ANALYSIS OF COWPEA MARKETING IN BIU LOCAL GOVERNMENT AREA, BORNO STATE, NIGERIA

BY

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CERTIFICATION

We certify that this dissertation entitled **''Analysis of Cowpea Marketing in Biu Local Government Area, Borno State, Nigeria"** has been presented by Maryam Baba Kyari (PGA/10/06033) of the Department of Agricultural Economics, Faculty of Agriculture, University of Maiduguri.

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Signature…………………………….

Dean, School of Postgraduate Studies

Date……………………………….

DEDICATION

This work is dedicated to my dear beloved parents late Alhaji Baba Kyari and Hajiya Falmata Ali.

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ABSTRACT

This study analysed cowpea marketing in Biu Local Government Area, Borno State. Five cowpea markets were selected for the study, namely Biu, Miringha, Mandragrau, Mandafuma and Buratai. Twenty respondents were randomly selected from each of the 5 markets giving a total of 100 respondents. Primary data and secondary information were used for the study and the data were analysed using descriptive statistics, Gini Coefficient, marketing margin and cointegration test. The findings of the study indicated that majority (62%) of the respondents were males, in the active age group of 31-50 years. The educational level of the respondents showed that 85% had various form of education and 96% were married. The Gini Coefficient for cowpea market participants showed an unequal distribution in the income generated with Gini Coefficient of 0.4322. The cowpea marketing margins were 27.3%, 30.8% and 28.4% for retailers, wholesalers and wholesaler/ retailers respectively. Johansen co-integration and vector error correction model (VECM) result revealed that in the long run, the markets were cointegrated and the rate at which VECM restored deviation from equilibrium was moderate. The result showed that the coefficient of Mandragirau (-0.527807), Mandufuma (- 0.222926), Miringa ((-0.132527) and Buratai (-0.277589) were statistically significant at 5%. The study showed that spatial price linkages exist within cowpea markets and product moved efficiently across markets which are related to efficiency of price information flow. The study recommended that government and non governmental agencies should empower the marketers through the provision of micro credit facilities to encourage more people to go into cowpea marketing.

CHAPTER ONE

INTRODUCTION

1.1   Background to the Study

Cowpea (*Vigna unguiculata*) is one of the most ancient crops known to man. It is a broadly adapted highly valued crop, cultivated around the world primarily for grain but also as a vegetable (for leafy green, green pods, fresh shelled green peas and shelled dried peas), a cover crop and for fodder (Ayodeji *et al*., 2014). Economically, cowpea has a great value in internal trade in Nigeria because it promotes trade between the producing area and the non-producing area. It also serves as a source of income to middlemen who embark on its transportation from one place to another (Girei *et al*., 2013).

In year 2012, Nigeria was the largest producer and consumer of cowpea in the world with estimated production and consumption index of over two million metric tons and 2.27 million metric tons respectively (Food and Agriculture Organisation (FAO), 2015). Being the major producer in the world, the crop is widely grown in many parts of the savannah region of the country; including Borno State where Biu Local Government Area is one of the predominant areas of production. Domestic production of cowpea in the study area is in the hands of small scale farmers, who obtain low yields due to subsistence level of production usually characterized by lack of improved technologies, inputs and agronomic practices (Amaza, 2016).

In line with the challenges in cowpea production, the Canadian International Development Agency (CIDA) funded a project titled Promoting Sustainable Agriculture in Borno State (PROSAB), which was implemented in the southern part of Borno State in 2004 and Bill and Melinda Gates Foundation (BMGF) funded a project titled N2Africa which was also implemented for putting nitrogen fixation to work for smallholder farmers in Africa. The project was aimed at improving food security, reducing environmental degradation and improving sustainable agriculture through the transfer of improved agricultural technologies and management practices to farmers. Improved varieties of crops like cowpea, maize, rice, sorghum, and soybeans were introduced in the study area. These improved varieties were introduced along with their associated management practices which include seed rate, planting distance, weeding, fertilizer application (Amaza, 2016). For cowpea crop yield

before and after adoption of improved varieties and agronomic practices by farmers in PROSAB and Non PROSAB project areas were 877kg/ha and 704kg/ha respectively (Amaza *et al*., 2015). The impressive improvement in yield of cowpea had caused farmers to have surplus output for the market.

Cowpea marketing, like any other business, involves sustainable performance of all business activities which involve the flow of cowpea from the point of initial agricultural production until it is in the hands of the ultimate consumer (Nchouji, 2006). Marketing of cowpea is a profitable business engaged by most of agriculture produce merchants because of the high economic value of the crop. There is usually a high economic return on the marketing of cowpea because of its value in the diet of most consumers (Debaniyu *et al.,* 2011). However, the challenge that marketers face is to satisfy consumers' wants at a reasonable profit level and in a socially acceptable manner (Kotler, 1990). The emerging picture of cowpea marketing in West Africa is one of well established hierarchical trade link, especially between Nigeria and its neighbors (Lowenberge and Coulibaly, 2000).

The need for the market system to be well structured and efficiently organized cannot be over emphasized. It enhances the pace of economic development by encouraging specialization, generation of foreign exchange earnings, development of an exchange economy, provision of income and employment opportunities for marketing agents (Olukosi *et al*., 2005). Essentially, an efficient marketing system is one where there is a perfect market integration and full price transmission, with instantaneous price adjustment to changes from within or outside the system (Nkang *et al*., 2007). Such a system would enable producers, middlemen and consumers in the marketing chain to derive maximum gains. It would also help in elimination of unprofitable arbitrage and isolation of spatially differentiated markets and would ensure that efficient allocation of resources across space and time is achieved (Nkang *et al*., 2007).

Market integration refers to co-movement of prices and or flows between markets. More generally, it explains the relationships between two markets that are spatially separated. A well integrated market system is not only necessary for the efficient allocation of productive resources but also for a reduction in price risks that are likely to impair the wellbeing of economic actors most especially the poor and food insecure households (Ddungu *et al*., 2014). This is because the success of market reforms depends to a large extent on the strength of price signals transmitted between different market levels (Moghaddasi, 2009).

In marketing system studies, the structure and performance is one of the most important approaches to the analysis of markets. Efficiency in marketing encourages the participation of a large number of individuals at various types of markets and exchange points where the marketing services of assembling, storage, processing, transportation and break-of-bulk are performed. The effects of an efficient market can go a long way in influencing positively the supply response of agricultural products. This is therefore carried to assess the marketing of cowpea in Biu Local Government Area of Borno State, a major cowpea area in the state.

