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## **Comparative Evaluation of Estimated Regression Analysis for Socio-Economic Characteristics Influencing Family and Hired Labour Utilization in Small-Scale Maize-Cowpea Farms in Mubi North Local Government Areas, Adamawa State, Nigeria**

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### **Abstract:**

*A study on comparative evaluation of estimated regression analysis for socio-economic characteristics influencing family and hired labour utilization in small-scale maize-cowpea farms in Mubi North local government areas of Adamawa State was conducted in 2007. A total of 100 small-scale maize-cowpea farmers were selected using multi-stage sampling method. Structured questionnaire and interview scheduled were used in the collection of information from the respondents farmers. Descriptive statistics and regression analysis were used in data analysis. Results revealed that majority (80%) of the farmers were male and 89% were married with a mean age of 50 years. Most of them (80.25%) had attended formal education. The respondents were mostly small scale farmers and they cultivated an average of about two to four hectares of farm land using personal savings. The results further revealed that the amount of labour employed by family was positively influenced by household size, total output and farming experience while those employed by hired labour was influence positively by distance of farm to residence, total farm output and farming experience. The pattern of farmers behaviour in the employment of family labour shows positive significant influence on household size ( $p < 0.05$ ), total farm output ( $p < 0.05$ ) and farmers experience ( $p < 0.01$ ). The result of the regression equation revealed a positive and significant influence of distance of farm to residence ( $p < 0.001$ ) on the amount of hired labour employed. Farmers household size and farm size have negative significant influence on the amount of labour employed at ( $p < 0.001$ ), whereas off-farm income has negative and non-significant influence. The variables explained 93.48% of the total behaviour of farmers in their employment of hired labour on maize-cowpea farm operations. The positive significant influence of distance of farm to residence, total farm output and experience of farmers on the amount of hired labour employed could be attributed to the fact that an increase in the distance of farms to farmers residence poses greater amount of labour hired by the farmers putting into consideration the farmers previous experience with regards to labour demand and total farm output of maize cowpea crops.*

**Keywords:** *Comparative evaluation, regression analysis, socio-economic, Family and hired labour, utilization, Maize-cowpea, Mubi North, Adamawa, Nigeria*

### **1. Introduction**

Agriculture is an important sector for sustaining growth and reducing poverty in developing countries. Because the food and agricultural sector dominates most developing countries in terms of contribution to gross Domestic Product (GDP), employment and income, its growth and development are essential for the overall process of socioeconomic development of developing countries. In 2010 for instance, agriculture's contribution was about 40.9 percent of the Gross Domestic Product (GDP) (CBN, 2010).

Labour is the totality of the people who work for a purpose and are paid remuneration for the work done. The nature of the work affects the accompanying wage or salary; as such there should be cordiality between employer and employee. Hamidu, *et al* (2005) posited that in the interest of sustained productive economic activity, effort is made to manage the employer employee relationship to sustain the work. According to the world Book Encyclopedia (1995) labour force is that part of a nation's population that work for pay or is actively seeking work. Labour input is usually measured in man- days or, sometimes man-hours. These represent the input of work of an average man in a working day or hour.

Nigeria is regarded as one of the countries capable of providing enough food and raw materials, for its teeming population. Thousands of Nigerian small holder farmers can be relied upon as a driving force for the transformation of Nigeria's agriculture because they are willing to accept new crops and management practices and are responsive to price and income incentives (Adesino, 1991). Priority must therefore be given to small-holder farmer because they constitute about 95% of farming households in Nigeria and produce most of the food crops consumed in the country (Adesino, 1991).

Agricultural production in Nigeria depends largely on labour. Inadequate supply of labour has posed a major constraint to increasing agricultural production (Hamidu, 2000). Norman (1970) found that in northern Nigeria, the amount of land a family could cultivate was not limited by the availability of land but instead by the amount of labour they could supply. Small holder farmers used to rely on the family members as their major sources of labour on the farms. However, due to the increasing rural-urban migration, increasing rate of schooling among children as well as increasing monetarisation of the economy, small holder farmer have become dependent upon hired labour (Chidebelu, 1991). He also pointed out that, lack of labour particularly family labour has become the major problem of increase productivity.

With geometrical rate of population growth amidst scarce resources, food production can no longer measure up with the increasing demand. This is because the bulk of food production comes from small holder farmers which have been neglected over the years.

