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TECHNICAL EFFICIENCY OF COWPEA MARKETING IN MUBI NORTH

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Abstract:
This study was carried to analyze the technical efficiency of cowpea marketing in Mubi North. Both primary and secondary data were used. 120 questionnaires were administered only 74 were respondent to. The results were analyzed using data envelopment analysis (DEA) which involves constant return to scale (CCR) model and variable return to scale (BCC) model. The result shows that majority of the respondents are male. And that majority about 41% of them fall within the age of 31-40 years. The Marital status of the respondents showed that majority about 73% of the marketers are married. And the result on Household size of the respondents revealed that majority about 83% of the marketers' household size falls within 2-11 members. Level of education of the marketers showed that about 69% of them received low level formal education and majority with 2 to 17-years' experience on cowpea marketing. majority of them about 69% are formally educated in one form or the other while 31% are informally educated. Income level of the respondents showed that more than half 54% of the marketers earned an income of 15,000 and below while 46% earned above 15,000. Results on the marketing experience of the respondents showed that majority of them have 2-6 years of experience. The results show that about 70% of the marketers belong to a cooperative while 30% do not. The study also delved into the challenges experienced by cowpea marketers. Based on the envelopment analysis result of cowpea marketing efficiency it revealed that socio-economic characteristics of the respondents has positive influence on the cowpea marketing efficiency. It provided suggestions for the Government and NGOS to implement that will curb these challenges.

Keywords: Technical Efficiency; Cowpea; Constant Return to Scale; Variable Return to Scale.

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1. Introduction

1.1. Background of the Study

Cowpea *(Vigna unguiculata L. Wasp)* is one of the most important legume crops in arid and semi-arid regions of Sub-Saharan Africa (SSA) and it is an important source of protein for resource farmers as well as an essential component of cropping systems. It is a crop of major importance to

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the nutrition of rural households in the drier regions of Eastern Africa, where diets tend to heavily rely on starchy foods such as millet, sorghum, maize and cassava and it is consumed both as a grain and a vegetable. (Annual progress report, 2014).

Cowpea is gradually attaining economic importance in Nigeria, particularly the Southern states of Nigeria, even though the bulk of the production is done in the semi-arid zone (Northern) of Nigeria (Petu-Ibikunle *et al* 2010). The appreciating economic importance made due to food value which made it a good supplement/complimentary source of protein from animal (meat, egg and fish) because it contains 20 – 25% of protein and 64% carbohydrate. It therefore has a tremendous potential towards alleviating malnutrition specifically amongst the poor, (Ya'aishe, *et al* 2010). Cowpea has the potential to contribute to food security and to poverty reduction in West Africa. The demand for cowpea in this region is increasing because of high population growth, mainly from the urban areas, and also because of poverty and the demand for low-cost food. The high protein content of cowpea and its use as a staple in the diets of Sahelian and coastal populations make it also a crop with high potential for food security in these regions. Cowpea forage contributes significantly to animal feed mainly during the dry season when the demand for feed reaches its peak, (Lowenberg-DeBoer,*et al* 2010).

The largest producer and consumer of cowpea in West Africa is Nigeria where a dense population creates an enormous demand for the crop. Nigeria is the largest cowpea exporter in West Africa with an estimated 215 000 MT exported annually, mainly from Nigeria. Substantial amounts of cowpea also come to Nigeria from other neighboring countries, especially Cameroon and Chad (Coulibaly and Lowenberg-DeBoer, 2012). More than 5.4 million tons of cowpeas are produced worldwide, with Africa producing nearly 5.2 million. The principal cowpea producing countries are Nigeria, Niger, Senegal, Ghana, Mali, and Burkina Faso. Among these countries, Nigeria is the largest producer which accounts for 61% of production in Africa and 58% worldwide in 2006, (FAOSTAT. 2014). Nigeria is the largest cowpea producer in West Africa and also has the highest level of consumption, the Northern parts are the largest cowpea producer in Nigeria particularly Adamawa state. Cowpea has a variety of uses including food for human consumption, feed for livestock and industrial applications. The area planted to cowpea worldwide has increased by 66 percent over the past 50 years, while yield has increased by 255 percent. Around half of the cowpea produced is fed to livestock, and half is consumed by humans and used in other applications.

Several studies indicated that the existing low levels of technical efficiency hinder efforts to achieve progress in production (Belete *et al*, 1991; Seyoum *et al*, 1997). Despite the significant growth in cowpea production, there is huge inefficiency in the production system. An improvement in the efficiency of production system will have direct positive impact on agricultural growth, nutritional security and rural livelihood in a state like Adamawa, where cowpea is one of the major crops. Under these circumstances it is important to know whether the marketers have the same or different levels of technical efficiency. The study, therefore, tries to measure the technical efficiency of cowpea marketing in Mubi North L. G. A. of Adamawa state Nigeria.

1.2. Problem Statement

The limited capacity of the Nigeria cowpea production sector to meet the domestic demand due to high export rate has raised a number of pertinent questions both in policy circles and among

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researchers. Some of these questions have to do with whether farmers are allocating resources efficiently in cowpea production or whether they are receiving remunerative profits in cowpea production or whether the market structure is technically efficient.

1.3. Research Questions

1) What are the socio-economic characteristics of cowpea marketers in the study area?
2) What is the technical efficiency of cowpea marketing using CRS?
3) What is the technical efficiency of cowpea marketing using VRS?
4) What are the factors influencing cowpea marketing in the study area?
5) What are the constraints facing cowpea marketers in the study area?

