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Farmers Socio-economic Factors Influencing Resource use Conflicts in a Typical Fadama Area in Nigeria: A Focus on Bauchi State

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ABSTRACT

This study has examined the influence and relationship of socio-economic characteristics of the Fadama Resource Users on conflicts incidence in Fadama areas of Bauchi State, Nigeria. Stratified multistage random sampling was employed resulting to 120 respondents (60 arable farmers and 60 pastoralists). Data were analyzed using correlation and multiple regressions. From the arable farmers, land size, total cost and saving had strong but negative relationship with conflict incident at $p < 0.001$. Education was also negative but significant at $p < 0.01$. Herd size, accessibility to grazing reserve, saving were significant at $p < 0.001$ for the pastoralists. The coefficient of awareness of grazing reserve, experience and education were significant at $p < 0.01$. Gender and saving were statistically significant at $p < 0.01$ and $p < 0.05$, respectively in respect of their influence on conflict for the arable farmers. Education, total cost and savings were all significant at $p < 0.001$, whereas accessibility to grazing reserves were significant at $p < 0.05$ for their strong sensitivity to conflict incident. The outcome of the study revealed strong relationship of all the selected variables with incident of conflict except marital status and experience for the arable farmers. Gender savings, education, accessibility to grazing reserves and total cost had strong influence in conflict incidences. Therefore, the Fadama area communities especially that of the pastoralist needed improvement in their education status and more grazing reserves should be provided by the relevant authority to ease accessibility to pasture and invariably reduce conflict incidences.

Key words: Conflict, relationship, influence, fadama accessibility, grazing reserve, pasture

INTRODUCTION

The rapidly growing human population on daily basis necessitates strategies for meeting the food requirement either of crops or livestock. For instance, the present world population of 6 billion rising from 2.5 billion in 1950 is expected to reach 8.9 billion by the year 2050 (Ochi and Toro, 2006). The higher proportion (83%) of world cultivated land is devoted to rainfed crop production while the remaining 17% is for irrigated crop production which resulted to 37% of the total world output of crop production (Uptons, 1996). This fact alone serves to emphasize the role of irrigated agriculture in accelerating food production (Gefu and Kolawole, 2003).

It was partly for this reason that the Federal Government of Nigeria and the World Bank initiated a project for the utilization of the flood plain and wet land known as "Fadama" for dry season irrigated agricultural production. This was implemented in some states of the Federation; Bauchi State (the study area) inclusive. The state among others is characterized by Sudano-Sahelian ecological zone with long dry season from October to May (IFESH, 1998). This situation confined fresh pastures to the Fadama area during the dry season and also compelled the pastoralists to graze along the Fadama creating conflict in the use of Fadama resources between the arable farmers and the livestock farmers. This had often resulted to resource use conflict (Blench, 2004).

The fresh pasture and the water harboured by the fadama were the central interest of the pastoralists while the land on which the fresh grasses grow and the water in the fadama are objects critical to arable farming-thus the conflicting interest-often result to violent clashes. It was a dysfunctional conflict referred to by Angaye (2003), as destructive and cause loss of lives, properties, man hour, investment opportunities, hunger and starvation when such open violence occurred.

The conflict has led to prohibitive economic losses as buttressed by Sulaiman and Ja'afar Furo (2010) report which indicated a loss of over N 87 million in selected fadama areas of Bauchi State between 2004 and 2007. It was relatively a huge loss in the economy of the State. However, this dispute and violent scuffle between Arable farmers and Pastoralists continued despite all attempt to stop it (IPCR, 2003).

It has also hindered reasonable progress in the irrigated crop production project. Attempts were made by the government and various groups to resolve the conflict with minimal success. According to Aron (2002) "Conflicts in general affects the capacity and credibility of States to allocate and regulates towards growth, education and improved living standard." This study focused attention on the relationship and influence of the socio-economic variable of the respondents on the conflict. Such an inference drawn from the outcome would perhaps lead to lasting solution.

MATERIALS AND METHODS

The study area was Bauchi State of Nigeria which occupies a total land area of 492,359 km^2, representing about 5.3% of Nigerian total land mass. Located between latitude 9°3" north of Equator and longitude 8°50" and 11° east of the Greenwich Meridian (Adaba *et al.*, 2008). The month of April is hottest with up to 40.55°C while in December/January temperature could be as low as 09.11°C (Muhammad, 2003). Annual rainfall is between 700 to 1,300 mm and relative humidity is about 12% in February and 68% in August. National Census of 2006 put the population of Bauchi state at 4,676,465 with 2,426,215 males and 2,250,250 females. The study covered the period of 2004 to 2008. Data collection was accomplish between 2004 and 2008.