Knowledge about farm labour at the farm level is required to provide an insight to the aspect of the individual farmers resources control, policy response yield and cultural practices in which he operates. This will therefore require policy formulation for increased productivity on the farm and its sustainability.

There has been decrease in food production owing to sudden disappearance of labour through increased number of children going to school, decreased in polygamy, rural- urban migration (Hamidu, 2000).

## 2. Material and Methods

### 2.1. Study Area

The study was conducted in Mubi Local Government Area of Adamawa State. Mubi is located within the North East Basement complex of Nigeria and form the Northern part of old Sardauna Province and presently forms Adamawa Northern Senatorial district as defined by NPC (2007).

Mubi lies between latitude 9° 30' and 11° north of the equator and longitude 13° and 13° 45' east of the Greenwich Meridian. Mubi is bounded in the North by Michika local government, in the West by Hong and Song local government areas and in the South and East by the republic of Cameroon. It has a land area of 4728.77km<sup>2</sup>.

The month of May to September constitute the wet season. Monthly rainfall increases steadily from May to August which has highest amount. Rainfall decreases from September to October at a very sharp rate.

Mubi falls within the Sudan Savanna belt of the Nigeria's vegetation zones. The vegetation type is best referred to as combretaceous woodland Savanna (Adebayo, 2004).

About 75% of people in Mubi are farmers engaged in different farming activities. The local farm practice which involves the use of hoes, cutlasses, axes and knives has been passed from generation to generation. Animal husbandry is a subsidiary activity to the people of this area, except for the few nomadic cattle rearers that moves their herds in and out of the area in accordance with seasonal changes.

### 2.2. Method of Data Collection

In this research of maize/cowpea mixture, primary Data was used. The instrument used for the collection of data were questionnaire and well trained enumerators drawn from colleges of Agriculture mubi and Adamawa Agriculture development programme (AADP) staff. Selection and posting of the enumerators was done base on their language compatibility, with the respondents to elicit desired and relevant responses. The researcher personally supervised the data collection by visiting the sample site. A total of hundred (100) farmers were selected and interviewed. The selection was done using random sampling out of the hundred and sixty (160) farmers, twenty (20) farmers were chosen to represent each community of the study area.

### 2.3. Method of Data Analysis

Data obtained were analyzed using the following:- Frequency distribution and Regression analysis.

### 2.4. Frequency distribution

Frequency distribution was used in the analyses of family and hired labour in cowpea/maize socio-economic characteristics in the study area.

### 2.5. Regression analysis

Regression provides estimates of values of the dependent variable from the value of the independent variable. This can be accomplished through the use of regression line which is fitted to the data. It describes the average relationship between x and y variables.

For this study multiple regression analysis was used because there are more than one independent variables explaining the behaviour of the dependent variable, whereas simple regression provides for only one independent variable to explain the performance of the dependent variable.

Multiple regression analysis was used to describe the behaviour of total labour utilized (man-days/hectare) by small scale maize/cowpea farms with the amount of family and hired labour utilized.

2.6. Regression analysis model specification for farm labour utilization in small-scale maize-cowpea farms

Multiple regression analysis was used to determine the contribution of household size, number of household members engaged in maize-cowpea farm, years of formal education, farm size (hectares) and distance of farm to farmers residence (Km) and the category of labour employed (man day) by small-scale maize/cowpea farms for farm operations.

The regression models were expressed as:

$$HLb = a + b_1F_1 + b_2F_2 + b_3F_3 + b_4F_4 + b_5F_5 + b_6F_6 + u$$

$$FLb = a + b_1F_1 + b_2F_2 + b_3F_3 + b_4F_4 + b_5F_5 + b_6F_6 + u$$

$$TLb = a + b_1F_1 + b_2F_2 + b_3F_3 + b_4F_4 + b_5F_5 + b_6F_6 + u$$

Where:

HLb = Hired labour employed (man-days)

FLb = Family labour employed (man-days)

TLb = Total labour employed (man-days)

F<sub>1</sub> = Household size

F<sub>2</sub> = Farm size (hectare)

F<sub>3</sub> = Distance of Farm to residence (Km)

F<sub>4</sub> = Total Farm output (kg)

F<sub>5</sub> = Number of labours used

F<sub>6</sub> = Age

U = Random error term

3. Results and Discussion

3.1. Socio-Economic Characteristics of the Respondents

Table 1 shows that the mean age was 49.75 and 51.19 for family and hired labour respectively. Old age is characterized by less strength and inability to be efficient in farm activities. About 76.26% and 80% of the surveyed farmers had an average age ranging from 35 to 64 for family and hired labour respectively. The average age of the farming population is rising due to scarcity of young people engaged in farming. Most young people are either away at school or have migrated to urban areas in search of greener pasture.