1.4. Objectives of the Study

The broad objectives of this study are to analyze the technical efficiency of cowpea marketing in Mubi Adamawa State, Nigeria. And the specific objectives are to:

1) Describe the socio-economic characteristic of cowpea marketers in the study area.
2) Determine the technical efficiency of cowpea marketer using CRS.
3) Determine the technical efficiency of cowpea marketers using VRS.
4) Investigate the factors influencing cowpea marketers in the study area.
5) Determine the constraints militating against cowpea marketing in the study area.

2. Literature Review

2.1. Technical Efficiency of Cowpea Marketing

The concept of efficiency is concerned with the relative performance of the process used in transforming given input into output. The crucial rule of efficiency in increasing agricultural output has been widely recognized by researchers and policy makers. The Nigerian Government in 2003 made a policy on exportation of food crops (Omonoma *et al.*, 2010). Therefore, it is necessary to study the efficiency of farmers' sequel to the export promotion on one of the major food crops produced in Nigeria. An underlying premise behind this study is that if farmers were not making efficient use of existing technologies, then effort made to improve efficiency will be more cost effective than introducing new technologies as a means of increasing agricultural output (Belbase and Grabouski, 1985; Omonana *et al*., 2010). The efficiency of a farm/firm refers to its success in producing as large amount of output as possible given a set of inputs. To determine the efficiency of a particular firm, there is need for efficiency measurement through the production factor inputs and processes. This efficiency measurement has received considerable attention from both theoretical and applied economics.

From a theoretical point of view, there has been a spirited exchange about their relative importance of the various components of firm efficiency (Cornanor and Leibenstein, 1969). From an applied perspective, measuring efficiency is important because this is the first step in a process that might lead to substantial resource savings. These resource savings have important implications for both policy formulation and firm management (Bravo-Ureta and Reiger, 1991). The measurement of

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efficiency begins with Farrell (1957) who drew upon the work of Debrew (1951) and Koopmans (1951) to define a simple measure of firm efficiency which could account for multiple inputs.

He proposed that the efficiency of a firm consists of two components: technical efficiency (TE), which reflects the ability of a firm to obtain maximal output from a given set of inputs, and allocative efficiency (AE), which reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices. These two measures are combined to provide a measure of total economic efficiency.

2.2. Data Envelopment Analysis (DEA)

It has long been recognized that data envelopment analysis (DEA) by its use of mathematical programming is particularly adept at estimating inefficiencies in multiple input and multiple output production correspondences. Following Charnes, Cooper and Rhodes (CCR, 1978), a number of different DEA models have now appeared in the literature (Seiford and Thrall, 1990; Seiford, (1996).

During this period of model development, the economic concept of returns to scale (RTS) has also been widely studied within the framework of DEA and this, in turn, further extended the applicability of DEA.

Two paths may be followed in treating returns to scale (RTS) in DEA. The first path, developed by Flare, Grosskopf and Lovell (FGL, 1985, 1994), determines RTS by a use of ratios of radial measures. These ratios are developed from model pairs which differ only in whether conditions of convexity and sub-convexity are satisfied. The second path stems from work by Banker (1984), Banker *et al*. (1984), Banker and Thrall (1992) and Banker and Maindiratta (1986). This path, which is the one we follow, includes, but is not restricted to, radial measure models. It extends to additive and multiplicative models as well and does so in ways that provide opportunities for added insight into the nature of RTS and its treatment by the methods and concepts of DEA.

We restrict attention to the latter and justify our restriction to this (second) alternative by noting that its paths of development have taken a variety of forms that are scattered in the literature. Hence, we think the time is ripe to attempt to provide a common source from which further developments may be conveniently essayed.

The alternative provided by the FGL approach is an important one, to be sure, so we will take the opportunity to comment further on it in our subsequent discussion. We do not undertake its development in detail in the present paper, however, because we believe that this approach has achieved a considerable degree of uniformity that has long been available—as in FGL (1985), for instance. We may also further justify its omission here because Banker *et al.* (1996b) and Seiford and Zhu (1999) demonstrated the equivalence of its results to the results obtained from the different uses of the same radial measure models that are to be treated in the present paper. See also Førsund (1996) where the FGL approach is reviewed in detail.

The plan of development starts with a recapitulation of results from the very important paper by Banker and Thrall (1992). Although developed in the context of radial measure models, we also

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use these (Banker–Thrall) results to unify the treatment of all of the models we cover. This is done after we first cover the radial measure models that are treated by Banker and Thrall. Proofs of their theorems are not supplied because these are already available in Banker and Thrall. Instead refinements from Banker *et al*. (1996a) and from Banker *et al.* (1996b) are introduced which are directed to (a) providing simpler forms for implementing the Banker–Thrall theorems and (b) eliminating some of the assumptions underlying these theorems. We then turn to concepts such as the most productive scale size (MPSS) concept introduced by Banker (1984) to treat multiple output–multiple input cases in DEA without departing from returns-to-scale concepts built around the single output case in classical economics. Additive and multiplicative models are then examined, and the latter are used to introduce (and prove) new theorems for determining scale elasticity.

The former (i.e., the additive case) is joined with the ‘‘goal vector’’ approach introduced by Thrall (1996a) in order to make contact with ‘‘invariance’’ and ‘‘balance’’ ideas that play prominent roles in the ‘‘dimensional analysis’’ used to guide the measurements used in the natural sciences (like physics). We next turn to the class of multiplicative models where, as shown by Banker and Maindiratta (1986), the piecewise linear frontiers usually employed in DEA are replaced by a frontier that is piecewise Cobb–Douglas (¼log linear). Scale elasticity estimates are then obtained from the exponents of these ‘‘Cobb–Douglas like’’ functions for the different segments that form a frontier, which need not be concave. A concluding section points up issues for further research.

