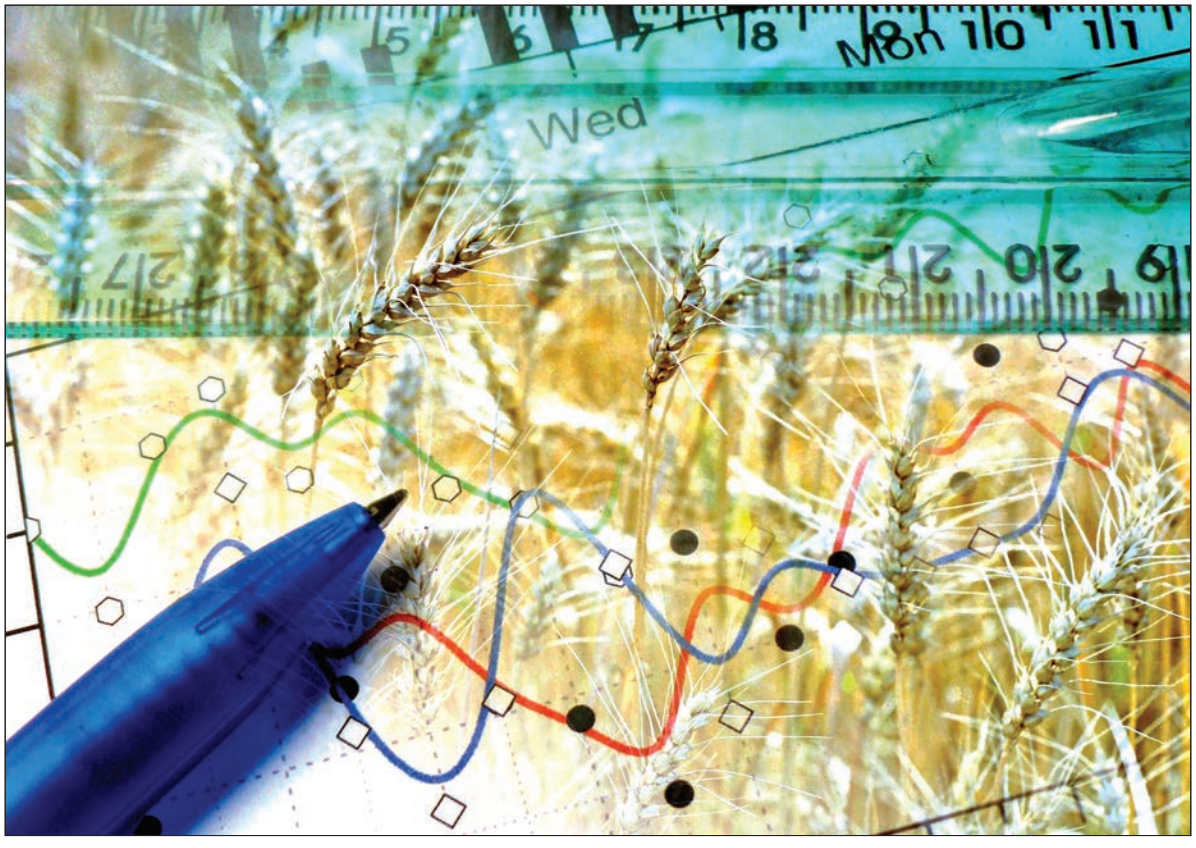

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Economic Effects of Farmer-grazier Conflicts in Nigeria: A Case Study of Bauchi State