Age (years)	Types of Labour			
	Family	%	Hired	%
25-34	9	11.25	5	6.25
35-44	18	22.50	21	26.25
45-54	25	31.25	20	25.00
55-64	18	22.50	23	28.75
65-74	10	12.50	11	13.75
Total	80	100.00	80	100.00
Mean		49.75		51.19

Table 1: Distribution of Farmers according to age.

Source: Field Survey, 2007

One of the important factors conditioning the level of production and productivity on peasant farms is the composition and size of the farming family (Chianu, *et al*, 2001). He further reported that in both pre-colonial and colonial days, most farmers had large families which supplied majority of the farm labour required by the peasant farmers.

Table 2 shows that 67.50% of family labour has between 0 and 4 people in their household. The table also shows that 1.25% have between 17 and 28 people where as 81.25% of hired labour had between 0 and 4 people in their household. No farmer has household size between 21 and 28 among hired labour. The mean household size of family and hired labour is 4.76 and 3.69 respectively.

Types of Labour	
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household size	Family	%	Hired	%
0-4	54	67.50	65	81.25
5-8	14	17.50	5	6.25
9-12	6	7.50	5	6.25
13-16	3	3.75	3	3.75
17-20	1	1.25	2	2.50
21-24	1	1.25	-	-
25-28	1	1.25	-	-
Total	80	100.00	80	100.00
Mean		4.76		3.69

Table 2: Distribution of Farmers according to Household size

Source: Survey, 2007

The size of farm plays an important role in farm success because it reflects availability of capital, access to credit and even managerial ability (Iadan, 1995). Table 3 revealed that the mean hectareage of maize cowpea farms is 2.58 and 3.15 for family and hired labour respectively. While 56.0% of family labour have farm size between 0.1 and 2.0, 50% hired labour have farm size between 4.10 to 6.00. It could be observed that hired labour have large farm size than family labour. This confirms earlier research on small-scale farmers land holding by Adesini (1991) who reported 1.5 hectareage, and Durojaiye (1991) reported 2.8 hectares.

Farm size (Hectare)	Type of Labour			
	Family	%	Hired	%
0.1-2.00	45	56.0	25	31.25
2.10-4.00	20	25.0	40	50.0
4.10-6.00	10	12.5	8	10.0
6.10-8.00	2	2.5	3	3.75
8.10-10.00	1	1.25	2	2.5
10.10-12.00	1	1.25	1	1.25
12.10-14.00	1	1.25	1	1.25
Total	80	100.03	80	100.00
Mean		2.58		3.15

Table 3 Distribution of farmers according to farm size

Source: Survey, 2007

Table 4 reveals that 69.75% and 86.25% of the farmers in both family and hired labour had attended either Koranic, primary, secondary and tertiary education. About 35.0%, and 13.75% had never been to school of any kind in family and hired labour respectively. It can then be said that hired labour were more educated than family labour as 86.25% of hired labour attended one level of education or the other as against 65% family labour.

Educational level	Type of Labour			
	Family	%	Hired	%
(a) Never been to school	28	35.0	11	13.75
(b) Had primary education only	17	21.25	15	18.75
(c) Had Koranic education only.	11	13.5	4	5.0
(d) Had secondary education.	14	17.5	18	22.5
(e) Had tertiary education	10	12.5	32	40.0
Total	80	100.0	80	100.00

Table 4: Educational background

Source: Survey, 2007

Table 5 shows the mean cost of labour paid by farmers per man-day. Labour cost per man-day for various farm operations among farmers using family labour was between N1716.43 and N328.44. The highest being paid on first weeding and the lowest for planting maize.

Farmers utilizing hired labour had their cost per man-day for various farm operation between N2750.11 and N350.85, where the highest amount was paid on second weeding, and the lowest on second fertilizer application where family labour expended highest amount on the first weeding, hired labour spent their own on second weeding. Comparatively, hired labour spent more in all the operations than family labour. The reason for the exorbitant spending was because hiring labour in the study area is expensive. Farmers in the study area spent a total of N23,120.24 on labour. Where hired labour constitute about N14,513.99 and family labour constituted about N8,606.25 as shown in table 5.

