



An Empirical analysis of *FADAMA* farming in North-Eastern Nigeria

(A Case study of Adamawa state, Nigeria)

¹DATONG, Godwin Monday & ²CHOJI N. Martha

¹Department of Mathematics
University of Jos, Jos, Nigeria

*Email of Correspondence Author: mallong2007@yahoo.com

²Department of Mathematics,
Plateau State University,
Bokkos, Nigeria.
Email: marthaniri@yahoo.com

ABSTRACT

This paper evaluated the sustainability of *fadama* farming in Adamawa state of Nigeria. The investigation made used of both primary and second data in its analysis. Questionnaires and schedule interviews constituted the main source of the primary data. Simple descriptive statistics and farm budgeting techniques were carried out, while the analysis of variance to test for “no significant difference in the profit among the various enterprises produced”. The results show that there were a number of problems militating against tomato and pepper production. The most serious were scarcity of fertilizer, fuel and lack of credit facilities. However, farmers who cultivated mixed crops (tomato and pepper) made a profit of ₦70,122.16 per hectare, while farmers who produced tomato and pepper sole made ₦54,192.40 and ₦11,711.70 per hectare respectively. It was concluded that *fadama* farming is sustainable. However, the awareness of farmers to cultivate the crops in mixture rather than sole and the supply of inputs that are scarce should be improved.

Keywords: *fadama* farming, tomato, pepper, mixed cropping, profitability, Adamawa State

INTRODUCTION

Subsistent agriculture in Nigeria accounts for about 39 per cent of the Gross Domestic Products (GDP) of the country (CBN Annual Report, 1997). Two-thirds of the citizens are employed by this sector of the economy. Most of them cultivate land using traditional methods and tools, under rain-fed conditions. However, the economic growth of the nation based entirely on rain-fed farming system is likely to fall short of the needs of the rapidly growing population of about 3.4% per annum (World Bank, 1992). Researchers have found out that there are substantial surface and ground water resources in the *fadamas* particularly along the river belts of the northern parts of the country. Cultivating these areas using small scale irrigation can make a major contribution to increasing food supplies and reducing poverty (World Bank, 1992).

‘*Fadama*’ is a Hausa word referring to the low lying-lands relative to other areas adjacent to the river or stream. They are water logged or flooded during the raining seasons. At the beginning of the wet season, they may be marked by a lush of new vegetation before the upland turns green, but they are highly conspicuous at the end of the rains when they remain prominently green while the surrounding upland turns brown. The *fadamas* are mainly noticeable in Sudan and Sahel ecological regions that have dry

savannah vegetation and a mean rainfall of between 400 and 1000 mm which is concentrated within four months (May to September) of the year. Evaporation and transpiration is very high in these zones, as a result of which some states in Northern Nigeria are prone to moderate and strong drought risks. Variations in weather, particularly the uncertainty in the timing of rainfall, limit the profitability of rain-fed cropping in the season. Consequently, *fadama* farming is not only essential for crop production in the dry season, but can also reduce crop risk in the wet season.

Kabura (1977), reports that the bulk of vegetable production in Nigeria is in the northern region of the country. Some of the major vegetables grown in the region especially Adamawa state include peppers, okro, tomatoes, onions and cabbage. However, this paper focuses on the production of tomato and peppers because they are produced in larger quantity in the state and more farmers cultivate these two vegetables.

Tomatoes and peppers are widely used vegetables in most parts of the world. The fruits are usually either cooked or eaten raw. Large quantities of tomatoes are used in the canning industry to produce juice, sauce, ketchup, puree, paste and powder (Purseglove, 1974). The semi-drying seed oil is used as salad cream and in the manufacture of margarine and soap, while the press cake residue is used as animal feed and fertilizer. Meanwhile, peppers are also cooked with the food, used in its raw form as condiment or hot ingredients of curry powder. In addition, extracts of chillies are also used in the manufacture of ginger, beer and other beverages.

Objectives

The objectives of this study were to:

- i. describe the socio-economic characteristics of *fadama* farmers;
- ii. investigate the problems of *fadama* farmers in tomato and pepper production;
- iii. compare the profitability of tomato and pepper cultivated under mixed and sole cropping systems in the *fadamas*.

METHODOLOGY

The study was conducted in Mubi, Yola and Mayo-Belwa zones of Adamawa Agricultural Development Project (AADP). The selection of these zones was based on the intensity of farming activities and variations in the zones. The local governments selected based on these premise included, Yola North, Mubi, Numan and Mayo-Belwa.