2.2.1. Constant Return to Scale (CCR Model)

The DEA CCR model introduced by Charnes, Cooper and Rhodes (CCR, 1978) assumes constant returns to scale, meaning any change in inputs should produce a proportional change in output. The model uses the mathematical programming optimization method to determine the efficiency of a DMU (Decision Making Units) dividing the weighted sum of outputs (virtual output) by the weighted sum of inputs (virtual input), generalizing thus definition presented above.

The classic model CCR with input orientation (i.e minimizing the input and maintains the level of production), considers DMUs analysis unit to be compared according to their efficiency based on the following model, called model of Multipliers:

2.2.2. Variable Return to Scale (BCC Model)

The BCC model, introduced by Banker, Charnes and Cooper in (1984) introduced a change in the formulation of CCR in order to analyze the variable returns to scale in DEA. That is, the BCC model wanted to give account to interpret the fact that, at different scales, the DMUs could have different productivities and still be considered efficient. The objective of this analysis proposed by the BCC model is to take into account the fact that in different situations the conditions that influence the productivity of production are also diverse. As mentioned in the introduction, different production technologies have their productivities influenced by the scale at which the DMUs are operating. When the production frontier exhibits constant returns to scale, efficient DMUs have the same productivity; however, when the production line has variable returns efficient DMU need not have the same productivity.

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The formulation of the BCC introduces a restriction on the PSS of the original model CCR. The frontier of this concave down set is restricted by $\sum_{j=1}^{n} \lambda_j = 1$, making the area BCC production possibilities less that the CCR.

Consequently, any projection inefficient DMU in the efficient hyperplane, may be represented by an equation of the line segment of the linear combination border, where the sum of the contributions of efficient DMUs (λ_j) must result in 1.

Thus, the BCC efficiency is less than or equal to the CCR efficiency.

The model also introduces the variables v * (scale factor in the output orientation) and u * (scale factor in the input orientation) to the objective function and constraints. These variables, according to indicate the scale return of the DMU. In the oriented to inputs model, when the scale factor is positive, an increasing return to scale is verified; when negative, a decreasing return is verified; and, finally, when if the scale factor is null, a constant return is verified.

3. Methodology

3.1. Study Area

This study was conducted in Mubi North Local Government Area of Adamawa state. Mubi North local government area of Adamawa state lies on the West bank of the River Yedseram, a stream that flows into Lake Chad and is situated on the Western flanks of the Mandara Mountain. It is bounded by Borno State to the North, Hong Local Government Area to the West, Maiha Local Government to the South and Cameroun Republic to the East (Adebayo 1996).

Temperature is normally warm to hot with minimum temperature of 12^0C and maximum temperature of 37^0C (Adebayo, 1996). The ethnic groups are mainly Fali, Gude, Marghi and Fulani. The inhabitants are predominantly farmers and traders.

Mubi North is the capital of Mubi Local Government Area of Adamawa State in Nigeria. It lies on latitude 10º 32’ N to 10º 11’ N and longitude 13°12’ E to 13° 35'E, with a total land mass of 506.4Km2 and a population size of 759,045 people. Mubi has a tropical climate which is determined by the movement of the Inter Tropical Convergence Zone (ITCZ), as well as the effect of relief. Rainfall begins in April, progressing and reaching its peak in July/August and stops most of the times in October. Average annual rainfall ranges between 998 mm and 1262 mm. The areas just below the Mandara Mountains record the highest rains. Rainfall intensity is high with rainy days making up to 87 % of the days with more than 20 mm of rainfall. Over the course of the year, the temperature typically varies from 16^0C to 38^0C and is rarely below 13^0C or above 38^0C. Alongside air and water, soil is another vital resource that provides the basis for human living (Adebayo, 1996). The soil is composed of weathered rock materials (parent material), organic matter, moisture content, and dissolved minerals in the air (Adebayo, 1996). Thus, it forms a very important medium for plant growth. However, soils vary in their texture, structure, color, mineral content and moisture holding capacity (Adebayo, 1996). Some of these physical properties collectively form the basis for their classification.

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The soil of Mubi regions, therefore, fall under the category of ferruginous tropical soils of Nigeria based on the genetic classification made by the Food and Agricultural Organization of the United Nations (Adebayo, 1996). Mubi region falls within the Sudan Savanna belt of Nigeria's vegetation zones. The region's vegetation type is best referred to as Combretaceous woodland Savanna. It is made up of grasses, aquatic weeds in river valleys and dry land weeds interspaced by shrubs and woody plants (Adebayo, 1996).