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Abstract: The study examined the economic effects of farmer-grazier conflicts in the fadama areas of Bauchi State in Nigeria. Bauchi State occupies total land area of 492,359 km^2 and has human population of 4,696,465. Using multistage random sampling technique a total of 60 fadama farmers were randomly selected from 60 Fadama Users Associations (FUA) and a corresponding 60 pastoralists randomly selected from 60 fadama communities where the selected FUAs resided. Primary data were collected using structured questionnaire administered through individual personal interviews. The data were analysed using the descriptive statistics, t-test and alternative cost technique. Results revealed that about N3, 193, 100.00 was incurred from both totally damaged and partially destroyed tube well/washbore equipment with water pumps recording N176, 415.00. Motorcycles and bicycles accounted for N565, 254.00 in terms of losses experienced. Comparatively, the arable farmers incurred higher (N80, 075,172.00) losses in monetary term than the pastoralists (N7, 047, 013.00). While reduction in farm production, increased poverty within and among the communities and social insecurity and inadequate food supply for the family were the major setbacks encountered in the area, interruption of education of children and reduction in healthcare provision of the family represented relatively lower proportions. Further, the income (N358, 000.00) of farmers in the conflict area was significantly ($p<0.05$) lower than those in non-conflict areas (N437, 313.00). Conclusively, the farmer-grazier conflicts have had negative economic effects on both the families involved and the nation in terms of the huge resources lost. It is therefore, strongly recommended that the government should put appropriate measures towards curbing the occurrence of such conflicts for the benefit of all.

Key words: Losses, cost, distortion, destruction, poverty

INTRODUCTION

The need to provide food of crop and animal origin to meet the growing demand due to population increase necessitates the opening up of land hitherto uncultivated. For instance, the present world population of over 6.5 billion rising from 2.5 billion in 1950 is estimated to reach 8.9 billion by the year 2050 (Ochi and Toro, 2007). The intensification of the population driven agriculture often necessitates the adoption of certain farming techniques such as

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irrigation techniques (Ochi and Malumfashi, 2005), which is recently being given national and international support in many African countries (Gefu and Kolawole, 2003). Due to the concern about the overall worsening food production and nutrition situations in Nigeria, the World Bank offered to assist the country in accelerating local food production through fadama development (Gefu and Kolawole, 2003). The target was to utilize flood plain and wet lands (fadama) for dry season irrigated agricultural production.

The fadama represents one of the major productive systems of the terrestrial landscape and are found in every continent except in Antarctica with estimate of about 4-6% of the earth surface (Maisamari, 2004). In essence, the objective of the World Bank was to promote agricultural growth through conjunctive exploitation of surface and shallow aquifer water resources for smallholder owned and managed small scale irrigation system (FACU, 1993). A pilot project on small scale farmer managed irrigation system was executed by some of the World Bank funded Agricultural Development Projects (ADPs) in 1982/83 with a sound success which informed the endorsement of the system as a key source of agricultural growth by the Federal Government (World Bank, 1992). On account of this, the National Fadama Development Project (NFDP) was put in place in 1993.

The core implementing states of NFDP I (Bauchi, Gombe, Kano, Jigawa, Katsina, Kebbi, Sokoto and Zamfara States) are characterized by Sudano-sahelian ecological zone (semi arid) with long dry season from October to May. Evapo-transpiration ranges from 2000-2400 mm, while rainfall ranges from 600-900 mm in the zone (IFESH, 1998). The water deficit in this area necessitates full irrigation during dry season and supplementary irrigation during the wet season for high crop production.

The NFDP loan package commenced in 1993 and terminated in 1998 with reported expansion in fadama cultivation (BSADP, 1998). However, practical field indicator identified conflicts arising from the use of fadama resources as a key set back in the project and has also threatened the sustainability of achievements made over the years (BSADP, 1998). Upton (1996) envisaged this phenomenon for any irrigation project and recommended that when irrigation systems are introduced, appropriate institutional structure must be established for allocation of water, distribution of complementary inputs, such as seeds and fertilizer, maintenance of the system and conflict management. Blench (2004) affirmed, the competition for land, water and vegetation by pastoralists and farmers coupled with scarcity or dwindling of the resources and adverse climatic changes all act as precipitant in pastoralist-farmer conflicts.

The conflict is by nature economic and mostly inflicted to promote parochial interest devoid of communal interest which is undesirable, destructive and therefore constitute an impediment to growth and development of agricultural economy (Musa, 2004; Collier, 1999). Therefore, this study, economic effects of farmer-grazier conflicts in Bauchi State, Nigeria was intended to evaluate the economic consequences as a result of conflicts experienced in Fadama areas towards deriving appropriate policies with the hope of curbing further occurrences.