Farm operation	Type of Labour		
	Family	Hired	Total
Land preparation	406.25	560.50	966.75
Ridging	1073.71	1800.25	2873.96
Planting (m)	328.44	450.17	778.61
1 <sup>st</sup> fert. App. (m)	607.38	660.41	1267.79
1 <sup>st</sup> weeding (m)	1716.43	2600.68	4317.11
2 <sup>nd</sup> fert. App. (m)	332.04	350.85	682.89
Planting (C)	343.75	2000.00	2343.75
2 <sup>nd</sup> weeding (M + C)	1236.73	2750.11	2873.84
Harvesting (M)	789.60	480.61	1270.21
Spraying (C)	339.56	440.00	779.56
Harvesting (C)	1431.64	1451.99	2883.63
Total	8606.25	14305.3	22,131.1

Table 5: Mean cost of labour per man-day per farm operation (N)

Source: Survey, 2007

The cost and returns analysis in Table 6 reveals that small scale maize-cowpea farmers expend a mean total of N46,246.82 and N48,561.16 per hectare for family and hired labour respectively and realized a revenue of N69,084.39 and N73,201.22 for family and hired labour respectively.

The mean returns over variable cost of production for family and hired labour are N22,837.57 and N24,640.06 respectively. Similarly, the mean total cost of production per man-day is N489.38 and N1033.22 for family and hired labour respectively. While the mean total revenue for family and hired labour were N731.05 and N1557.47 respectively. The mean gross margin per man-day for family and hired labour were N241.67 and N524.26 respectively. Both family and hired labour made reasonable profit with that of hired labour higher than family labour. This could be possible, because farmers who used hired labour tends to supervise their workers to ensure work is done according to specification consequently greater returns.

The table also shows that farmers spent a mean of 67% and 66% of the total revenue realized in paying for operating expenses on the farm for family and hired labour respectively. The mean return on capital investment was N1.49 and N1.51 for family and hired labour respectively. These are not too attractive given, the demand and commercial status of the crops in the area. From the above analysis therefore, it reveals that although small-scale maize/cowpea farming is profitable, farmers should utilize their production inputs efficiently for better and higher profit.

Cost/Returns Farm components	Family	Hired
<b>Cost</b>		
Seed	1554.74	1554.74
Fertilizer	26406.25	26406.25
Tractor hire	2505.83	3200.92
<b>Animal tractions hires</b>	167 3.75	1673.75
Insecticide	1000.00	1000.00
Herbicide	4500.00	4500.00
Labour	8606.25	10,225.50
Total	46,246.82	48,561,16
<b>Returns</b>		
Maize output	48,729.98	50,275.72
Cowpea output	20, 354. 41	22,925.50
Total	6,9084.39	73,201.22
Total cost/manday	489.38	1033.22
Total Revenue/manday	731.05	1557.47
Gross margin	22,837.57	24,640.06
Gross margin/manday	241.67	524.26
Operating	0.67	0.66
Returns on naira invested	1.49	1.51

Table 6: Cost-returns Analysis of maize cowpea mixture in Mubi LGA Adamawa state

Source: Survey, 2007

The pattern of farmers behaviour in the employment of family labour shown on Table 7 shows positive significant influence on household size ( $p < 0.05$ ), total farm output ( $p < 0.05$ ) and farmers experience ( $p < 0.01$ ). Farm size has negative non-significant on the amount of family labour employed on the farm. Distance of farm to farmers' residence has no significant. About 73.93% of the variation in the amount of family labour employed were explained by the variables, the positive and significant relationship between household size, total farm output and farmers experience indicate that the larger the household size the more the number

of those that will be employed to work on the farm putting into consideration his total farm output and his knowledge of labour requirement for the crops. The negative and significant relationship between off-farm income and family labour employed reveal the fact that farmers does not need any income from outside to employed his family members on the farms. He spends less as most members goes to farm. Similarly, the negative non-significant relationship between farm size and family labour employed reveals that, the number of people going to farm is not a function of farm size. Since the work must be done irrespective of the size of the family members.