1.2   Statement of the Problem

The introduction and promotion of improved agricultural technologies, management practices and capacity building of farmers in the use of technologies to improve yields, incomes and nutrition are major components of international development efforts focused on Africa. For instance, PROSAB and N2Africa are among such efforts engaged in the study area to enable smallholder cowpea farmer's benefit from improved yields and higher incomes. The impressive improvement in yield and income from cowpea in Biu Local Government Area could cause farmers to have surplus output for the market and the increase in yield would translate to increase in income when the surplus is marketed. Despite the impressive increase in cowpea production and marketing, there are no enough empirical studies known to the researcher on cowpea marketing system that used cointegration and error correction modeling techniques in Biu Local Government Area. Several techniques have been used to test the degree of integration in spatially separated markets. Earlier works on market integration used correlation analysis to determine prices movements in spatially separated markets but have been limited by population growth and climatic patterns (Wyeth, 1992). Regression- based procedures have also been used to test for spatial price integration (Alexander and Wyeth, 1994). However, the use of regression- based tests has several shortcomings. The models are intrinsically static in nature because adjustment lags are not explicitly recognized and contemporaneous arbitrage conditions are assumed to hold. Also, non-stationarity of price data may invalidate standard econometric tests, thus giving misleading results regarding the degree to which price signals are transmitted from one market to another. The limitations related to the neglect of transaction costs and price variation within the transaction cost band also apply to regression tests. The remedy for problematic regressions with integrated variables is to test for co-integration and to estimate a vector error correction model to

distinguish between short run and long run responses, since co-integration provides more powerful tools. This research was therefore carried out to answer the following questions:

i. What are the socio-economic characteristics of cowpea marketers in the study area?

ii. What is the structure of cowpea marketing?

iii. What is the performance of the marketing?

iv. Are the cowpea market spatially integrated?

v. What are the problems associated with cowpea marketing in the study area?

1.3 Objectives of the Study

The main objective of the study was to analyze marketing of cowpea in Biu Local Government Area of Borno State. The specific objectives of the study were to:

i. describe the socio-economic characteristics of cowpea marketers;

ii. determine the structure of cowpea marketing;

iii. analyse the performance of the marketing;

iv. determine the spatial integration of cowpea markets and

v. identify problems associated with marketing of cowpea in the study area.

1.4 Significance of the Study

The results of this study are expected to throw more light on the market structure, performance and other marketable qualities of the crop. The findings of the study is not only expected to depict the market performance and other marketable potential of cowpea, but also expected to serve as a guide for policy makers to effectively plan for the growth and development of the industry through formulating effective market policies.

The finding could be of importance to students and researchers because it is expected to add knowledge to the existing body of knowledge for students and researchers interested in cowpea marketing research. Extension agents could also find the results useful in designing relevant extension packages for marketers on cowpea marketing.

The findings could also be useful to cowpea producers and marketing agents to make informed decisions. The work could also serve as a reference document for researchers to embark on studies of the same or related kinds in other parts of the country.

1.5 Scope and Limitation of the Study

This study was concerned with the analysis of cowpea marketing in Biu Local Government Area, Borno State, Nigeria. The study covered five markets known for cowpea marketing in the area. Biu market is the consuming market, whereas Mandafuma, Mandragrau, Miringha and Buratai were the supply markets. Weekly price series of cowpea from January to December 2015 obtained from BOSADP were used for market integration analysis. Due to the insurgency in the study area, vehicular movements to and from some of the markets were interrupted, thereby delaying access to these markets. This notwithstanding, research assistants and enumerators had to trek to these markets to ensure complete coverage of the selected markets.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Law of One Price

The relationship between prices has a long history in economics and has been used to define a market as early as the 19th century. Cassel (1918) seems to be the earliest reference in relation to international trade introducing the notion of purchasing power parity and the law of one price (LOOP). Stigler (1969) defines a market as "the area within which the price of a commodity tends to uniformity, allowance being made for transportation costs". Based on this definition, there exists a large empirical literature investigating market integration by analyzing price relationships (Ardeni, 1989).

The LOOP states that for a given commodity, a representative price, adjusted by exchange rates and allowance for transportation costs, will prevail across all countries. Therefore, the LOOP suggests that similar commodity markets across all countries should be integrated as a single market, which is warranted by efficient international commodity arbitrage. Geographically separated markets are spatially integrated if goods and information flow freely among them and, as a result, the effects of price changes in one market are transmitted to another market's price. Theoretically, under the assumption of perfect competition, when two regions trade, the product price in the import region equals the price in the export region plus transportation cost. Therefore, the price change in the export region induces a price change in the import region in the same direction and of the same degree. If this is the case, the two markets are completely integrated as a single market. The extent and the speed to which shocks are passed through, and the strength of the interdependence among prices are indicators of the degree of integration and global efficiency of markets' performance. As pointed out by Ravallion (1986), measurement of market integration can be viewed as basic data for understanding how specific markets work. The extent to which commodity markets are integrated also has important implications for governments' regulation and general economic policy (Baffes, 1991).

The issue of price convergence in commodity markets both at national and international level has been studied in the literature rather extensively either under the notion

of the LOOP (Ardeni 1989, Baffes 1991) or under the notion of market integration (Ravallion 1986). Recognizing the nonstationarity property of commodity prices, researchers have extensively employed co-integration and error correction models (ECM) (Engle and Granger, 1987) to test the LOOP and market integration on international commodity markets. This is particularly useful because the LOOP and market integration are tested as a long-run relationship that is not affected by short-run deviations. Earlier studies already found that the LOOP almost never holds in the short-run. These include Ardeni (1989), Hazel *et al*. (1990), Mundlak and Larson (1992), Baffes (1991), Goodwin (1992), Zanias (1993), Barrett (1996), Fackler (1996), Mafimisebi (2012) and Ifejirika *et al*. (2013). Most of these authors found some evidence for the validity of the LOOP and international / regional market integration.

2.1.2 Market Structure

As a branch of applied price theory, the basic paradigm of Industrial organization (IO) which was popularized by Bain in late 1950s, holds that market structure influences the competitive conduct of firms in the market, which in turn influences market performance. Therefore, structure, conduct and performance (SCP) is the basic framework of analysis in the theory of Industrial organization.

Economists recognize that by their very nature, markets are systemic and all elements within them are interlinked. Therefore, analyses often emphasize the behavior of groups of similar firms, and the influence that the relationships among these firms has on market performance. This approach came to be known as the 'industrial organization' or 'structure conduct-performance' approach to market analysis.

The basic tenet of this approach is that, given certain basic conditions, the structure of an industry or market determines the conduct of its participants (buyers and sellers) which, in turn, influences its performance. Basic conditions refer to characteristics which are exogenous to the market, for example infrastructure, legal and policy environment and available technology. Efficiency factors can be evaluated by examining marketing enterprises for structure, conduct and performance (Abbott and Makehem, 1979).

As the name suggests, the SCP paradigm comprises of three elements: market structure, market conduct and market performance. The market structure refers to the way the market is organized in terms of the concentration or market share of firms. A high market concentration implies low competition and vice versa (Lee, 2007). According to Margetts

(2006), there are three market structure models used for categorizing the structure of a market based on the degree of market control by the dominant market player(s). On the supply side, these are monopoly, monopolistic competition and oligopoly. On the demand side such models include monopsony, monopsonistic competition and oligopsony.

In empirical work, the variables used to determine structure include seller concentration, degree of product differentiation and barriers to entry (Smit and Trigeorgis, 2004). Lee (2007) further classifies these variables into two main groups namely, intrinsic and derived structural variables. Intrinsic structural variables are those which are determined by the nature of products and availability of production and marketing technologies. Derived structural variables, on the other hand, are those that are determined by firms and governments such as barriers of entry, seller and buyer concentration and product differentiation.