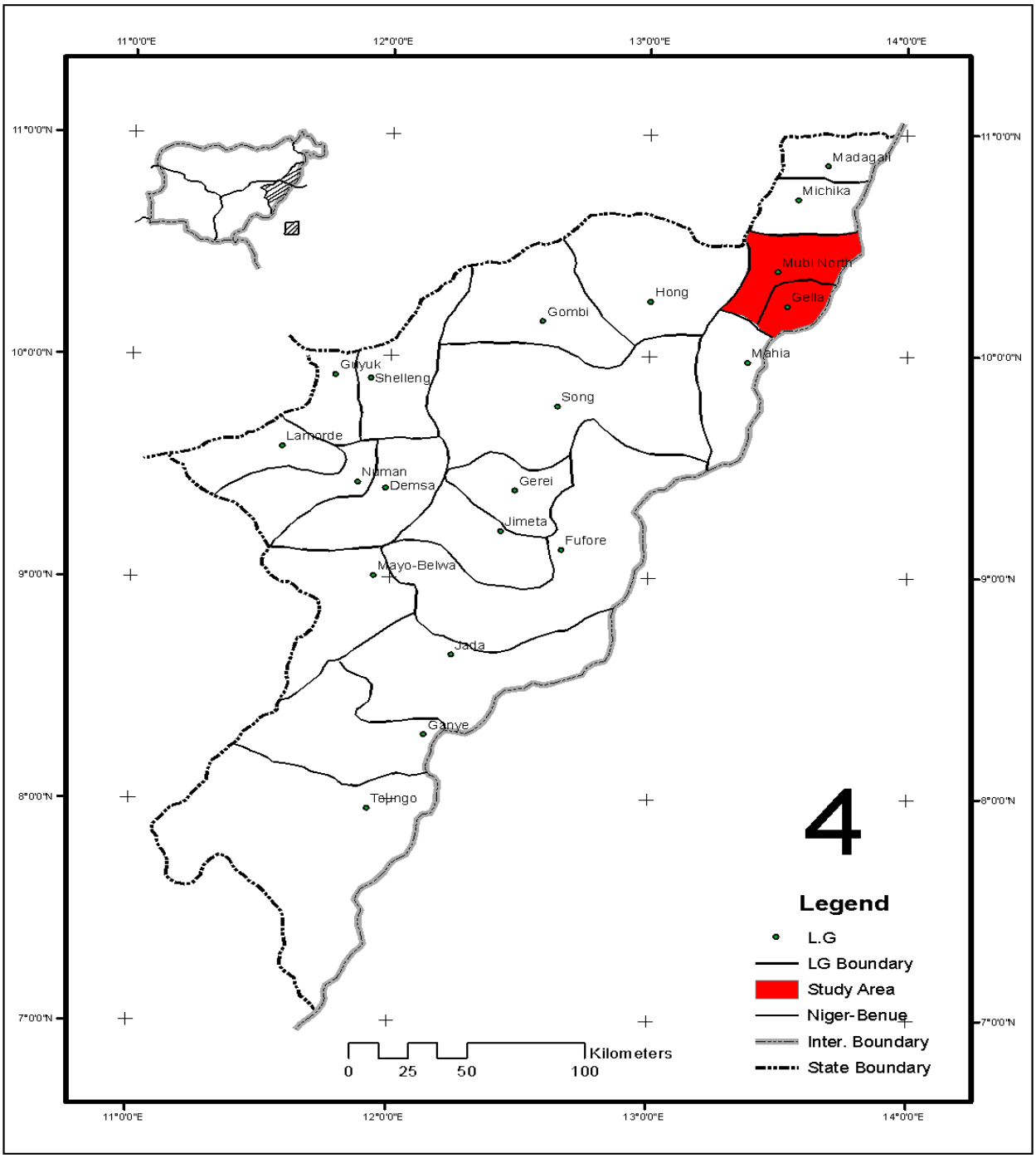

Figure 1: Map of Adamawa State, showing a portion of Mubi North local Government (Adebayo 1996)

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3.2. Sources of Data

The data for the study were collected from both primary and secondary sources. The primary data was obtained through the use of well-structured questionnaire while the secondary data was generated from reviewed journals, books and another reputable article.

Based on the study, the population targeted were the cowpea marketers in the study area (Mubi North, LGA) of Adamawa State. Mubi North comprises of five (5) districts (Mubi-Town, Bahuli, Mayo-B.ani, Vimtim and Muchalla) the districts are further divided into eleven (11) political wards namely; Mijilu, Lokuwa, Mayo-Bani, Kolere, Digil, Yelwa, Vimtim, Muchalla, Bahulli, Sabon-layi and Betso. The multi-stage random sampling techniques was used in selecting the respondents. Out of the population, four wards were chosen from the districts that were noted for cowpea marketing from which five (5) marketers were selected from each ward.

3.3. Sampling Procedure

- **Stage I:** Mubi North consist of five geopolitical districts; (Mubi Town, Bahuli, Maya-Bani Vimtim and Muchalla), among which two districts were selected and focused on for the purpose of the research which includes (mubi district and vimtim district).
- **Stage II:** From the two districts selected for the research, we purposively selected four political wards that are known for cowpea marketing; three wards were selected from Mubi district which includes; sabon kasuwa market in Yelwa ward, main market in Sabon layi ward, and kolere market in Kolere ward, and one ward from Vimtim district which is vimtim central market.
- **Stage III:** At the fourth stage, thirty (30) questionnaires were administered to thirty (30) respondents from each ward using an equal allocation of stratified sampling making a total number of 120 respondents.

3.4. Sampling Technique

The sampling technique for this research was purposive and stratified.

3.5. Pretesting of Questionnaires

The researcher used 10 questionnaires for pretesting to ensure its reliability and validity.

3.6. Questionnaires Administration and Data Collection

The primary data for this research was collected from the cowpea marketers using detailed and well-structured questionnaires. The questionnaires were administered to the respondents and personal interview was conducted.

3.7. Analytical Tools for the Study

The analytical tools used for this research work includes.

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1) Data Envelopment Analysis (DEA).