Estimated parameters	Functional forms			
	Linear	Semi log	Double log	Log inverse
Constant	18.623 (2.780)	4.52 (2.110)	1.05 (0.13)	1.301 (0.05)
Household size	0.580* (0.190)	9.86** (7.28)	0.222*** (0.041)	0.0131 (0.034)
Farm size	-0.735 <sup>NS</sup> (0.711)	-4.406 <sup>NS</sup> (3.613)	-0.113 <sup>NS</sup> (0.100)	-0.021 (0.013)
Distance of farm to residence	0.867 <sup>NS</sup> (0.691)	3.42 <sup>NS</sup> (3.12)	0.034 <sup>NS</sup> (0.040)	0.013 (0.012)
Total farm output	0.541* (0.245)	2.034* (1232)	0.046 <sup>NS</sup> (0.023)	0.001 (0.004)
Off Farm income	-0.036** (0.027)	3.45** (3.64)	-0.017** (0.051)	-0.501 (0.601)
Exp	0.614** (0.301)	4.35* (2.78)	0.060** (0.051)	0.032 (0.005)
R <sup>2</sup> (%)	73.93%***	66.51%***	60.30%***	55.50***

Table 7: Estimated Regression for Socioeconomic Characteristics Influencing Amount of Family Labour Used in Small Scale Maize/cowpea Farms  
Source: Survey, 2007

- \* = 0.05% level
- \*\* = 0.01% level
- \*\*\* = 0.001% level
- NS = Non significant

Four functional forms of regression models; linear, semi-logarithm double logarithm and log inverse were used to determine the relationship existing between the amount of hired labour utilized on small scale maize-cowpea farms and some socio-economic characteristics on Table 21. Based on the value of coefficient of determination and the test of significance, linear functional form was selected as the best fit that explains the relationship.

The result of the regression equation revealed a positive and significant influence of distance of farm to residence (p<0.001) on the amount of hired labour employed. Farmers household size and farm size have negative significant influence on the amount of labour employed at (p<0.001), whereas off-farm income has negative and non-significant influence. The variables explained 93.48% of the total behaviour of farmers in their employment of hired labour on maize-cowpea farm operations. The positive significant influence of distance of farm to residence, total farm output and experience of farmers on the amount of hired labour employed could be attributed to the fact that an increase in the distance of farms to farmers residence poses greater amount of labour hired by the farmers putting into consideration the farmers previous experience with regards to labour demand and total farm output of maize cowpea crops. The negative significant relationship between household size and farm size may substantiate the fact that farmers depend solely on labour outside, hence household size has no importance to him. Whereas the negative influence of hired labour on farm size could not be unconnected with the employment of labour saving device and technology like herbicides, fertilizer and the use of tractor by the farmer thereby less labour are employed.

Estimated parameters	Functional forms
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	Linear	Semi lug	Double log	Log inverse
Constant	1314 (1132)	3.47 (0.28)	5.62 (2.51)	1272.00 (3748)
Household size	-5.48** (5.82)	-0.05* (0.03)	-0.38* (0.26)	-320.42** (314.04)
Farm size	-1.56** (1.33)	-0.12* (0.14)	-0.32* (0.15)	-160.90* (478.09)
Distance	6.21** (3.83)	0.32** (0.13)	0.48* (0.13)	988.20* (548.08)
Total farm output	66.94** (52.81)	0.79** (0.66)	0.63* (0.55)	231.43* (131.56)
Off Farm income	-81.66 <sup>NS</sup> (52.11)	-0.52 <sup>NS</sup> (0.48)	-0.46* (0.28)	-162.48* (118.73)
Exp	8.21*** (9.42)	0.05** (0.01)	0.36 <sup>NS</sup> (0.27)	245.70 <sup>NS</sup> (595.70)
R <sup>2</sup> (%)	93.48***	52.41**	55.36**	48.31**

Table 8: Estimated Regression for Socioeconomic Characteristics Influencing Amount of Hired Labour used in Small-scale Maize/Cowpea Farm

Source: Survey, 2007

\* = 0.05%  
 \*\* = 0.01%  
 \*\*\* = 0.001%

#### 4. Conclusion

The research shows that majority of Nigerian farmers are small-scale. The level of production depending on variety of factors such as land tenure, input availability, labour, marketing as well as climatic conditions.

This work was directed at one of the most limiting resource in agriculture, which is labour the investigation shows that growing maize and cowpea in a mixture gives appreciable returns to variable cost of production in terms of labour used.

Low productivity is a critical constraint to overall increase in agricultural input and threat to food security. This constraint could be averted through the formulation of policies and programmes which enable farmers to utilize production input efficiency. Farm policies should be formulated to facilitate the dissemination and adoption of appropriate labour saving technologies for farm operations. Agricultural research should focus on the development of simple and relevant farm technologies and technique compatible with farmers existing practices.

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