MATERIALS AND METHODS

Study Area

Bauchi State occupies a total land area of 492,359 km^2, representing about 5.3% of Nigeria's total land mass (Adaba *et al.*, 2008). The state spans two distinct agro-ecological zones, namely; the Sudan savannah and the Sahel savannah. It is located between latitude

9°3' and 12°3' North of Equator and longitude 8°50' and 11° East of the Greenwich Meridian (Adaba *et al*., 2008). Based on 2006 census result, the state has human population of 4,676,465. The state is bordered by seven states: Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the East and Kaduna to the West.

The weather is hottest in the month of April, with temperature rising up to 40.55°C and coolest in the months of December and January when the temperature may fall as low as 09.11°C (Muhammad, 2003). The annual rainfall ranges from 700 to 1,300 mm and the relative humidity of about 12% in February and 68% in August (Muhammad, 2003).

Data Collection

Data for the study were generated from two sources viz., primary and secondary. Primary data were collected in 2004, 2006 and 2007 fadama seasons using structured questionnaire, which was administered to the crop farmers and pastoralists through personal interview. Secondary data were collected on the socio-economic characteristics, consequences of conflicts, frequency of conflicts, financial cost/benefit of conflict and economic impact of conflict. Secondary data were sourced from available literature and relevant documents of agencies such as Bauchi State ADP, National Livestock Development Project, Ministry of Agriculture and Natural Resources, etc.

Methods of Data Analysis

The approach to the analysis of losses incurred in the conflicts is similar to that employed by Yonguan *et al*. (2001) when analyzing the environmental cost of water pollution in Charg qing, China. It was specifically on the damage to human health and life. Using the strategy of estimating the resource cost of the water pollution which actually consisted of two items: (1) resource spent to mitigate the impact, e.g., the cost of treatment of ill health, (2) the loss of potential GDP-the loss through leave of absence from work by the victim. For the dead, they employed the loss of production (the production possibility forgone)-expected production and or its value by the victim.

The approach is embedded in the opportunity cost concept expressed by Lipsey and Chrystal (1995) as choice measuring the cost of anything that is chosen in term of the best alternative that could have been chosen instead. The sacrificed alternative measures the cost of obtaining what is chosen.

However, in the conflict situation, circumstance determines the choice and the alternative, but in principle of opportunity cost, the alternative is used to measure the choice as in the case of cost of water pollution above. This establishes the alternative cost principle the Alternative Cost Technique (ACT).

In applying the principle for the analysis of economic loss from the farmer-pastoral conflicts, the elements were categorized into the following component and processes of analysis.

Loss Due to Death of Human (LD)

$$LD = EEPO + EESO + EEOS \quad (1)$$

Where:
EEPO = Expected earnings from primary occupation
EESO = Expected earnings from secondary occupation
EEOS = Expected earnings from other sources

Loss Due to Injury (LI)

$$LI = Ct + Eet_t \quad (2)$$

Where:
Ct = Cost of treatment of injury
EEt_t = Expected earnings during period of treatment by victim

Loss of Facilities

- Partial loss (damaged) of facility (Ldf)

$$Ldf = Cr + Eef_t \quad (3)$$

Where:
Cr = Cost of repair
EEf_t = Expected earnings from facility during time spend on repairs

- Complete loss of facility (Lif)

$$Lif = PVf \quad (4)$$

Where:
PVf = Present value of facility (depreciated value of facility)

The facilities included: water pumps, tube/wash-bore and other farm equipment for both farmer and pastoralists

Loss of Shelter

- Loss due to damaged shelter (Lds)

$$Lds = Cr + Cfd_t \quad (5)$$

Where:
Cr = Cost of repair of shelter
Cfd_t = Cost of family displacement during time of repairs

- Loss due to total loss of shelter Lls

$$Lls = PVs + Cfd_t + Hlp \quad (6)$$

Where:
PVs = Present value of shelter (depreciated value)
Cfd_t = Cost of family displacement
Hlp = Value of household property loss

Cost Due to Loss of Farm/farm Produce

- (for both crops and livestock) = Lly

$$Lly = Y \times P - C \quad (7)$$

Where:
Y = Total quantity produced/expected to be produced
P = Unit price of the produce
C = Cost of production