Simple random sampling was used to select 10% of the farmers from each of the selected local government area. This gave 39 farmers in Numan, Mayo-Belwa 15, Mubi 51 and 15 in Yola North. The sample size was 120 *fadama* farmers that produced tomato and pepper in these selected areas. The data used for the analysis was both primary and secondary. For the primary data, I employed the services of enumerators from the Adamawa Agricultural Development Programme to administer interview schedules and questionnaires. The secondary information was collected from Adamawa Agricultural Development Programme and the state office of the National *Fadama* Development Project.

Descriptive statistics of finding averages, frequency distributions, summary description of the data collected and percentages of the various methods of irrigation.

Farm Budgeting Techniques was used to determine the profitability of different enterprise combinations. The Net Farm Income as a tool of partial budgeting was used because *fadama* farming has a sizeable fixed cost element such the depreciation costs of wash bore and water pumps.

The general model of the farm budget is:

$$NFI = GI - TC$$

where NFI = Net farm income (₦)

GI = Gross income (₦)

TC = Total cost (₦)

Total cost = Total variable cost (TVC) + Total fixed cost (TFC)

The variable cost component included costs of seeds, labour, fertilizer, agrochemicals and fuel while rent on land, depreciation on washbores and motorized water pumps made up the fixed cost.

The analysis of variance (ANOVA) was used to test the hypothesis of “no significant difference in the profit (NFI) among the various enterprises produced”.

FINDINGS

A. Socio-Economic Characteristics of Sampled Fadama farmers

Some socio-economic indicators were found to influence the efficiency of resources used in *fadama* farming. Variables used included age, level of education attained, years of experience in *fadama* farming, land tenure, farm size, household size, irrigation management system and membership of *fadama* Users association.

Table 1: Socio-economic characteristics of sampled fadama farmers

Variable	Numan		M/Belwa		Mubi		Yola North		Toatal		
	N	%	N	%	N	%	N	%	N	%	
Age in years											
≤ 25	7	17.9	-	-	-	-	-	-	7	5.8	
20 - 35	7	17.9	7	46.7	-	-	-	-	14	11.7	
36 – 45	10	25.6	7	46.7	50	98	14	93	81	67.5	
46 – 55	5	13.0	-	-	1	2.0	1	6.7	7	5.8	
56 and above	10	25.6	1	6.6	-	-	-	-	11	9.2	
Total	39	100	15	100	51	100	15	100	120	100	
Level of Education											
Primary	7	17.9	7	46.7	25	49	7	46.7	46	38.3	
Secondary	2	5.1	5	33.3	2	3.9	-	-	9	7.5	
Arabic	25	64.1	3	20.0	24	47.1	8	53.3	60	50	
Adult education	2	5.1	-	-	-	-	-	-	2	1.7	
None	3	7.7	-	-	-	-	-	-	3	2.5	
Total	39	100	15	100	51	100	15	100	120	100	
Years of farming Experience											
1 – 5	3	7.7	3	18.8	-	-	-	-	6	5.0	
6 – 10	7	17.9	11	75.0	1	20	-	-	19	15.8	
11 – 15	3	7.7	-	-	-	-	1	67	4	3.3	
16 – 20	7	17.9	-	-	30	58.8	10	66.7	47	39.2	
Above 20	19	48.7	1	6.3	20	39.2	4	26.7	44	36.7	
Total	39	100	15	100	51	100	15	100	120	100	
Types of tenure											
Inherited	20	57.3	7	46.7	20	39.2	5	33.3	52	43.3	
Purchased	9	23.1	3	20.0	10	19.6	4	26.7	26	21.7	
Rented	9	23.1	5	33.3	18	35.3	5	33.3	37	30.8	
Pledge	1	2.6	-	-	3	5.9	1	6.7	5	4.2	
Total	39	100	15	100	51	100	15	100	120	100	
Average farm size	0.52		0.40		0.41		0.40		0.45		
Average household size	8		7		7		8		8		
Irrigation device											
Shadoof	1	2.6	1	6.7	3	5.9	-	-	5	4.2	
Motorized pump	38	79.4	14	93.3	48	94.1	15	100	115	95.8	

Total	39	100	15	100	51	100	15	100	120	100
Source of irrigation water										
Surface	21	53.8	15	100	45	88.2	12	80	93	77.5
Underground	18	46.2	-	-	6	11.8	3	20	27	22.5
Total	39	100	15	100	51	100	15	100	120	100
Membership of Fadama Users Association										
Yes	25	64.1	14	93.3	50	98.0	15	100	104	86.7
No	14	35.9	1	6.7	1	2.0	-	-	16	13.3
Total	39	100	15	100	51	100	15	100	120	100

From the analysis, it was found out that 67.5% of the farmers were within the age bracket of 36 – 45 years of age, indicating that most of the respondents were young farmers. Furthermore, 97.5% of the respondents had one form of education or the other. This has implication for the adoption of any new agricultural practices in the near future. Njoku (1991) observed that years of formal education has a positive effect on the adoption of innovations.