According to Tiku *et al*. (2012), market structure is mostly measured by the Gini coefficient and Lorenz curve. The Gini coefficient expresses the extent to which the market is concentrated. It ranges from zero to one, with zero indicating perfect equality in the size and distribution of buyers or sellers, and one implying perfect monopsony/monopoly in the market. The Lorenz curve, on the other hand, is used to represent income distribution by showing the proportion of income which goes to a particular percentage of the population (Phuu, 2013). In Lorenz curve analysis, high inequality in the distribution of market share reflects high market concentration, which is depicted by a wide gap between the Lorenz curve and the line of perfect equality. This indicates that a few firms control the market (Nellis and Parker, 1992).

To further explain the structure of the market, the degree of product differentiation and barriers to entry/exit are assessed. Product differentiation refers to the process of distinguishing a product or service from others in the market in order to make it more attractive to a particular target market (Phuu, 2013).   Differentiation of a product may be viewed as a source of monopoly power such that if products in the market were homogenous, it means there would be perfect substitutes for products of a particular firm and such a firm would have no market power as a result (Hitt *et al*., 2007). A homogenous product in a market is one of the features of a competitive market. Barriers to entry/exit refer to factors that make it difficult to enter or exit a particular market, barriers to entry act as a deterrent against new competitors and may be either innocent (for example, the dominating company's absolute

cost advantage) or deliberate (for example, high spending on advertising by firms in the market to make it expensive for new entrants into the market) (Phuu, 2013).

According to Bain (1956), market structure consists of characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within the market (Go *et al*., 1999). In particular, these are the degree of seller and buyer concentration, entry conditions, and the extent of agent and product differentiation (Scott, 1995).

Market structure is also defined as a selected number of organizational characteristics of a market that establishes relationship between buyers and sellers of a homogenous product (Rugayah, 1993). More specifically it refers to the number and size distribution of firms, and any entry barriers arising from the technology of the production. It therefore describes the nature of the degree of competition and pricing in the market. At one end of the market spectrum is perfect competition while at the other extreme end is monopoly. Market structures between these two represents varying degrees of imperfect competition (APEC, 2008). Concentration of establishment in the hands of a few firms in an industry is generally criticized on the grounds of competition loss.

A market is said to be more concentrated when there are fewer number of firms in production or the more unequal the distribution of market share. The higher the concentration level in an industry, the higher would be the degree of monopoly and absence of competition. Nonetheless, high concentration brings greater innovation and technological change and thus the benefits associated with it may perhaps be sufficient to offset the adverse monopoly effects of high concentration (APEC, 2008).

Competitive market and low concentration of an industry indicate low market power held by firms. According to Alvarado, (1988), market power refers to the condition where the providers of a service can consistently charge a price above those that would be established by competitive market. Market power can also be defined as the concentration of resources in the hands of a single producer or an insufficient numbers of producers. It enables a firm to set prices above marginal costs. Dessalegn *et al*. (1998) mentioned that market concentration refers to the number and relative size distribution of buyers or sellers in a market. He also indicated the existence of some degree of positive relationship between market concentration and gross marketing margin. Market structure relates especially to the degree of competition

in a market. It tends to consider whether the number of firms producing products is large or whether the firms are of equal sizes or dominated by small group. It is concerned with whether entry for new firms is easy or not (Girei *et al*., 2013). Structure also relate to the degree of market knowledge which is available to these firms, Olukosi *et al*. (2005).

2.1.3 Market Performance

The S-C-P approach postulates that as market structure deviates from the paradigm of a perfect competition, the degree of competitive conduct will decline and there will be a consequent decrease in output (supply) and allocative efficiency, and an increase in prices. This implies that the performance of markets can be assessed based on the level of competition and efficiency in those markets (Williams *et al*., 2006). According to Giroh *et al*. (2013) market performance is the assessment of how well the process of marketing is carried out and how successfully its aims are accomplished.

The performance of a certain market or industry depends on the conduct of its sellers and buyers which, in turn, is strongly influenced by the structure of the relevant markets (Scarborough and Kydd, 1992; Margrath, 1992). Variables relevant in appraising firms behavior can be put into three general categories: Structure, Conduct, and Performance (SCP) related variables (Clodius and Mueller, 1961). One important approach to the study of market performance is the structure, conduct and performance framework. The SCP approach postulates a relationship between market structure and the behavior of market participants, including farmers, traders, consumers and other participants; in turn the behavior of these participants influences market performance (Scarborough and Kydd, 1992).

2.1.4 The Concept of Spatial Market Integration

Although contemporary economics rests fundamentally upon the concept of markets, the discipline struggles with the important and practical challenges of clearly defining a market empirically and of establishing whether markets are efficient in allocating scarce goods and services (Barrett, 2001). Much of the problem revolves around the concept of 'market integration' one employs and the empirical evidence thereby needed to demonstrate that condition. In macroeconomics and international economics, a common conceptualization of market integration focuses on 'tradability', the notion that a good is traded between two economies or that market intermediaries are indifferent between exporting from one nation to

another and not doing so. Tradability signals the transfer of excess demand from one market to another, as captured in actual or potential physical flows. Positive trade flows are sufficient to demonstrate spatial market integration under the tradability standard. But prices need not be equilibrated across markets. Spatial market integration conceptualized as tradability is therefore consistent with Pareto inefficient distributions.

For this reason, the primary approach one finds in the spatial market integration literature focuses, instead, on the notion of competitive equilibrium and Pareto efficiency manifest in zero marginal profits to arbitrage. At the heart of most analyses of market integration lies the Enke-Samuelson-Takayama-Judge (ESTJ) spatial equilibrium model (Enke, 1951; Samuelson, 1952; Takayama and Judge, 1971), in which the dispersion of prices in two locations for an otherwise identical good is bounded from above by the cost of arbitrage between the markets when trade volumes are unrestricted and bounded from below when trade volumes reach some ceiling value (for example, associated with a trade quota). More precisely, in ESTJ spatial equilibrium

$$p^0 = p^1 + \tau^{10} \text{ if } q^{10} \in (0, q^{10}{}_*)$$

$$\leq p^1 + \tau^{10} \text{ if } q^{10} = 0$$

$$\geq p^1 + \tau^{10} \text{ if } q^{10} = q^{10}{}_*$$

where p^0 and p^1 are the prices in two spatially distinct markets, 0 and 1, respectively, τ^{10} is the cost of moving the good from market 1 to market 0, q^{10} is the physical volume of trade between the two markets and $q^{10}{}_*$ is a maximal permitted trade volume between the two markets (for example, due to a trade quota). These equilibrium conditions imply both firm-level profit maximization and long-run competitive equilibrium at market level. The strict equality reflects the form of competitive equilibrium assumed under the law of one price. If trade occurs and is unrestricted, the marginal trader earns zero profits and prices in the two markets co-move perfectly. The theory, however, implies multiple competitive equilibria. The first weak inequality reflects a segmented equilibrium in which no trade occurs. Prices can be uncorrelated within the price band created by the costs of inter-market arbitrage. The latter weak inequality reflects binding trade quotas that may yield positive marginal quasi-rents to arbitrage. Note that trade is neither necessary nor sufficient for the attainment of ESTJ competitive equilibria. Hence the difference between tradability-based and efficiency based conceptualizations of market integration. In the prevailing view, spatial market

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integration occurs when the ESTJ equilibrium condition holds, irrespective of whether trade occurs.