Therefore, the total loss (in monetary terms) due to the farmer-pastoralist conflict :

$$TLDC = (LD + LI + Ldf/Llf + Lds/Lls + Lly)$$

Paired sample test was employed to know if there was a significant difference in the rate of loss incurred by arable farmer and pastoralist with the formula:

$$t = \frac{X_1 - X_2}{std}$$

X_1 = Total loss incurred by arable farmer
X_2 = Total loss incurred by pastoralists

RESULTS AND DISCUSSION

Financial Loss Incurred in the Farmer-Pastoralist Conflicts

Table 1 shows that the heaviest loss in monetary terms (N72, 117,006.00) arose from the loss of farm and farm products. This was more valid where about 200 incursions were made into the arable farmers' farm during the period. Livestock that were lost through the farmers-pastoralists conflict included 34 cattle and 11 sheep/goats, valued about 1.8 million Naira and N66, 000.00 for cattle and sheep/goat, respectively.

Six persons lost their lives during the period with anticipated economic contribution valued at N2, 844,000.00. The number of persons injured in the farmer-pastoralists conflict as revealed by the study was 45 among whom 15 persons were incapacitated that they could not perform their economic activities during the period of treatment. The cost implication due to the body injuries of those affected in this respect was about N2.64 million.

The result of the analysis shows that six houses were completely destroyed beyond repairs while five were able to accommodate repairs. However, the monetary value of the loss incurred on shelter was N5, 920,410.00.

The use of irrigation facilities is a common activity in fadama cultivation. The facilities include the irrigation pump and the tube well/washbore. Results of the analysis have indicated that about 230 tube well/wash bores were totally destroyed, while 103 were partially damaged and were therefore repaired. About 91 among the damaged could not be operated for the farming activities during repairs. In essence, the repair period was lengthy and they could not be used for economic purpose. The total value of loss incurred from both totally destroyed and partially damaged tube well/wash bore was N3, 193,100.00.

Table 1: Cost of the farmer-pastoralist conflict in Bauchi State between 2003 and 2007

Item	No./Qty	Source of costs	Mean value of cost (N)	Total value of loss/cost (N)
Human life lots	6	Annual earnings from:		
		Primary source	397,000	2, 3862,000
		Secondary source	77,000	462,000
Injured persons	45	cost of treatment	43,000	1,935,000
	15	Expected earning during treatment	47,000	705,000
Shelter (house)	6	Depreciated value	730,000	4,380,000
	5	Cost of repairs	240,000	1,200,000
	3	Cost of using alternative Accommodation	113,470	340,410
Farm/farm produce				
Crops	200	Expected output value	351,235	70,247,000
Livestock; Cattle	34	Market value of animal	53,059	1,804,006
Sheep/goat	11	Market value of animal	6,000	66,000
Facilities				
Tube well/wash bore				
Total loss	230	Depreciated value	6,500	1,495,000
Partial loss	103	Cost of repairs	2,700	278,100
	71	Expected earnings during Period of repairs	20,000	1,420,000
Water pumps				
Total loss	10	Depreciated value	15,320	153,200
Partial loss	3	Cost of repairs	5,405	16,215
	1	Expected earnings during Period of repairs	7,000	7,000
Means of transportation	7	Depreciated value	53,451	374,157
	9	Cost of repairs	21,233	191,097
		Grand total		N87, 456,185

Source: Field survey data 2004-2007

Destruction and or damages of water pumps was not as much as those of the tube wells, specifically, because most farmers either went home with the pump or kept them safe away from the farm after the day's operation (Massam, 1998). However, the results of this study revealed that 10 pumps were destroyed and 3 were damaged. The value of losses incurred as a result of destruction or damages of water pumps was N176, 415.00.

Reports have indicated that the transhuman pastoralists who in most cases were more aggressive and combat ready often perpetrated the destruction of irrigation facilities in the night and disappeared before dawn to unknown location, leaving the resident pastoralist with blames (Sule, 1998). Those carried out during the days were often met with retaliations from farmers resulting to violence leading to loss of livestock and even human life. According to Sule (1998), the animals killed during the conflict were never consumed by anyone.

The study revealed that means of transportation such as motorcycles and bicycles were destroyed during the course of conflict between the farmers and pastoralist. Accordingly, about 7 units were destroyed while a unit was damaged but later repaired. The value of loss in respect of destroyed and damaged motorcycles and bicycles was N565, 254.00.