- **Constant Return to Scale (CCR Model).**

$$Max\ Eff_0 = \frac{\sum_{j=1}^{s} u_j y_{jo}}{\sum_{i=1}^{r} v_i x_{io}}$$

Subject to

$$\frac{\sum_{j=1}^{s} u_j y_{jk}}{\sum_{i=1}^{r} v_i x_{ik}} \leq 1, k = 1, \ldots, n$$

$$u_j e\ v_i \geq 0\ \forall\ j,i$$

Where:
u = the weight of the outputs and inputs.
y = the outputs. (Dependent variable) that is the market efficiency.
v = weights of outputs and inputs.
x = inputs. (Independent variables) that is the socioeconomic variables.
k = coefficient of the inputs.

- **Variable Return to Scale (BCC Model).**

$$Max\ Eff_0 = \frac{\sum_{j=1}^{s} u_j y_{jo}}{\sum_{i=1}^{r} v_i x_{io}} - u^*$$

Subject to

$$\frac{\sum_{j=1}^{s} u_j y_{jk}}{\sum_{i=1}^{r} v_i x_{ik}} - u^* \leq 1, k = 1, \ldots, n$$
$$u_j e\ v_i \geq 0\ \forall\ j,i$$

Where:
U*= the scale factor.
y = outputs. (Dependent variables).
v = weights of the outputs and inputs.
x = inputs. (Independent variables) that is the socioeconomic variables.
k = coefficient of the inputs.

4. Results and Discussion

4.1. Introduction

In this chapter, the study attempts to analyze the technical efficiency of cowpea marketing in Mubi North, Adamawa state, Nigeria.

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The data for this study were collected, analyzed, interpreted and presented based on the research questions which guided the study. The socio-economic characteristics of the respondents, the result of the data analysis, the efficiency of the marketers/respondents, factors influencing marketing as well as the challenges experienced by the respondents in cowpea marketing in the study area is presented, interpreted and discussed in this chapter.

4.2. Data Presentation

The presentation of data was based on the response of the questionnaires issued. Of the total of one hundred and twenty (120) questionnaires administered to the respondents, only seventy-four (74) questionnaires were responded to indicating a reasonable response rate of 74% which is acceptable for analysis.

4.3. Socioeconomic Characteristics of the Respondents

The socio-economic characteristics of the marketers have the ability to influence the efficiency of their market. The relevant socio-economic characteristics considered in this study include respondent's gender, age, marital status, education or literacy level, family size, income level and years of experience in cowpea marketing,

Table 4.3.1: Socio-Economic Characteristics of the Respondents

GENDER	**FREQUENCY**	**PERCENTAGE (%)**
Male	58	78
Female	16	22
AGE	**FREQUENCY**	**PERCENTAGE (%)**
18-30	24	32.4
31-40	30	41.3
41-50	12	16.2
51-60	7	9.1
>60	1	1.4
MARITAL STATUS:	**FREQUENCY**	**PERCENTAGE (%)**
Single	22	30
Married	48	65
Others	4	5
HOUSEHOLD	**FREQUENCY**	**PERCENTAGE (%)**
2-6	35	47
7-11	27	36
12-16	5	7
>16	1	10
EDUCATION	**FREQUENCY**	**PERCENTAGE (%)**
Formal Education	51	69
Non-formal Education	23	31
LEVEL OF EDUCATION	**FREQUENCY**	**PERCENTAGE (%)**
Primary	8	10.8
Secondary	38	51.4
Tertiary	5	6.8

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INCOME LEVEL	FREQUENCY	PERCENTAGE (%)
500-5000	16	22
6000-15000	24	32
16000-30000	17	23
>30000	17	23
MARKETING EXPERIENCE	**FREQUENCY**	**PERCENTAGE (%)**
2-6	31	43
7-11	25	34
12-17	8	11
>17	10	12
COOPERATIVE SOCIETY	**FREQUENCY**	**PERCENTAGE (%)**
YES	52	70
NO	22	30

Source: field survey, 2019.

The result based on the gender of the marketers has shown that 78% of the marketers are male while 22% of the marketers are females, indicating that men are more involved in cowpea marketing in the study area than their female counterparts as shown in Table 4.1 above. It is shown that male practices cowpea marketing in the study area more than female according to the data percentage presented above in the study area. The crowding or dominance of the male in the cowpea marketing may be due to the fact that it involves more physicality, and the low percentage of women participating in the cowpea marketing may also be explained by socio-cultural factors affecting women, stress and the fatigue involved and not as a result of technical and managerial inefficiency. This conforms to the assertion by Phillis and Umebali (2008) that agricultural policies do not explicitly recognized the role of female marketers in the society. Consequently, development assistance is usually directed to male farmers/marketers, regarding women's work as simply "what women do" hence their contribution have remained invisible. It could also be as a result of religious restrictions on women in the study area as most Muslim women are not allowed to go out and mingle with other people especially other men.

The age distribution of the marketers revealed that 32.4% fall within the age of 18-30 years, 41.3% fall within the age of 31-40 years, 16.2% fall within the age of 41-50 years, 9.1% fall within the age of 51-60 while only 1.4% are 60 years old and above, indicating that majority of the marketers are young, energetic and fall within the economically active age.

The reason for the high percentage of marketers within the range of 31- 40 years might be due to the fact that, within that age bracket, people are still in their youthful active ages and are capable of undergoing the vigorous task involved in marketing.

The results on marital status of the respondents showed that 30% are single, 65% are married, while 5% are either divorced, widowed etc. The supply of manpower or labor is expected to be more among the married folks than the unmarried ones.