2.2 Reviews on Socio-economic Characteristics of Cowpea Marketers, Market Structure, Market Performance, Spatial Market Integration and Problems associated with Cowpea Marketing.

Debaniyu *et al*. (2011) studied cowpea marketing and consumer preference in Magama Local Government Area of Niger State and revealed that 83.75% of the cowpea marketers fell within the age- group of 26 – 47 years with mean age of 43 years. These distributions indicated that the youths are highly involved in cowpea marketing. They are quite energetic and active and are able to deal with exigencies of travel and movement from market to market with regards to cowpea marketing. Adejobi (2005) in a study on cowpea marketing in Maiduguri, Borno State found that the traders were within the age range of 32 and 42 years. Gaya (2014) in a study analysis of the structure and performance of soybean markets in Borno State showed that the mean age of the wholesalers and retailers were 48 and 45 years respectively. Abah and Tor (2012) in a study on costs and returns of cowpea enterprise in Lafia Local Government of Nasarawa, reported that 95.0% of the respondents were still within their active age of between 21 and 60 years. The mean age of the marketers was found to be 42.6 years. Mzyece (2010) in studying "factors influencing cowpea producer's choice of marketing channels in Zambia" revealed that about 12% of these farmers did not sell their cowpeas and those farmers older than 60 years did not sell any cowpeas. He concluded that age is therefore less likely to influence cowpea farmers' marketing choices. Joel (2010) in a study on estimation of consumer's preferences for cowpea varieties in Kumi and Soroti districts of Uganda, found that the average age of the respondents was 37.9 years and that this being the economically active age group, they were likely to have some disposable income. Katanga *et al*. (2016) in a study analysis of cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria revealed that cowpea marketing was dominated by middle aged (30- 39 years) and aged males (40- 49 years). These economically active age brackets are usually self motivated and innovative (Yunusa, 1999).

Abah and Tor (2012) studied on cost and returns of cowpea enterprises in Lafia Local Government Area of Nasarawa and indicated that women comprised 75% of the respondents and men comprised 25%. The result implies that women in the study area dominated cowpea

marketing. According to Katanga *et al.* (2016) in a study analysis of cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria showed that 98.5% of the respondents were male while female constitute only 1.5%, probably because the business requires frequent outing from home to the market, which is against the culture and religion of the people. Gaya (2014) in a study analysis of the structure and performance of soybean markets in Borno State reported that about 57% of the women in the total sample engaged in retailing as opposed to wholesale trade, which was dominated almost exclusively by men (96.0%). Ngigi (2008) studied the structure, conduct and performance of commodity markets in South Sudan: linkages food security found that respondents were predominantly males (76%). However, the Juba Sub-sample featured a considerably higher (55%) proportion of female. Observations showed that participation of south Sudanese women in agricultural marketing was relatively low; they were mainly active in small-scale trade, mainly involving making and selling food snacks mostly (tea and pastry). The data also suggested a segregation of marketing functions by gender, with 90% of the women in the total sample being engaged in retail. Debaniyu *et al*. (2011) studied on cowpea marketing and consumer preference in Magama Local Government Area of Niger State. They found that 89.24% of the respondents were male and concluded the male gender is the highest participants in cowpea marketing in the study area. Langyintuo *et al*. (2004) in a study on consumer preference for cowpea in Cameroun and Ghana revealed 100% female as the highest in cowpea marketing in the humid coastal area of the study area; the result may imply women appreciate the crop more than their male counterparts. However, Musa (2003) in a study on marketing of cowpea in Nigeria revealed that only seven women in over 100 observations were involved in cowpea trading. Adejobi (2005) studied on cowpea marketing in Maiduguri, Borno State. The result of the finding revealed that the trader groups are predominantly males with some itinerant female traders. Girei *et al*. (2013) have shown in their study on assessment of problems affecting the structure, conduct and performance of cowpea marketing in Yola North and Yola South Local Government Areas of Adamawa State, that majority of the respondents 76% were male while 24% were female. This shows that cowpea marketing in the study area was mostly undertaken by men and the reason could be attributed to the high cultural believe attached to restriction on women. Imam (2014) studied channels of distribution of cowpea in Borno State. The findings showed that 76.3% of the marketers were male while 23.7% were female. The study further revealed that 31.8% of the respondents were within the age of 10 – 29, 10.2% were 30 – 39 years, and 18.2% 40– 49 years respectively.

Gaya (2014) studied analysis of the structure and performance of soybean Markets in Borno State. The study revealed that the mean years of formal schooling was approximately nine years for wholesalers and 12 years for retailers. A study on cowpea marketing in Maiduguri, Borno State by Adejobi, (2005) revealed that majority of the marketers acquired formal education with the highest level of education attained been post secondary education. He therefore concluded that majority of the marketers were literates which could aid the marketers in the adoption of improved marketing strategies that could positively influence the profit accruing from their marketing activities. Imam (2014) studied channels of distribution of cowpea in Borno State and analysis of the result revealed that 2.3%, 4%, 9.1% and 8.8% of the respondents had attain up to primary, secondary, diploma and university education respectively while 43.9% had no formal education. Katanga *et al*. (2016) on cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria observed that 51.5% of the respondents had non- formal (Quranic) education, implying that quranic education was the most prominent education among respondents. Ngigi (2008) studied structure, conduct and performance of commodity markets in South Sudan: linkages food and security found that the respondent's level of education was generally low, with over 50% having either no formal education or primary level education. However traders in Juba were relatively better educated with over 50% having secondary or college level education. Abah and Tor (2012) in a study on cost and returns of cowpea enterprises in Lafia Local Government Area, Nassarawa State showed that the proportion of cowpea farmers who had formal education were higher than those who did not go to school. In a study on estimation of consumer preferences for cowpea varieties in Kumi and Soroti districts, Uganda, Joel (2010) revealed that the highest level of formal education for the respondents was primary seven. Also Debaniyu *et al*. (2011) studied cowpea marketing and consumers preference in Magama Local Government Area, Niger State and found that there is a spread in the level of education with Arabic education being the highest at 28.75% followed by primary and secondary schools at 18.7%.

Abah and Tor (2012) have shown in their study on cost and returns of cowpea enterprise in Lafia Local Government, Nassarawa State that 78.3% of the respondents were married. The high proportion of the respondents who are married is an indication that family labour could be available among the cowpea marketers in the study area. Gaya (2014) studied analysis of structure and performance of soybean markets in Borno state and observed that most of the respondents sampled (97% of wholesalers and 91.3% of retailers) were married.

Katanga *et al*. (2016) in a study analysis of cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria revealed that 93.2% of the marketers were married, such result is expected, since married people bear the responsibility for their family members making them more committed and able to making rational decisions in the business.