The value of the total loss incurred during farmer-pastoralist conflicts in the study areas was about N87.12 million. This represents a huge economic loss from the economy of Bauchi State.

Loss Incurred by Arable Farmers and Pastoralists Compared

The monetary value of losses incurred by the two categories of respondents within the specified period 2003-2007 revealed who actually suffered greater loss. However, not all classes of loss were incurred by both categories.

The result in Table 2 shows that the arable farmers incurred higher losses in monetary term than the pastoralist (N80,075,172 compared to N7, 047,013) with difference of N73, 028,159.

Although, there was a huge difference between the total loss incurred in monetary term by the arable farmers and the pastoralist, the result of the paired sample t-test revealed that there was no significant difference proportionally in the rate of losses. In essence, both the arable farmers and the pastoralists suffered losses in similar way.

Effects of the Farmer-pastoralist Conflicts on Livelihood

Farmer-pastoralist conflicts are generally considered as a negative phenomenon which often lead to loss of lives and properties which invariably impacts negatively on the community.

Table 3 shows that reduction in farm production was the most serious effect accounting for 90%, followed by increased poverty within and among the communities (76.7%), social insecurity and inadequate food supply for the family accounted for 67.5 and 66.7%, respectively. Reduction in farm production could be linked to many other factors and consequences. This could be brought about by scarcity and increase in cost of inputs including labour resulting from conflict (Sule, 1998). Consequentially, food items are scarce and there is reduction in income leading way to poverty. This may not be far fetched

Table 2: Loss incurred by arable farmers and pastoralist compared

Type of loss	Arable farmer N-value	Pastoralist N-value	Total N-value
Human life lost	1,422,000	1,422,000	2,844,000
Injured person	1,351,000	1,225,000	2,579,000
Shelter (house)	3,333,470	2,316,940	5,650,410
Farm/Farm produce crop	70,247,000	-	70,247,000
Livestock	-	1,870,006	1,870,006
Facilities			
Wells	3,193,100	-	3,193,100
Pumps	176,415	-	176,415
Means of transport	352,187	213,067	565,254
Total	80,075,172	7,047,013	87,125,179
Paired sample test			
Mean	9064790.0		
Standard deviation	24768289.983		
Standard error	875612.9		
t-value	1.035		
Sig (2 tailed)	0.335		

Source: Field survey data 2004-2007

Table 3: Effect of the farmer-pastoralist conflicts

Effects	Frequency*	Percentage
Inadequate food for the family	80	66.7
Interrupted dependent education	43	35.8
Reduction in health care provision in the family	58	48.3
Unable to repay loan	70	58.3
Reduction in farm production	108	90
Increased poverty	92	66.7
Social insecurity	81	67.5
Occupational mobility	35	25
Spill-over effect		
Distortion in price of goods	100	83.3
Refugees management	38	31.7
Scarcity of food items	94	87.3
Migration of labour	78	65.0
Social insecurity	90	7.0

Source: Field survey data 2004-2007; * Multiple responses

from why manifestation of poverty was rated second highest effect of conflict. Similarly, probable link to reduction in production was inadequate food for the family. According to Goodhand (2001), one of the most devastating effects of wars or conflict is scarcity of food item which often led to poverty and diseases. This further buttressed the manifestation of poverty in the conflict committee. Project coordinating unit in 2003 identified social insecurity as one effect of conflict which often hampers the accomplishment of other life endeavour including economic activities such as production and marketing. Although, interruption of education of children and reduction in health care provision of the family represented relatively lower proportions (35 and 48%, respectively), they are critical issues in the life of the communities. The lower proportion might not be unconnected with the fact that most children of the respondents especially the pastoralist did not attend school.

It has been established that most violent conflicts do not stop at the boundary of the communities in which the conflict occurs (Blomberg *et al.*, 2001), it often spill-over to neighbouring communities.