The data obtained on the household size of the marketers revealed that majority of the marketers' household size falls within 2-11 members. In rural communities, large family size guarantees cheap and high supply of family labor thereby reducing the cost of manpower. This implies that

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large family size is an indication that some of them may depend on their family for labor. Greater family size may increase efficiency because most marketers are financially constrained and thus, the availability of family labor will ease hiring of labor (Bayacay and Rola, 2001). Majority of respondents about 47% from the above table attested to having 2-6 members in their households as such is common within the locality under study, this number is followed by 36% of the respondents who stated that they had within 7-11 members in their households. Only 7% respondents indicated that they had 12-16 people in their households and 1% responded to above 16 members.

The result revealed that only 31% of the cowpea marketers had no formal education while 69% of them had one form of formal education or the other. 10.8% had primary education, 51.4% of the respondents had secondary education and 6.8% had Tertiary education.

This is an indication that majority of the marketers are literate to some extend and could be receptive to new and improved innovation and marketing policies and strategies that could lead to increase in output compared to those without formal education. Njoku (1991) observed that years of formal education has a positive influence on adjustment and adoption of innovation by marketers and farmers.

Results on the marketing experience of the respondents showed that 43% have only 2-6 years of experience, 34% have 7-11 years of experience, 11% have 12-17 years of experience and 12% have above 17 years of experience. Marketing experiences have direct and positively influence on the management capabilities of the marketers. As reported by Adeyumi and Okunmadewa (2001), the economic efficiency of marketers and farmers is significantly affected by their experience. Results on the income level of the respondents showed that more than half (54%) of the marketers earned an income of 15,000 and below while (46%) earned above 15,000. And that about 70% of them belongs to a cooperative while 30% do not.

4.4. Determinants of Technical Efficiency.

Table 4.4.1: Determinants of technical efficiency of Yelwa Ward marketers.

	Coefficient.	**Standard Error.**	**P-Value**	**T-ratio**
Gender	.3566443	-2.80	-1.757	0.014
Age	.1257344	4.14	-.250	0.001
Marital status	.3067921	2.74	-.4255	0.002
Household	.1645001	1.45	-.111	0.042
Education	.366744	-0.51	-.967	0.620
_cons	.7284204	0.19	-1.414	0.852
/sigma	.1062879	.2452782		

The socio-economic variables used in determining the factors affecting marketing efficiency are; gender, age, marital status, household size and education. From the above analysis, all the variables contained positive coefficient and are both significant at one percent. The coefficient of gender is 0.3566443 and that of age is 0.13, this implies that a unit increase in age increases the technical efficiency by 0.1257. And the coefficient is laying between the upper and the lower confident interval. While the coefficient of marital status is 0.3067921 and that of household size is

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0.1645001. While education from my result of analysis contained coefficient of 0.366744 respectively and so are all significant, having positive coefficient on technical efficiency in Yelwa ward of mubi north.

Table 4.4.2: Determinants of Technical efficiency of Vimtim Ward Market

	Coefficient.	Standard. Error.	P-value	T-ratio
Gender	.2239383	-1.82	-.874	0.083
Age	.2213828	-3.30	-.526	0.008
Marital status	.2203496	0.90	-.260	0.380
Household	.1990688	2.68	-.277	0.001
Education	.1836764	0.92	-.212	0.365
_cons	.4223469	2.46	-.683	0.009
Sigma	.0601846	.296		

In Vimtim ward the same socio-economic characteristics were used to determine the marketing efficiency which includes; gender, age, marital status, house hold size and education. Here gender and age contained coefficient of .2239383 and .2213828 respectively and so are significant in determining technical efficiency of cowpea marketing in the area. While the other variables like education, marital status and household all contained positive coefficient of .1836764, .2203496 and .1990688 respectively and are all highly significant in determining marketing efficiency in the area.

Table 4.4.3: Determinant of technical efficiency of Sabon Layi Ward Market

	Coefficient	Standard Error.	P-Value	T-ratio
Gender	.5337344	1.23	-.519	0.245
Age	.461977	-4.14	-1.08	0.003
Marital status	.5277631	-2.26	-1.29	0.009
Household	.261789	1.09	-.290	0.298
Education	.3802596	2.36	-.320	0.022
_cons	.7188761	-3.88	-2.21	0.007

Here in Sabon layi ward the same socio-economic variables used in the other wards were used to determine the factors affecting marketing technical efficiency. These variables include; gender, age, marital status, household and education. From the result of data analysis obtained at sabon layi ward revealed that age and marital status contained coefficient of .461977 and .5277631 respectively therefore they are significant in determining the marketing technical efficiency. While gender, household and education all contained positive coefficient and are all significant at one percent.

Table 4.4.4: Determinant of Technical Efficiency of Kolere Ward Market

	Coefficient	Standard. Error.	P-value	T-ratio
Gender	.	.	.	.
Age	.1409092	-2.64	-.681	0.023
Marital status	.3490893	3.05	.295	0.011

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Household	.2405591	-0.77	-.714	0.458
Education	.2752087	-2.75	-1.88	0.007
_cons	.5809327	2.68	-.884	0.012
sigma	.0926781	.140		

In Kolere ward the same socio-economic variables used in the other wards were applied to determine the factors affecting marketing technical efficiency. These variables include; gender, age, marital status, household and education. From the result of the data analysis obtained at Kolere ward revealed that age and marital status contained coefficient of 0.141 and .3.5 respectively therefore they are significant in determining the marketing technical efficiency. While gender, household and education all contained positive coefficient and are all significant at one percent.