Gaya (2014) analysed structure and performance of selected soybean markets in Borno State, Nigeria and revealed that majority (85%) of the wholesalers made an average monthly sale of over ₦400,000.00 while 64% of retailers made less than ₦100,000.00 of monthly sales from soybean. Girei *et al*., (2015) in a study determination of conduct, performance and structure of cowpea marketing in Yola North and Yola South Local Government Areas of Adamawa State, Nigeria revealed that the net income of wholesalers and retailers was ₦1,527.55 per ton and ₦855.38 per ton respectively. This finding has revealed that cowpea marketers practicing wholesaling are efficient in the marketing of the commodity by virtue of the positive sign of the net incomes. This makes cowpea highly valued and profitable in the study area. In a study estimation of consumer preferences for cowpea varieties in Kumi and Soroti districts, Uganda, Joel (2010) found that the respondents on the average have five members in their family and earn monthly income of about 184, 000/= (US$ 93.4) which translates into daily income of 6000/= (US$ 3.11), which is higher than the poverty line of 1US$ a day meaning high purchasing power of the interviewed group.

Girei *et al.* (2013) studied problems affecting the structure, conduct and performance of cowpea marketing in Yola North and Yola South Local Government Areas in Adamawa State and found out that, about 44 percent of the respondents had marketing experience of between 1- 10 years and 32 percent of the respondents had marketing experience of 11- 20 years. Similarly, about 15 percent and 9 percent of the respondents had experiences of between 21- 30 and 31- 40 years respectively. They however, pointed out that the ability to succeed in cowpea marketing is not necessarily a function of experience in the marketing system, but that experience provides marketers with skills and helps in making rational decisions that enhances efficiency and effectiveness of the industry. Ngigi (2008), in his study "structure, conduct and performance of commodity markets in South Sudan: Linkages and Food Security" revealed that the respondents had been in the trade for an average of 10 years. Seventy percent of the traders interviewed in Juba had been in business for only 1 to 3 years. About 60% of those interviewed in Wau had been in business for one to five years. He further disclosed that over 50% of those interviewed in Rumbek and Malakal have been in business

over 10 years. Gaya (2014) showed that wholesalers had a mean experience of 9 years in soybean marketing while retailers had a mean of 6.5 years experience. Adejobi (2005) studied cowpea marketing in Maiduguri, Borno state and revealed that the marketers had not less than 10 years of experience in cowpea marketing. Katanga *et al*. (2016) in a study analysis of cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria reported that 40.6% of the respondents were in the business for a period of 1- 6 years, marketers are in marketing profession for quite some period of time, with mean years of experience of 10 years.

Odhiambo *et al*. (2006) analysed the structure and performance of the beans marketing system in Nairobi. The results of the concentration ratio analysis indicated that the largest four and eight retailers had a low to moderately concentrated structure with a combined market share of 19.29% and 33.92 % respectively. However, in the wholesale trade, the largest four and eight firms controlled 34.76% and 59.84% of the market share respectively, resulting into a market structure that is moderately concentrated with a competitive fringe. From this analysis, it appears that the beans market structure in Nairobi approaches that of pure competition. In a study of determination of structure, conduct and performance of cowpea marketing in Yola North and South Local Government Areas of Adamawa State, Girei *et al*. (2015) obtained a gini coefficient of 0.4690. This is a demonstration that the market is competitive, characterized by large number of buyers and sellers such that the action of any buyer or seller would not have any perceptible influence on the marketers. Gaya (2014), in a study analysis of the structure and performance of selected soybean markets in Borno State, Nigeria revealed that the soybean retail market had a HH index of 0.014; the low index number signified low concentration of market shares and thus a competitive market with large number of sellers in the retail market. He further revealed that the soybean wholesale market was concentrated in the hands of few sellers with the presence scale economies.

Girei *et al.* (2015) in a study determination of conduct, performance and structure of cowpea marketing in Yola North and South Local Government Areas of Adamawa State revealed that the marketing margin of cowpea was estimated at 10.78% for all the marketers, while it was estimated at 11.78% and 10.11% for retailers and wholesalers respectively. This indicates that the marketing margin of wholesalers is lower than that of retailers, although the overall marketing margin which is 10.78% is higher than that of the wholesalers. The low

marketing margin indicates that marketers do not make excessive profit in cowpea sales. Gaya (2014), in a study analysis of the structure and performance of selected soybean markets in Borno State, Nigeria showed a total marketing margin of 68.75% with producer participation margin of 31%. The marketing margin for the rural assembler, wholesalers and retailers were 6%, 38% and 25%, respectively. Sallawu *et al.* (2014) in a study an analysis of cowpea marketing margin in Nigeria observed that largest component of the marketing margin for cowpea accrues to transportation and handling charges constituting 51% and 10% respectively.

Akpan *et al.* (2014) in a study on monthly price analysis of cowpea and maize in Akwa Ibom State, Nigeria showed that there is co-integration between the rural and urban prices of cowpea and maize. They further revealed that the coefficients of price variable in the co-integration equation for cowpea and maize markets converged to unity or law of one price which implied perfect market integration in the long run. Error correction model also confirmed the existence of short run market integration between the rural and urban prices of cowpea and maize. Debaniyu (2013), in his study on price integration of cowpea retail markets in Niger State, observed that markets in Niger State present a relatively long run integration in cowpea prices. A strong spatial price linkage exists between Kontagora and Sabonwuse, and Bida and Sabonwuse markets. This was adduced to ease of flow and use of market information, competition among market participants and the presence of arbitrage. The result indicated both birectional and unidirectional conditions. According to Gaya (2014) in a study of structure and performance of selected soybean markets in Borno State, Nigeria that markets in Maiduguri, Biu, Mbulatawiwi, Kwaya and Marama were integrated. The significant coefficient of the error correction term confirms the existence of a long run equilibrium relationship of soybean retail real price in Maiduguri Monday market with the soybean retail real prices in the other markets included in the analysis. Ddungu *et al.* (2014) in a study marketing and market integration of cowpea in Uganda revealed that cowpea markets as a whole are not integrated. They also showed that this is not a surprising result since it can be linked to the general lack of market information. Alemu and Biacuana (2006) measured the extent of market integration between major surplus and deficit markets in Mozambique namely, Chimoio-Maputo, Chimoio-Beira, Ribaue-Nampula and Mocuba-Nampula. The results revealed that out of four surplus and deficit market combinations studied, Chimoio-Maputo and Mocuba-Nampula market pairs were integrated. However, the degree of integration was found to be strongest in the former. According to Kibiego *et al.*

(2003) in a study" bean marketing system in urban areas of Kenya" revealed that the bean market was not fully integrated. They attributed this to inefficiency and lack of market information. Mtumbuka *et al*. (2014) examined the extent of market integration among different bean markets across Malawi showed that bean prices in different markets move in the same direction, meaning that the markets are cointegrated. Price information is not fully transmitted between markets and transaction costs were found to be higher in markets which are far away from major cities and in those markets serviced by poor roads. Mayaka (2013) assessed dry beans market integration in selected markets in Kenya and found that markets were integrated of order zero before differencing; co-integration tests revealed that all the markets were co-integrated and Granger causality tests confirmed independent causality with only one market link showing bidirectional causality leading to symmetric price adjustment between Kitale and Nairobi markets.