Table 3 also indicates that distortion in prices of goods and services accounted for 83%, scarcity of food items 78.3% and social insecurity 75%. It asserts that the first economic parameter often affected by war or conflict situation is price of goods and services; because other factors such as transportation cost, labour, information disruption affect the price of goods and services. Scarcity of foods during conflict is a very common phenomenon as there could be blockage in supply and diversion to peaceful environment. Social insecurity is a common manifestation in conflict situation especially when it is a violent one. People develop fear of being attacked unnecessarily which also negatively affect their ability to carry out their economic activities (Blench, 2004). Perhaps there were fewer refugees during the conflicts which were why refugee's management accounted for 31.7%. However, it was one of the most important effects of war or conflict as asserted by Pal (2003), which creates a huge burden on the government or the neighbouring communities.

Economic Impact of the Land Resource use Conflict

Here, the economic impact of the land resource use conflicts from the result of the comparative analysis of the conflict areas and their neighbourhood where conflict did not occur (Table 4) shows that the average income of the farmers in the conflict area (N358, 000.00) was significantly ($p<0.05$) lower than that of the farmers in non conflict area (N437, 313.00). However, the average price of fadama fruit vegetable was significantly higher ($p<0.001$) in the conflict community than the non-conflict community. Despite the increase in prices, the farmer income in conflict area was lower. This was directly attributable to intrusion into farm by pastoralist, scarcity of input such as fertilizers, abandonment of

Table 4: Economic impact of the land resource use conflict

Indicators	Conflict community	Non-conflict community	Difference	t-value
Average income from farm (N)	358,000	437,313	79,313	2.081*
Average price of fadama fruit, vegetable (tomatoes, pepper, garden egg (N)	4,120	2,922	1,198	4,807***
Average labour cost per Manday (N)	750	450	300	3.104**
Average cost of transportation of Farm products (100 kg bag) (N)	200	140	60	2.02**
Average price of a bull (N)	81,000	78,424	2,576	0.912^{NS}
Person abandoned fadama farming (No.)	21	3	18	6.70***
Number of drop out of school (not Able to pay school fees) (number)	7	2	5	6.91***

*p<0.05; **p<0.01; ***p<0.001; ^{NS}: Nonsignificant; Source: Field survey data 2004-2007

fadama farming, a phenomenon buttressed by Collier report. It was to this fact that Bennon and Collier (2004) assert that as conflict range, income tends to plunmet, mortality rises and even diseases spread.

The difference in the transportation and labour costs in the conflict area and non-conflict area were significant (both $p<0.01$).

Easterly (2000) proclaimed that conflicts generally reduces the desired stock of factors of production such as labour often reduced through killings and immigration which in turn hike price of labour. Easterly further added that increase in prices of inputs as encouraged by the conflict situation does have direct negative impact on income such that the affected persons were impoverished.

Transportation is crucial to aspects of production, processing and marketing of agric product and therefore, whatever affects it would have impact on the general outcome of production process (Collier, 1999). Thus, the increase in its price must have contributed to the lower income of the farmers in the conflict areas.

However, the difference in average price of bulls between the conflict and non-conflict communities was not significant probably because transportation costs were often eliminated as the animals were mostly moved on legs to their sales points.

The difference between the number of persons who abandoned fadama farming as a result of conflict in the conflict community (21) and the non-conflict community (3) was highly significant ($p<0.001$) suggesting that the conflict situation have discouraged cultivation of fadama crops negatively impacting on the food security of the community.

The result also indicated that children drop out of school resulting from inability to pay school fees was significantly ($p<0.001$) higher in the conflict community (7 children) than in non-conflict community (2 children). This was the aftermath of lost of breadwinner and reduction in income of the fadama farming families during the conflict situations as revealed by the study. The drop out incidences would invariably draw back education statuses which suppose to actually assist in reducing conflict incidences as already indicated by the study.

CONCLUSION

The outcome of the study has revealed the devastating consequences of fadama areas resource-use conflicts in terms of the prohibitive financial loss amounting to 87.4 million encompassing lost of both human and livestock lives and properties within a five years period. The conflicts have had negative impact on the economic lives of the communities. Their average income was substantially reduced; price of goods and services were significantly increased. The aftermath of the conflicts was critical economic incapacitations manifesting in inability to pay children school fees leading to drop out. Many farmers abandoned fadama owing to the conflict which led to reduction in production as attested to by the results of the study. Improving the education status of the community and establishment of standard grazing reserve would reduce conflict. However, the study established the necessity of forming a relief programme for the victims of the conflicts.

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