4.5. Technical Efficiency of Market Under Constant Returns to Scale (CRS)

Table 4.5.1: Technical efficiency of Yelwa ward market under Constant Returns to scale (CRS)

Range	**Frequency**	**Percent (%)**
<20	0	0
21-30	0	0
31-40	0	0
41-50	8	40
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	12	60
Summary		
Mean	0.602	
SD	0.487	
Max	1	
Min	0.005	

Field survey (2019)

Table 4.5 Revealed the range, frequency and percentage of technical efficiency scores of Yelwa ward market under constant return of scale (CRS). About 40% of the markets have efficiency score range between 0.41 and 0.51 while 60% are having scores more than 0.90. The mean technical efficiency was found to be 0.60 and this translates that about 40% of the respondents were technically inefficient.

Standard deviation was found to be 0.49 while maximum and minimum were 1 and 0.005 respectively.

Table 4.5.2: Technical efficiency of Vimtim market ward under Constant Returns to scale (CRS)

Range	**Frequency**	**Percent (%)**
<20	0	0

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21-30	0	0
31-40	1	3.9
41-50	6	23.1
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	19	73
Summary		
Mean	0.732	
SD	0.45	
Max	1	
Min	0.004	

Field survey (2019)

Table 4.5.1 revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under constant return of scale (CRS). About 30% of the markets have efficiency score range between 0.41 and 0.51 while more than 70% are having scores more than 0.90. The mean technical efficiency was found to be 0.732 and this translates that about 27% of the respondents were technically inefficient.

Standard deviation was found to be 0.45 while maximum and minimum were 1 and 0.004 respectively.

Table 4.5.3: Technical efficiency of Sabon Layi Ward Market uder Constant Returns to scale (CRS)

Range	**Frequency**	**Percent (%)**
<20	0	0
21-30	0	0
31-40	0	0
41-50	6	37.5
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	10	62.5
Summary		
Mean	0.627	
SD	0.498	
Max	1	
Min	0.005	

Field survey (2019)

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Table 4.5.2 revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under constant return of scale (CRS). About 37.5% of the markets have efficiency score range between 0.41 and 0.51 while more than 62.5% are having scores more than 0.90. The mean technical efficiency was found to be 0.627 and this translates that about 37.5% of the respondents were technically inefficient.

Standard deviation was found to be 0.5 while maximum and minimum were 1 and 0.005 respectively.

Table 4.5.4 Technical efficiency of Kolere ward marketers under constant return to scale (CRS)

Range	Frequency	Percent (%)
<20	0	0
21-30	0	0
31-40	0	0
41-50	7	46.7
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	8	53.3
Summary		
Mean	0.536	
SD	0.514	
Max	1	
Min	0.005	

Field survey (2019)

Table 4.5.3 revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under constant return of scale (CRS). About 46.7% of the markets have efficiency score range between 0.41 and 0.51 while a little more than 53.3% are having scores more than 0.90. The mean technical efficiency was found to be 0.536 and this translates that about 46.7% of the respondents were technically inefficient.

Standard deviation was found to be 0.514 while maximum and minimum were 1 and 0.005 respectively.

4.6. Technical Efficiency Under Variable Returns to Scale (VRS)

Table 4.6 1: Technical efficiency of Yelwa under Variable Returns to scale (VRS)

Range	Frequency	Percent (%)
<20	0	0
21-30	0	0
31-40	0	0

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41-50	0	0
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	20	100
Summary		
Mean	1	
SD	0	
Max	1	
Min	1	

Field survey (2019)

Table 4.6 Revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under variable return of scale (VRS). Exactly 100% are having scores more than 0.90. The mean technical efficiency was found to be 1.0 and this translates that about 0% of the respondents were technically inefficient.

Standard deviation was found to be 0 while maximum and minimum were 1 and 1 respectively.

Table 4.6.2: Technical Efficiency in Vimtim marketers under Variable Returns to scale (VRS)

Range	**Frequency**	**Percent (%)**
<20	0	0
21-30	0	0
31-40	0	0
41-50	0	0
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	26	100
Summary		
Mean	1	
SD	0	
Max	1	
Min	1	

Field survey (2019)

Table 4.6.2 revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under variable return of scale (VRS). Exactly 100% are having scores more than 0.90. The mean technical efficiency was found to be 1 and this translates that about 0% of the respondents were technically inefficient.

Standard deviation was found to be 0 while maximum and minimum were 1 and 1 respectively.

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Table 4.6.3: Technical efficiency of Sabon Layi marketers under Variable Returns to scale (VRS)

Range	**Frequency**	**Percent (%)**
<20	0	0
21-30	0	0
31-40	0	0
41-50	0	0
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	16	100
Summary		
Mean	1	
SD	0	
Max	1	
Min	1	

Field survey (2019)

Table 4.6.3 revealed the range, frequency and percentage of technical efficiency scores of yelwa and market under variable return of scale (VRS). Exactly 100% are having scores more than 0.90. The mean technical efficiency was found to be 1 and this translates that about 0% of the respondents were technically inefficient.

Standard deviation was found to be 0 while maximum and minimum were 1 and 1 respectively.

Table 4.6.4: Technical efficiency of Kolere marketers under Variable Returns to scale (VRS)

Range	**Frequency**	**Percent (%)**
<20	0	0
21-30	0	0
31-40	0	0
41-50	0	0
51-60	0	0
61-70	0	0
71-80	0	0
81-90	0	0
91-100	15	100
Summary		
Mean	1	
SD	0	
Max	1	
Min	1	

Field survey (2019)

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Table 4.6.4 revealed the range, frequency and percentage of technical efficiency scores of yelwa ward market under variable return of scale (VRS). Exactly 100% are having scores more than 0.90. The mean technical efficiency was found to be 1 and this translates that about 0% of the respondents were technically inefficient.