Yohanna (2015) in a study analysis of cowpea marketing and price trends in some selected rural and urban markets in Kaduna State, Nigeria revealed that lack of access to credit facilities, lack of market information, inadequate market infrastructure, provision of quality products and poor storage facilities are major problems hindering marketing of cowpea. He further revealed that other facilities such as clean environment, communication facilities and health facilities, fire services, banking facilities, security facilities, water supply and good toilets are also lacking in most markets. Adejobi (2005) in a study of cowpea marketing in maiduguri revealed that the major marketing problems faced by cowpea marketers are lack of credit facilities, lack of stalls, inadequate supply of cowpea, theft/ fire accident, default/ lack of trust, competition, high cost of transportation, seasonality of produce and spoilage. Fagboun (2007) in a study analysis of cowpea retail marketing in Abeokuta North Local Government Area, Ogun State observed that some of the problems facing the cowpea marketers include; lack of storage facilities, price variation, high cost of transportation, inadequate government policies and economic instability. Girei *et al*. (2013) studied problems affecting the structure, conduct and performance of cowpea marketing in Yola North and Yola South Local Government Areas in Adamawa State and revealed that, inadequate capital (21.86%), pest infestation (17.96%), low profit (17.65%), high cost of transportation (16.17%), bad road network (7.78%), inadequate and poor storage facilities (6.89%), high taxes (5.10%), inadequate market information (4.79%) and lack of standard measure were some of the problem identified as militating against cowpea marketing in the study area. Amongst all the problems, inadequate capital, pest infestation and low profit ranked most

important problems. The combine effects of these problems on the marketing system were reduction in profit margin of the marketers, consequently, discouraging marketers of the commodity in participating in the study area. Nzima and Ja (2015) in a study of efficiency of soybean markets in Malawi: structure conduct and performance approach observed that traders constraint to soy bean marketing include poor road infrastructure, limited capital, high market fees, poor grading and drying, low supply of produce, high transport cost, inadequate technology for value addition and storage facilities. Katanga *et al.* (2016) in a study of analysis of cowpea marketing channel in Kiyawa Local Government Area of Jigawa State, Nigeria showed that 44.7% of the traders were constrained by transportation hence ranked first. Insufficient capital was ranked second (28.03%) among the constraints faced by the traders in purchase of cowpea. Francis (2000) studied cowpea marketing in Uganda: a case study of Soroti and Pallisa Districts and revealed that at both wholesale and retail levels transport costs attributed to a higher percentage of total marketing costs incurred by traders. Poor storage and seasonal fall in demand of cowpea were among the leading marketing problems faced by cowpea marketers.

CHAPTER THREE

METHODOLOGY

3.1 The Study Area

The study was conducted in Biu Local Government Area (LGA), Borno State, Nigeria. The LGA is located in the southern part of Borno State about 210 kilometers away from Maiduguri (Nigeria Mapping Company, 1999). It is located between Latitudes 10.25^0N to 11.00^0N and Longitudes 11.42^0E to 12.30^0E (Fig 3.1) with a population of about 175,760 in 2006 and a projected population of 246,900 persons for 2016 at 3.4% growth rate, National Population Commission, 2006. It lies on the Biu Plateau at an average elevation of 626 meters above sea level and located in the Northern Guinea savannah (NGS) agro-ecological zone with a small portion in the Northeast, the Kimba area lying in the dryer Sudan Savannah zone (Amaza *et al*. 2007). The study area is bordered by Damboa, Chibok and Askira Uba LGAs to the north and Bayo, Kwaya Kusar and Shani LGAs to the south (Encyclopaedia Britannica, 2009).

Agriculture is the main activity in the area. The agricultural activities can be categorized into crop production activities and animal husbandry. There are two cropping season, one that starts with early onset of rain, usually in May and the dry season cropping which starts soon after harvesting of the rain-fed crops between November- December. The economy is mixed agriculture based on herding cattle, goats, sheep, horses and donkeys (Encyclopaedia Britannica, 2009) and arable farming of sorghum, millet, maize, cowpea and cotton (Raw Material Research and Development Council, 2011). Cowpea is one of the commodities that are commonly grown and marketed in the study area .The increasing importance of the crop for food and industrial uses reflect huge market potentials and increased opportunities for farmers, market agents and processors in the study area. The main ethnic group is the Babur/Bura who are related to the Kanuri people (People and Languages of Borno State, 2015). In Biu LGA all the markets are linked to Biu market in terms of prices, transportation, activities of the middle men and services of vehicles such as Hilux and heavy truck and Lorries.
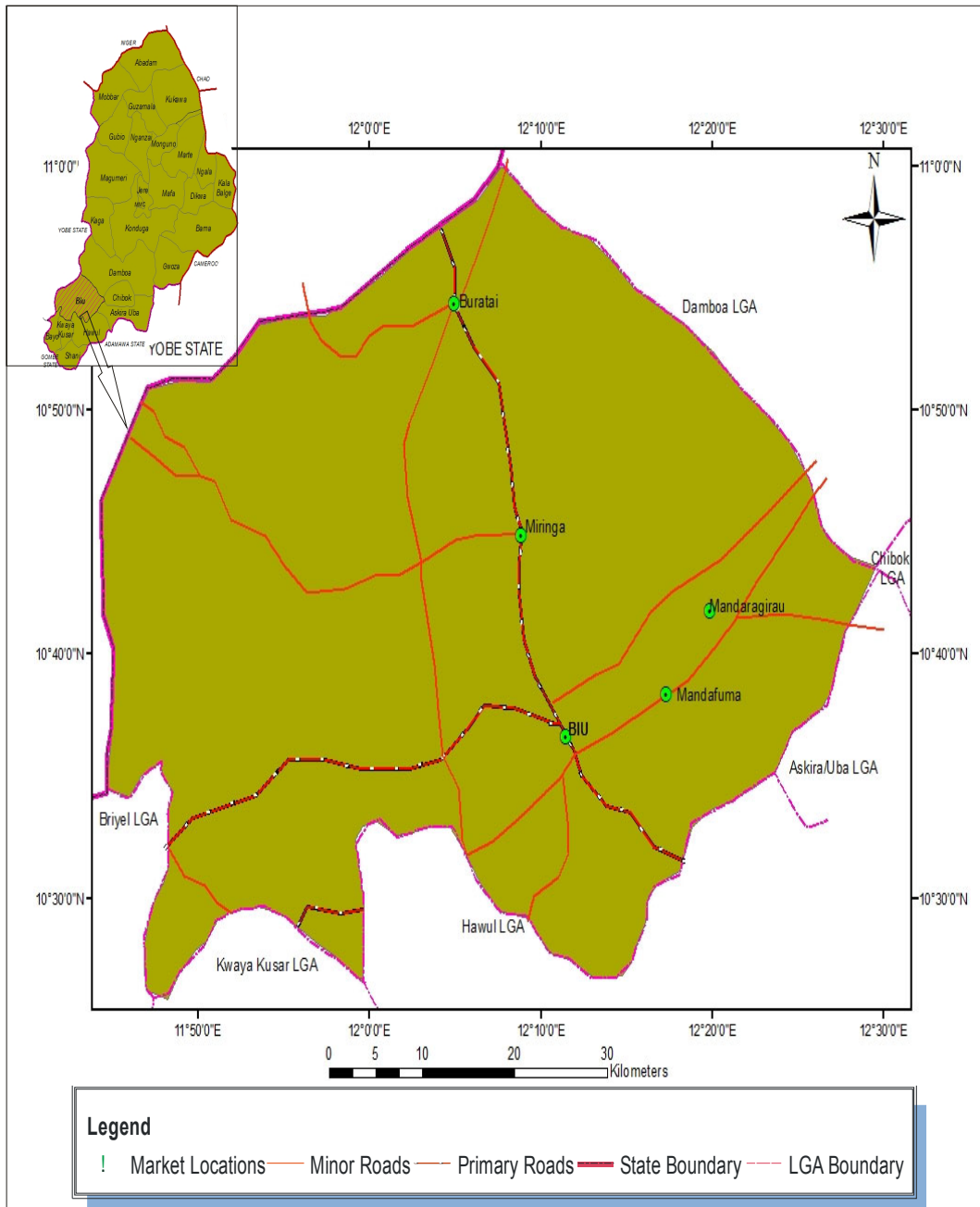
Fig 3.1: Map of Biu Local Government Area showing the study area