Most of the respondents had between 5 – 10 years of experience of cultivating tomato and pepper, with a result of about 95% of them in that range. However, about 43% of the farmers got their land through inheritance (called *gado* in Hausa), while the remaining 57% had to either buy, pledge or rent the piece of land.

Motorized pumps constituted about 95.8% of the irrigation device to supply water, while the traditional shadoof method accounted for only 4.5% of the devices used. However, most of the farmers were members of the *Fadama* Users Association, with about 87% of them being members. This shows that most of the farmers in the study were active participants and beneficiaries of the *fadama* package offered by the *Fadama* Development Programme.

B. Problems of Tomato and Pepper Production in the *Fadamas*

The production of these crops was greatly affected by a number of problems, some of which are outlined in the table below.

Table 2: Problems encountered by *fadama* farmers of Tomato and Pepper

Problems	Numan		M/Belwa		Mubi		Yola North		Total	
	N	%	N	%	N	%	N	%	N	%
1 Fuel Scarcity	28	73.7	9	60	25	49	5	33.3	5	55.8
2 High cost of fertilizer	20	55.6	1	6.3	31	60.8	9	60	61	50.8
3 Fertilizer scarcity	30	78.9	2	12.5	36	70.6	9	60	77	64.2
4 Lack of credit	9	23.7	10	62.5	39	76.5	15	100	73	60.8
5 Low water level	18	47.4	1	6.3	1	2.0	-	-	20	16.7
6 Poor access road	2	5.3	-	-	-	-	9	60	11	9.2
7 Pump maintenance	3	7.9	-	-	10	19.6	2	13.3	15	12.5
8 Farmer pastoralist conflict	10	25.6	2	12.5	27	52.9	4	26.6	47	39.2
9 High cost of agrochemicals	38	100	1	6.3	24	47.1	7	46.7	32	26.7
10 High cost of labour	2	5.3	-	-	-	-	1	6.7	3	2.5
11 Land tenure system	38	100	4	25	1	2.0	-	-	5	4.2
12 Inadequate ext. Support	-	-	-	-	19	37.3	10	66.7	29	24.2

N = number of farmers interviewed

% = percentage of farmers response.

From the survey, it was discovered that about 64.2% of the farmers had problems of fertilizer scarcity, while 50.8% had access to the commodity but the price was on the high side due to the scarcity of the product.

Furthermore, 40% of the farmers encountered farmer- pastoralist conflict while other problems like high cost of agrochemicals was mentioned by 27%, lack of extension information had 25% of the respondents; low water level was mentioned by 18% of the farmers. However, issues like pump maintenance had only 12.5%, access road had 9%, land tenure problem had 4% and high cost of labour was mentioned by 3% of the farmers.

C. Farm Budgeting Analysis of Tomato and Pepper Cultivated Under Different Farming Systems

Farm budgeting technique was used to analyse the data collected from the respondent farmers. Input quantities, factor prices, physical output and total returns were derived. Factors of production were valued at the market price prevailing at the period of the study. In determining the profitability of an enterprise, the returns must be higher than the cost incurred. A table of these averages is presented below.

Table 3: Summary of average costs and returns per hectare for tomato and pepper production

Item	Tomato/pepper mixture				Tomato sole			Pepper sole		
	Unit/ha	Value/Unit	Total cost(N)	%	Unit/ha	Total cost(N)	%	Unit/ha	Total cost(N)	%
Yield (kg)										
Tomato	4899.7	17.0			6480					
Pepper	2158.4	25.0						2475		
Gross return (N)										
Tomato			83,294.90	60.7		110,160				
Pepper			53,960.00	39.3					61,875	
Total			137,254.90	100		110,160			61,875	
Costs										
Fertilizer (kg)	270.8	30	8,123.90	12.1	265.8	7,973.60	14.2	241.4	7,242	14.4
Seed (kg)										
Tomato	0.32	4500								
Pepper	0.43	5800	3,934.00	5.9	0.51	2,288.10	4.1	0.64	3,703.8	7.4
Fuel cost (litres)	233	25	5,832.10	8.7	168	4,188	7.4	212	5,291.0	10.5
Agrochemicals (Ltrs)			459	0.7		864.4	1.5		587	1.2
Labour (man-hour)										
Land preparation	69.9				46.6			41		
Ridging	99.9				77			62.5		
Planting/transpl.	116.6				84.4			68.0		
1 st weeding	91.7				98.1			80.2		
2 nd weeding	92.9				64.4			51.8		
Water application	236.1				200.4			193.5		
Thinning	33.8				9.9			9.3		
Fertilizer appl.	27.2				17.6			14.9		
Pest/Disease Contr.	17.3				10.1			8.3		
Harvesting	78.5				79.4			67.2		
Weighing/Bagging	69.2				60.8			50		
Total Labour	933.1	30	27,993	41.7	748.7	22,461	40.1	646.7	19,401	38.7
Other variable cost	----		11,099.90	16.5		7,719.50	13.8		6,643	13.2
Total Variables	----		57,771.90			45,494.60			42,867.8	
Rent on Land	----	1500	1,500	2.2	----	1,500	2.7		1,500	3.0
Depreciation										
Washbore			1,956.34	2.9		2,020			1723	3.4
Water pump			6,234.50	9.3		6,953			4,072.5	8.1
Total fixed cost			9,690.84			10,473			7,295.5	
Total Cost			67,132.74			55,967.60			50,163.30	
Net Farm Income			70,122.16			54,192.40			11,711.70	
NFI/Naira invested			1.08			97k			22k	