Standard deviation was found to be 0 while maximum and minimum were 1 and 1 respectively.

Table 4.7: Constraints Militating Against Cowpea Marketing

S/N	Constraints	Frequency	Percentage (%)	Ranking
1	Lack of capital	73	14.2	3rd
2	Lack of technology	69	13.4	4th
3	High cost of operation	49	9.5	6th
4	High cost transportation	56	10.9	5th
5	Inadequate manpower	21	4.1	9th
6	Lack of Infrastructure	74	14.4	2nd
7	Incidence of pest and disease	77	15.1	1st
8	Lack of proper education on the enterprise	48	9.3	7th
9	Lack of management skills	47	9.1	8th
	TOTAL	514	100	

From the results obtained, it was revealed that the challenges experienced by cowpea marketers include; incidence of pest and diseases, lack of infrastructure, lack of capital, lack of technology, high cost of transportation, lack of proper education on the enterprise, lack of management skills and inadequate manpower. The combine effect of these problems on the marketing system could bring about a distortion in the structure, conduct and performance of the marketing process. Hence, this could lead to the reduction in profit margin of the marketers and consequently, discourage the present and prospective marketers of the commodity in participating in the enterprise in the study area.

About 15.1% of the respondents attested that incidence of pest and disease militate against the success of their business, 14.4% agree to lack of infrastructure as a big challenge to their business, 14.2% mention lack of capital as a constraint, 13.4% respondents were of the opinion that lack of technology is a challenge, while 10.9% responded that high cost of transportation brings setback, and 9.5% responded to high cost of operation, 9.3% to lack of proper education on the enterprise, 9.1% lack of management skills, with only 4.1% respondents mentioning inadequate manpower as a constraint because most of them utilized family labor.

5. Summary, Conclusion and Recommendation

5.1. Summary of Finding

The result based on the gender of the marketers has shown that 78% of the marketers are male while 22% of the marketers are female, indicating that men are more involved in cowpea marketing in the study area than their female counterparts. The result based on age distribution of the marketers revealed that 32.4% fall within the age of 18-30 years, 41.3% fall within the age of 31-

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40 years, 16.2% fall within the age of 41-50 years, 9.1% fall within the age of 51-60 while 1.4% are 60 years old and above, indicating that majority of the marketers are young, energetic and economically active age. The results on marital status of the respondents showed that 30% are single, 5% are either divorced, widowed or separated, while 65% are married this may not be unconnected with their higher demand for family upkeep. The supply of labor is expected to be more among the married marketers than the unmarried ones. The data obtained on the household size of the respondents revealed that majority (83%) of the marketers' household size falls within 2-11 members. In rural communities, large family size guarantees cheap and high supply of family labor.

From my findings on the level of education of the marketers showed that majority about (69%) of them received low level formal education and majority with 2 to 17-years' experience on cowpea marketing they are formally educated in one form or the other while (31%) are informally educated. This indicates that, the respondents are educated and are likely to be receptive to new and improved innovation that could lead to increase in output compared to those without formal education. Results on the income level of the respondents showed that more than half (54%) of the marketers earned an income of 15,000 and below while (46%) earned above 15,000. Results on the marketing experience of the respondents showed that 43% have only 2-6 years of experience, 34% have 7-11 years of experience, 11% have 12-17 years of experience and 12% have above 17 years of experience. The results show that about 70% of the marketers belong to a cooperative while 30% do not.

From the results obtained, it was revealed that the challenges experienced by cowpea marketers include; incidence of pest and diseases, lack of infrastructure, lack of capital, lack of technology, high cost of transportation, lack of proper education on the enterprise, lack of management skills and inadequate manpower. The combine effect of these problems on the marketing system could bring about a distortion in the structure, conduct and performance of the marketing process. Hence, this could lead to the reduction in profit margin of the marketers and consequently, discourage the present and prospective marketers of the commodity in participating in the enterprise in the study area.

5.2. Conclusion

It is concluded that socio economic variables affects the efficiency cowpea marketing and that the Prices of cowpea in different markets are not equal due to the change in the supply of cowpea, thus, cowpea markets are not fully integrated and there is no leading market whose price changes influence all other market. Cowpea marketing is poised with so many problems. These problems range from the farmer, middlemen, and the marketer themselves, which include lack of capital, inadequate access road, and attitude of middlemen, lack of storage facilities, pests infestation fluctuation of price, lack of market infrastructure and information, were the serious problems affecting cowpea marketing.

5.3. Recommendation

Based on the findings of the study, the following recommendations were made:

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- Effort should be made by governments, trade unions and other organization to reduce excessive externality costs associated with the marketing of Beans in the state.
- Government should embark on price control system to reduce problem of price variation.
- Government and NGOS should improve roads and road networks to market areas to facilitate trading of the produce so as to ease transportation problems.
- Government should make provision of market infrastructures and storage facilities to ensure availability of high-quality products in the market.
- Government and private institution should make credit facilities available to the marketers through rural and urban banking system at low interest rates.
- The marketers should be encouraged to form and operate through adaptive cooperative associations specifically for cowpea marketing which will help them in accessing better markets, better credit and capacity building.
- However, there is so much room for improvement, interrelation, and networking among the three parties involved that is the producers, distributors, and marketers in other to minimize these problem so as to improve cowpea of marketing.

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