Source: Digitized in GIS Laboratory, Department of Geography, University of Maiduguri 2017

3.2 Sampling Procedure

Two- stage sampling procedure was used to select the respondents for the study. The first stage involved the purposive selection of five markets, (Biu, Buratai, Mandafuma,

Mandragirau and Miringha) prominent for cowpea marketing in the study area. The second stage involved random selection of twenty marketers from each market making 100 respondents for the study. The sample frame was the list of cowpea marketers obtained from cowpea marketers association of the markets and the frequency of visit was 48 weeks. Statistical package for social scientists is the software package used for the analysis of this study.

3.3 Sources of Data

Primary time series data and secondary information were used for this study. The primary data were obtained from respondents by the use of structured questionnaires administered to the marketers and from BOSADP. Secondary information was obtained from Journals, Gazettes and Government publications.

3.4 Analytical Techniques

Analytical tools employed for this study include; descriptive statistics, Gini Coefficient (GC), market margin analysis. Also co-integration and error correction models were also used.

3.4.1 Descriptive statistics

Descriptive statistics such as mean, percentage and frequency distribution were used to examine the socio- economic characteristics of cowpea marketers and the problems encountered in cowpea marketing. This was used to achieve objectives i and v.

3.4.2 Gini Coefficient

Gini coefficient was used to analyze the structure of the market (objective ii). This helps to determine the degree of market concentration. The Gini Coefficient is a measure of statistical dispersion most prominently used as a measure of inequality of wealth or product distribution. It has values between 0 and 1 (Enibe *et al*., 2008). A low Gini Coefficient indicates more equal incomes, wealth or product distribution and a high Gini Coefficient indicates more unequal distribution. Zero corresponds to perfect equality and 1 (one) corresponds to perfect inequality (Enibe *et al*., 2008).

$$G.C. = 1- \Sigma XY \text{---}1$$

Where,

G.C = Gini coefficient

X = percentage share of cowpea market participants

Y = cumulative percentage of cowpea purchase

Σ = Summation sign

3.4.3 Marketing Margin

The marketing margin analysis was also employed. This is an indicator of market performance. It satisfies objective three. The model was given by Tiku *et al*. (2012) as:

$$MM = \frac{SP-CP}{SP} \times 100\text{---}2$$

Where,

MM = Marketing margin

SP = Selling price of cowpea

CP = supply price of cowpea.

3.4.4 Market Integration Analysis

The Augmented Dickey-Fuller (ADF) test was used to test for stationarity of the variables while co-integration and vector error correction was used to determine the integration among markets. This was used to achieve objective iv. Determination of market integration using the cointegration technique is a sequential procedure:

i.   *Test for stationarity*

A series is said to be stationary if the means and variances remain constant over time (there is no random work or unit root). Non stationary stochastic series have varying mean or time varying variance (i.e the series has unit root). The price series in this study was tested for stationarity using Augmented Dickey Fuller (ADF). According to Ikudayisi and Salman (2011):

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \Sigma^{k}_{i=1} \rho_i \Delta Y_{t-i} + Et\text{………………..}3$$

$$\Delta Yt_{t-i} = (Y_{t-i} - Y_{t-i-1})\text{………………………………………….....}4$$

$$\Delta Y = Y_t - Y_{t-1}\text{...}5$$

Y_t = price at time, t

ΔY_t = implies first difference

B_1, β_2 and ρ = parameters

E_t = error term

ii.   *Johansen Co-integration Test*

After conducting the stationarity test on each price series, cointegration test was conducted between the price series. The residuals were also obtained from the test for stationarity so as to see the long run relationship. The Johansen trace test detects the number of cointegrating vectors that exist between two or more cointegrated series. According to Ikudayisi and Salman (2011), it is computed as:

$$LRtr\ (^r/_n) = -T\ \Sigma^n_{i=r+1}\ \log(1-\lambda)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

$$LR_{max}\ (^r/_n + 1) = -T\ \log(1-\lambda)\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .7$$

Where,

LR = likelihood ratio

n = number of variables

λ = max eigen value

T = sample size

r = number of co-integrating vector = 0, 1, 2….n – 1

Σ = summation

The likelihood ratio (LR) test determines r, the number of co-integrating vector in the equation. The criterion for selection is that the trace statistical value must be greater than the critical value at 5% level of significance, the Ho of no co-integration i.e., r = 0 is rejected.

iii.   *Error Correction Model* (ECM)

The error correction model enabled us to differentiate between long run and short run relationships of time series analysis. F calculated was compared with F tabulated at 5% level of significance. Vector Error Correction Model (VECM), a restrictive vector autoregression (VAR) is often used prior to some information concerning the number of co-integrating vectors which is done by sequential likelihood ratio tests for rank determination as shown in Johansen (1988). According to Hendy and Juselius (2000), the use of the VECM is facilitated

when variables are stationary at first difference and co-integrated. Therefore, Vector Error Correction Model measures how price deviations restore to equilibrium, as shocks in one market may not be instantaneously transmitted to other markets or due to delays in transportation. Obayelu and Salau (2010) reported that VECM treats all variables as endogenous; restricts long run behavior to converge to their co-integrating relationships while permitting short run adjustment dynamics. The long run and short run error correction models were computed by Ikudayisi and Salman as:

$$\Delta X_1 = C_1 + \lambda_1 Z_{t-1} + \beta_1 \Delta X_{t-1} + \text{----} + a_1 Y_{t-1} + \text{------} + \varepsilon_{xt}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.8$$

$$\Delta Y_1 = C_2 + \lambda_2 Z_{t-1} + \gamma 1 \Delta X_{t-1} + \text{-------} + \delta_1 Y_{t-1} + \text{-------} + \varepsilon_{xt}\ldots\ldots\ldots\ldots\ldots\ldots...9$$