Sampling: The main sampling frames for the study were:

- The Fadama Users Associations (members)
- The pastoralist operating within the Fadama communities

The three Operational Zones were used as stratum from which a multistage probability sampling technique was employed. However, 50% of respondents were drawn from Northern Zone

Table 1: Distribution of respondents

Sample frame	Northern zone	Central zone	Western zone	Total
FUA members	30	15	15	60
Pastoralists	30	15	15	60
Total	60	30	30	120

where 60% of conflict occurred as reported by (BSADP, 1998). The other two Zones contributed 25% each of the respondents. The distribution of respondents are shown in Table 1.

A total of 120 respondents were used for the study.

Data collection: Data were obtained from both primary and secondary sources. Secondary sources include Bauchi State Agricultural Development Programme (BSADP), National Livestock Development Project and the Ministry of Agriculture. Structured questionnaire was administered to elicit relevant primary data from the respondents.

Data analysis: To obtain the relationship between the selected socio-economic characteristics and incident of conflicts, correlation analysis was employed, while regression analysis was used to obtain the influence of the selected socio-economic characteristics on conflict incidence using the SPSS package.

The socio-economic characters selected for pastoralist include: Gender (X_1), Age (X_2), Marital Status (X_3), Household Size (X_4), Education (X_5), Experience (X_6), Herd Size (X_7), Awareness about grazing reserve (X_8), Accessibility to grazing reserve (X_9), Annual Savings (X_{10}) and Total Cost (X_{11}).

That of arable farmers included variable X_1 to X_6 of pastoralist and land size (X_7), Savings (X_8) and Total cost (X_9). However, Y_C denotes dependent variable of conflict incident in the specified equation:

$$Y_c = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, U) \tag{1}$$

where, U is random error.

Linear functional form showed better result when tested with other functional forms (Semi-log and Cobb-Douglas) and was therefore chosen as the lead equation expressed as follows:

$$YC = a_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + b_7 x_7 + b_8 x_8 + b_9 x_9 + b_{10} x_{10} + U$$

RESULTS

The relationship of socio-economic variables with conflicts incidence: Table 2 shows that the entire variables except gender negatively correlated with incident of conflict; and with the exception of marital status and experience, all other variables significantly correlated with incident of conflict. Variables with highest level of significance were: land size, savings and total cost, with marginal contribution of -0.637, -0.788 and -0.599. Education, Age, Gender and Household size at lower significant level had marginal contribution of -0.344, - 0.300, 0.293 and -0.285, respectively.

Table 3 shows that the coefficient of the entire selected variables except gender (X_1) in respect of the pastoralist exhibited negative signs of relationship with incidence of conflict. The variables that exhibited high level of significance at $p<0.001$ include herd size (X_7) with marginal contribution of -0.598, accessibility to grazing reserves (X_9) -0.424 and saving (X_{10}) with -0.709. The

Table 2: Correlations matrix of the relationship between selected socio-economic variables and conflict incidence for arable farmers

Parameters	C	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
C	1.00									
X_1	0.293*	1.00								
X_2	-0.300*	0.083	1.00							
X_3	-0.221	0.159	0.361**	1.00						
X_4	-0.285*	0.072	0.823***	0.418***	1.00					
X_5	-0.344**	0.101	0.307*	-0.144	0.061	1.00				
X_6	-0.169	0.082	0.751***	0.258*	0.646***	0.255*	1.00			
X_7	-0.637***	0.077	0.700***	0.312*	0.680***	0.353**	0.550***	1.00		
X_8	-0.788***	0.017	0.573***	0.284	0.590***	0.350**	0.411***	0.880***	1.00	
X_9	-0.599***	0.011	0.694***	0.293*	0.667***	0.296*	0.540***	0.977***	0.849***	1.00

X_1: Gender, X_2: Age, X_3: Martials status, X_4: Household size, X_5: Education, X_6: Experience, X_7: Herd size, X_8: Awareness about grazing reserve, X_9: Accessibility to grazing reserve. *Significant at p<0.05. **Significant at p<0.01. ***Significant at p<0.001

Table 3: Correlation matrix of the relationship between selected socio-economic variables and conflict for pastoralist