The different farming systems were: Tomato sole, Pepper sole and Tomato/pepper mixture. The production cost includes both fixed and variable costs. From the study, the average variable costs were tomato/pepper mixture = ₦67,771.90; tomato sole = ₦55,494.60; and pepper sole = ₦52,867.80. The total fixed cost consists of rent cost on land, depreciation on washbores and motorized water pumps. The average fixed costs per hectare were: mixed cropping = ₦19,690.00; tomato sole = ₦20,473.00; pepper sole = ₦17,295.50.

The Net Returns for mixed cropping was ₦137,254.90, while for the sole cropping, the values were tomato = ₦110,160.00, pepper = ₦61,875.00. The breakdown shows that farmers who practised mixed cropping (tomato/pepper) made a Net Farm Income (NFI) of ₦70,122.16 per hectare, with that of tomato sole as ₦54,192.40 while pepper sole recorded NFI of ₦11,711.70. The analysis also showed that for every naira invested in mixed cropping, tomato sole or pepper sole ₦1.05, 97k, and 22k were realised respectively. This shows that mixed cropping farmers made more profit than the others. It was also observed that mixed cropping farmers got 2158kg of pepper from the mixture which is about 87.2% of what sole pepper farmers got, while 4899kg of tomato was obtained from the mixed cropping which is 75.6% of what those who planted tomato sole got. It is evident that economically speaking, farmers of mixed cropping are better off than their sole cropping partners.

The analysis of variance (ANOVA) test of significance was carried out to compare the Net Farm Income (NFI) from the three farming systems. The result showed that the Net Farm Incomes from tomato/pepper mixture and tomato sole were significantly different from that of pepper sole, while the Net Farm Incomes from tomato/pepper mixture and tomato sole were not significantly different. This means that tomato/pepper mixture and tomato sole were more profitable than pepper sole, whereas tomato/pepper mixture compared to tomato sole alone gives a low profit margin.

Table 4. Analysis of variance result

Source	Total degrees of freedom	F-value	level of significance
Between groups	2		Pepper
Within groups	117	16.7	* Tomato
Total	119		* Mixture

*Pairs of groups significantly different at 0.05

It is evident from this analysis that, in Adamawa state, *fadama* farming should be sustained with farmers cultivating more of the tomato/mixture and tomato sole for better profit margin.

CONCLUSION AND RECOMMENDATION

This study highlights the fact that *fadama* farming in Adamawa state is faced with a lot of problems, yet the cultivation of tomato and pepper under the scheme has shown that *fadama* farming should be sustained in the state. This is because the analysis shows that for ₦1.00 spent on mixed cropping, a profit of ₦1.05 is made, while for ₦1.00 spent on cultivating tomato solely, a profit of 95k is made and for pepper sole, a profit of 22k is made. This shows that tomato and pepper production under *fadama* farming system was profitable.

With the problems identified from the study, it is recommendation that the following actions should be taken by the relevant agencies.

1. Supply of farm inputs like fertilizer, fuel, motorized water pumps and the likes should be adequate and available at affordable cost to the farmers.
2. Extension workers should be employed and sent to fields to enlighten *fadama* farmers about modern irrigation devices and cultivation of high yielding crops with better profit.

3. Government should provide financial support through small credit schemes to help farmers expand their production capacity.
4. Individuals with higher educational qualifications should be encouraged through incentives and soft loans to go into *fadama* farming.
5. Government should endeavour to demarcate irrigation farm lands from grassing areas to avoid conflict between farmers and pastoralists.
6. Earth dams should be constructed at irrigation sites for easy and an uninterrupted water supply to the farmers.

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