculi 1987, Kolawole 1986 and Ariyo 1991). It is hoped that gradual adoption of improved technology will one day make possible mechanized agriculture in Nigeria. Using data on methods of farmland preparation and farm size ownership collected from all the agricultural zones of Adamawa state of Nigeria, we contend that the rate of mechanized farm technology is still low and this is an impediment to increased food production in Nigeria. This calls for a fast approach to turn the country away from subsistence farming practices. Adamawa state, having a 70% of her population as farmers is a good ground for testing the adoption of mechanized farm technology and increased farm size ownership as a means of improved food production.

Methods

This study was carried out in Adamawa state of Nigeria. The state is made up of 21 local government areas and a population of 2,102,053 people (NPC 1991). The land area is about 3, 8741 square kilometer and the land farm type favors tropical agriculture. The major vegetation formation in the state are the southern guinea savannah, the northern guinea savanna and the sudan savanna (Akosim *et al* 1999). The onset of the rainy season is normally accompanied by strong devastating wind storms (Amadi 2002). The major food crops grown in the state include cereals, legumes and root crops; while the cash crops are mainly cotton, groundnut and sugarcane. (Sajo and Kadams 1999). The implication is that since the land and climate favors crop production, with the adoption of mechanized

agriculture, improved production will be sustained in all these Agricultural Crops, hence, Nigeria can feed the entire Africa.

Data on method of farmland preparations, farm size and the infrastructure as put on ground by the Adamawa State Agricultural Development Program (ADP) were collected from rural farmers and ADP management using questionnaires and focus group discussion between 2006 and 2009. The scope of the oral discussion included availability of tractors, cost of tractors hiring and the need to increase farm size. The data generated were subjected to t-test and regression analysis. To test whether there is significant difference in farm size ownership and use of mechanized farm technology between the periods under review. Regression Analysis was used to identify the conditions that favor mechanized agricultural practices. Descriptive statistics such as tabular presentation and percentages were also used.

Results and Discussion.

Table 1 shows the size of farmland ownership by farmers between 2006 and 2009. The t-test result (Table 2) shows that there is a significant difference in total farm size ownership among farmers between 2006 and 2009. The t- calculated value is -2.39948 while the table value is 0.074398. Even though the number of plots increased substantially per farmer, yet there was no doubling of farm size in any of the agricultural zones of the state during the 3 years. This growth in plot size was low. However, when viewed in line with the present competition for land by other users, the rate is encouraging. One of the criteria for measuring the status of rural farmers is their farm size and from table 1, the total farm size owned by the 435 farmers in 2006 was 2,135 hectares and this increased to 3,606 hectares in 2009, giving a percentage increase of 69. The average farm size of rural farmers in 2006 was 4.9 ha, and this also increased to about 8.3 ha in 2009. The regression analysis for farm size (Table 5) shows that farm size is negatively related to road construction and maintenance, wash bores and extension agents, and positive related to culvert, tube wells, water pumps and loan. The implication is that

increase in irrigation facilities and loan, lead to increases in farm size of rural farmers, which in turn motivates farmers to adopt mechanized farm technology.

Table 3 shows the number of farmers using tractor, ox-drawn implement or manual method in farm land preparation. The t-test on improved technology use (Table 4) shows that there is a significant difference in the use of tractors for land preparation among farmers between 2006 and 2009. The t- calculated value is -2.49953 while the table value is 0.0668. Regression analysis for farm technology (Table 6) shows that tube wells, loan and extension are positively related to farm technology use. In 2006, 22.3 percent of the farmers used tractors for land preparation, this increased to 42 percent in 2009. This shows that total adoption of mechanized farm technology has not yet been achieved. Most of the available tractors are owned by private organizations who hire them out to farmers at exorbitant prices. The high cost of tractor hire force farmers to rely more on ox-drawn technology for land preparation. This indicates that non adoption of mechanized farm technology may not be attributed to farmers' unwillingness, but due to relative high cost of hiring tractors.

Recommendations

Based on the findings of this research, it is strongly recommended that sustained efforts be made to provide and improve irrigational facilities for rural farmers, make credit facilities easily accessible to farmers in Nigeria. These will not only encourage farmers to adopt mechanized farm technology but will also motivate them to take to dry season farming resulting to increased food production for the growing population.

Tables

Table 1 farm size ownership by farmers. (The mean farm size is shown in brackets.)

Zones	1991(ha)	1997(ha)	2003(ha)	No.of owners
1	600(7.4)	673(8.3)	764(9.4)	69
11	474(5.4)	643(7.4)	821(9.4)	47
111	787(4.6)	1076(6.3)	1530(8.9)	79
1v	274(2.9)	368(3.8)	493(5.1)	49
Total	2135(4.9)	2760(6.3)	3608(8.3)	244

source : Field data 2009.

Table 2 t- test for Farm Size Ownership.

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	825.2	1122.2
Variance	459606.7	389257.7
Observations	5	5
Pearson Correlation	0.912898	
Hypothesized Mean Difference	0	
Df	4	
T Stat	-2.39948	
P(T<=t) two-tail	0.074398*	

* =significant at 10% **=significant at 5% ***=significant at 1%

Table 3 methods of farmland preparation.

Zone	no. of farmers	tractor use		ox drawn use		manual	
		2006	2009	2006	2009	2006	2009
1	81	11	23	50	53	21	5
11	87	18	36	41	45	28	6
111	171	54	99	51	60	66	12
1v	96	14	25	52	54	30	17
Total	435	97	183	194	212	145	40
Percent	100	22.3	42	44.6	49	33.3	9

source field data (2009)

Table 4 t- test for use of improved Technology.

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	417.6	435
Variance	773922.3	769366
Observations	5	5
Pearson Correlation	0.999847	
Hypothesized Mean Difference	0	
Df	4	
t Stat	-2.49953	
P(T<=t) two-tail	0.0668*	

Table 5 Regression for farm size

predictor constant	Stand. dev.	coefficient
Roads	0.9532	-0.5252^{ns}
Culvert	5.967	2.520^{ns}
Tube wells	5.411	5.121^{ns}
wash bores	2.787	-0.501^{ns}
water pumps	1.448	2.458*
Loan	0.08197	0.15344*
ext. agents	0.3434	-0.0733^{ns}

ns = not significant

* = significant at 10% (p= 0.10)

Table 6 Regression for farm technology use

predictor constant	Stand. dev.	coefficient
Roads	0.06960	-0.00996^{ns}
Culvert	0.4357	-0.2321^{ns}
Tube wells	0.3951	0.5440^{ns}
wash bores	0.2035	-0.0389^{ns}
water pumps	0.1057	0.0577^{ns}
Loan	0.005985	0.009943*
ext. agents	0.02507	0.01402^{ns}

ns = not significant

* = significant at 10% (p= 0

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