Parameters	C	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
C	1.00											
X_1	0.050	1.00										
X_2	-0.226	0.273*	1.00									
X_3	-0.054	0.115	0.298*	1.00								
X_4	-0.098	0.046	0.767***	0.379**	1.00							
X_5	-0.348**	-0.088	-0.339**	-0.304*	-0.360**							
X_6	-0.367**	0.108	0.831***	0.228	0.258***	-0.334**	1.00					
X_7	-0.598***	-0.010	0.584***	0.188	0.492***	-0.108	0.762***	1.00				
X_8	-0.358**	-0.151	0.292	0.046	0.280*	0.002	0.430***	0.520***	1.00			
X_9	-0.424***	-0.138	0.220	0.016	0.208	-0.018	0.417***	0.542***	0.870***	1.00		
X_{10}	-0.709***	-0.019	0.508***	0.174	0.423***	-0.074	0.717***	0.921***	0.558***	0.605***	1.00	
X_{11}	-0.318*	-0.082	0.577***	0.250	0.605***	-0.161	0.717***	0.778***	0.565***	0.526	0.770***	1.00

X_1: Gender, X_2: Age, X_3: Martials status, X_4: Household size, X_5: Education, X_6: Experience, X_7: Herd size, X_8: Awareness about grazing reserve, X_9: Accessibility to grazing reserve, X_{10}: Annual saving, X_{11}: Total cost. *Significant at p<0.05. **Significant at p<0.01. ***Significant at p<0.001

significant coefficients at 1% include awareness, experience and education with marginal contribution of -0.358, -0.367 and -0.348. The least significant at p>0.05 was total cost (X_{11}) with marginal contribution of 0.318.

Influence of socio-economic variables on conflict incidence: Table 4 specifically indicates that two variables were statistically significant in their influence on conflict incident. They were gender (p<0.01) with marginal contribution of 0.19649 and t-ratio value of 2.45 and savings (p<0.05) t- ratio value of -2.05 and marginal contribution of -0.00000585.

In Table 5, the linear functional form shows that four variables were statistically significant. Education (X_5) at p<0.001 had marginal contribution of -0.06457 and Total cost (X_{11}) at p<0.001 t- ratio value of 5.24 with marginal value of 0.00002510. Savings at probability level of 1% t-ratio of -2.67 had a marginal contribution of -0.00002139. Accessibility to grazing reserve with t-ratio value of 2.20 (p<0.05) had marginal contribution of 0.2451. Accessibility to grazing land and total cost exhibited positive sign., marital status (X_3), experience (X_6), herd (X_7) and awareness (X_8) exhibited a negative sign although they were not significant, it was in agreement with the a priori expectation.

Table 4: Influence of selected socio-economic variable of arable farmers on conflict incidence in banchi state

Predictor	Coef.	Stdev	t-ratio
Constant	1.6680	0.3826	4.36***
Gender (X_1)	0.19649	0.08011	2.45**
Age (X_2)	0.007790	0.008213	0.95
Marital status (X_3)	-0.0181	0.1368	-0.13
Household size (X_4)	-0.00562	0.01299	-0.43
Education (X_5)	-0.00649	-0.01176	-0.55
Experience (X_6)	0.001138	0.004099	0.28
Land (X_7)	0.1050	0.1203	0.87
Savings (X_8)	-0.00000585	0.00000285	-2.05*
Total cost (X_9)	0.00000515	0.00000320	1.61

S = 0.2262, r-sq. = 81.6%, r-sq. (adj) = 77.9%. *Significant at $p<0.05$. **Significant at $p<0.01$. ***Significant at $p<0.001$

Table 5: Influence of selected socio-economic variables on conflict incidence in bauchi state

Predictor	Coef.	Stdev	r-ratio
Constant	2.2133	0.4101	5.40***
GenderX_1	0.03243	0.09860	0.33
AgeX_2	0.001162	0.007610	0.15
Marital statusX_3	-0.0362	0.1597	-0.23
Household sizeX_4	0.00132	0.01224	0.11
EducationX_5	-0.06457	0.01121	-5.76***
ExperienceX_6	-0.010481	0.007668	-1.37
Herd sizeX_7	-0.001584	0.002932	-0.54
AwarenessX_8	-0.0964	0.1169	-0.82
AccessibilityX_9	0.2451	0.1115	2.20*
SavingsX_{10}	-0.00002139	0.00000801	-2.67**
Total cost X_{11}	0.00002510	0.00000479	5.24***

S = 0.2516, R-sq. = 80.0%, R-sq. (adj) 74.9%. *Significant at $p<0.05$. **Significant at $p<0.01$. ***Significant at $p<0.001$

DISCUSSION

The relationship of socio-economic variables with conflicts incidence: In Table 2 gender exhibited a positive correlation, suggesting that the male arable farmers were more likely to be involved in the conflict than the female. The result has shown that the cost of production by the arable farmer had very strong relationship with the conflict. This suggests that cost of inputs and services were highly sensitive to conflict situation buttressing the assertion of Collier and Hoeffler (1998) who stressed that during crises cost of goods and services increase and thus the cost of production increases. Land is the key source from which the farmer-pastoralist and most conflict in the world emanated (Kurer, 2001). The expansion of Fadama cultivation which often led to blockage of stock route was a major cause of conflict (BSADP, 1998) which explains the strong relationship between land size and conflicts.

There was no significant correlation between gender and every other variable which suggests that variation in farm size, for instance was irrespective of the gender. This assertion is in consonance with the report of Zuckerman and Greenberg (2004) which emphasized that there was no significant difference in the genders land possessions.

In Table 3, the total cost of rearing the animal for one year which was often affected by conflict by reducing availability of inputs such as labour, fertilizer-leading to increase in cost of inputs. Massam (1998), Blench (2004), Ega and Erhabor (1998) and Meludu *et al.* (2005) identified limited and inaccessibility to grazing reserves as primary cause of farmer-pastoralist conflicts which buttressed the above outcome. Larger herd size means higher demand for pasture; scarcity of which

as is usually the case during dry season would lead to intrusion on cropped land leading to higher possibility of conflict. Grazing reserves provide feeds required by the stock of pastoralists and thus reduce the probability of intruding into cropped land to graze and thus reduction in conflict incidence. This is in perfect consonance with the *a priori* expectations. The higher level and the negative relationship with conflict exhibited by education suggests that the more enlightened the respondents are the more likely they avoid getting involved in conflict since they could analyze situations more objectively and make rational decisions.

Influence of socio-economic variables on conflict incidence: In Table 4, the positively and high significant nature of gender in influencing conflict suggest that the males were more affiliated with conflicts as they were more exposed to the use of the Fadama resources that were sources of conflict. Even though, the resource available in the fadama areas were sources of conflicts, the economy of the farming families was directly hinged to these resources dominated in use by the male.

Pur *et al.* (2005) observed that savings and revenue were sensitive to conflict situation as it often impact negative trend on them, thereby reducing the ability of individual to save or get high revenue as cost of operation increases. This actually confirmed the above outcome on the strong affinity of savings and conflict. In essence when there is reduction in ability to save, there will be decrease in the ability to re-invest which will have negative impact on the economy of the communities.

In Table 5, education and savings, negative influence is in consonance with the a priori expectation. In other words, it is expected that the more educated, the more rational in decision making and then the less affinity for conflict. Implicitly education would reduce incidences of conflicts. Conflict situation is expected to reduce ability to save from income as conflict reduces availability of inputs and services leading to increase in the cost of input and services (Sulaiman and Ja'afar Furo, 2010) which would eventually reduce profit margin. However, the inability to save would result to inability to re-invest often negatively impact on the economy of the community. The positive sign exhibited by accessibility to grazing reserve and total cost also agreed with *a priori* expectation. The inability of pastoralist to gain access to grazing reserves create more chances of intrusion into cropped land, therefore engineering conflicts leading to destruction of lives and economic items. This actually agreed with Blench (2004) and Maisamari (2004) that the lack of accessibility by pastoralist to grazing reserves initiates and perpetrates conflicts between farmers and pastoralists. The herd size, experience and marital status were all not-significant and were negative. However, the coefficient of household size and age which were negative in respect of the arable farmers were however positive in the case of the pastoralists, suggesting that age and house size did not discourage the pastoralists' involvement in conflict as in the case of the arable farmers.

CONCLUSION

The study revealed the strong relationship existing between the selected socio-economic variable and conflict incidence for both arable farmers and pastoralist in the Fadama areas of Bauchi State. In the same vein, some of the selected socio-economic characteristics of the communities were found to strongly influence conflict incidences suggesting that improvement in these variables such as education and accessibility to grazing reserves would reduce conflict incidences.

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