Where,

ΔY_t = price change at Biu market at time t

ΔX_t = price change at Biu, Miringha, Mandafuma, Buratai and Mandragirau

δ = the speed of adjustment parameter

$(\mathcal{E}_{xt}\mathcal{E}_{xt})$ is a bivariate white noise

ΔY_{t-1} = price change at Biu market in past period

ΔX_{t-1} = price change at Biu, Miringha, Mandafuma, Buratai and Mandragirau in past period

Vector Error Correction Model (VECM) examines the dynamic adjustment of variables both in the long and short run to their equilibrium state. Short term dynamics, which is a measure of deviation from steady state, is determined by Error correction model. If the series are co-integrated it means there is a long-term equilibrium relationship between them so VECM is applied in order to evaluate the short run of the co-integrated series. A negative and significant coefficient of the ECM (i.e. t-l) indicates that any short term fluctuation between variables will give rise to a stable long run relationship between the variables (Ikudayisi and Salman, 2011).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio- economic characteristics of the respondents

The socio-economic characteristics of the respondents studied were sex, age, marital status, educational qualification, household size, years of cowpea marketing experience, main occupation and annual income. The information regarding socio-economic characteristics of the respondents is presented in Table 4.1.

4.1.1 Sex

The result presented in Table 4.1 revealed that 62% of the respondents were male and 38% were female. This reveals that in the study area, the highest participants in cowpea marketing were males, implying that the dominance of males in cowpea marketing may be due to the fact that they are head of families. This is contrary to findings by Langyintuo *et al*. (2004), who revealed 100% female cowpea traders in the humid coastal areas of Ghana, Togo and Benin Republic. However, Musa (2003) reported that only seven women in over hundred (100) observations were involved in cowpea trading in Nigeria.

4.1.2 Age

The study revealed that 72% of the respondents fell within the age group of 31- 50 years of age with mean age of 40. This investigation indicated that the youths and middle aged are highly involved in cowpea marketing. This implies that cowpea marketers in the study area are quite energetic and active and are able to deal with exigencies of travel and movement from market to market with regards to cowpea marketing. These economically active age brackets are usually self motivated and innovative (Yunusa, 1999). This is in line with studies carried out by Adejobi (2005) who revealed that the traders in his study in Maiduguri were within the age range of 32-42 years.

Table 4.1: Socio- economic Characteristics of Respondents (n= 100)

Socioeconomic	Frequency	Percentage	Mean
Sex			
Female	38	38.0	
Male	62	62.0	
Age			
0-20	03	03.0	40
21-30	06	06.0	
31-50	72	72.0	
51-60	16	16.0	
Above 60	03	03.0	
Marital status			
Married	96	96.0	
Single	04	04.0	
Educational level			
Qur'anic	27	27.0	
Primary	24	24.0	
Secondary	22	22.0	
Tertiary	12	12.0	
No education	15	15.0	
Household size			
0-3	03	03.0	6
3-6	41	41.0	
7-10	37	37.0	
10-13	12	12.0	
Above 13	07	07.0	
Marketing Experience (years)			
0-5	03	03.0	10
6-10	39	39.0	
11-15	35	35.0	
16-20	21	21.0	
Above 20	02	02.0	
Main Occupation			
Farming	42	42.0	
Trading	52	52.0	
Paid labour	06	06.0	
Volume of cowpea sales from Marketers (₦)			
100,000	12	12.0	
101,000- 200,000	22	22.0	
201,000- 300,000	17	17.0	350,500
301,000- 400,000	14	14.0	
401,000- 500,000	25	25.0	
501,000-600,000	10	10.0	

Source: Field survey, 2017

4.1.3 Marital Status

Table 4.1 also reveals that 96 percent of the respondents were married and 4 percent were single, such result is expected since married people bear the responsibility for their family members making them more committed and able to making rational decisions in the business. This result conformed to the finding of Girei *et al*. (2013) who obtained a similar result for cowpea marketers in Adamawa State, where about 76% were married and 5% single. This implies that most of the cowpea marketers have additional responsibilities the high percentage of married respondents may be due to the fact that as the head of the family they always look for source of livelihood hence participation in marketing especially cowpea would help them cater for their spouses and children.

4.1.4 Educational Level

The result on educational level in Table 4.1 shows that, 27 percent of the cowpea marketers had Qur'anic education, 24 percent had primary education, 22 percent had attained secondary education, 12 percent attained tertiary education with 15 percent not attending any school at all. This indicates that, majority of the respondents (85 percent) had one form of formal education or the other, hence are expected to have the required basic knowledge and skills to enhance their marketing strategy and other related activities. Though the ability to trade in agricultural produce is not necessarily a function of one's level of education, it however helps in the efficient performance of all the marketing functions like loan application, effective communication, record keeping and devising strategies on how to enhance efficient marketing activities and survive during different period by either diversifying or evolving new approach that ensure keeping him/ her in business without necessarily encountering losses. The implication is that levels of education of cowpea marketers could largely contribute to income diversity, adopting technologies and creating conducive environment to educate dependent and ensure better living condition. This is in line with Imam (2014) in a study channels of distribution of cowpea in Borno state. The study revealed that 73.5% of the respondents had some form of education.

4.1.5 Household Size

Information on the household size of the respondents in the study area presented in Table 4.1 indicated that majority (41%) had household size that ranged from 3 - 6 (persons). Thirty seven percent had 7 - 10 persons and 12% had 10 - 13 persons. The mean house hold

size of the respondents was 6 persons. This implied that the household size is relatively large and large household has a direct bearing on increased availability of able- bodied labor for marketing activities.

4.1.6 Years of Cowpea Marketing Experience

Table 4.1 shows how long respondents had been involved in cowpea marketing. The findings indicated that most (39%) of the respondents had been in cowpea marketing for 5 - 10 years, 21% had being marketing cowpea for 16 - 20 years with only 2% being in the trade for 20 years and above, with a mean of 10 years. It is important to note that experience counts in marketing activities, however ability to succeed in cowpea marketing is not necessarily a function of experience in the marketing system, but experience provides marketers with skills and helps in making rational decisions that enhances efficiency and effectiveness of the industry. The implication of this result is that years of marketing experience could stand as an added advantage in strategizing market situations to make more profit.

4.1.7 Main Occupation

The main occupation of the respondents presented in Table 4.1 revealed that majority (52%) of respondents considered cowpea trading as their predominant occupation and source of livelihood, followed by farming (42%) and paid labor having the least (6%) of the respondents. It is common in developing countries like Nigeria for household members to engage in other occupation to complement their earnings, implying help towards income diversification.

4.1.8 Volume of sales from Marketing of Cowpea

The annual sales of cowpea by cowpea marketers are presented in Table 4.1. The result revealed that 12% of the cowpea marketers in the study area made less than ₦100,000 of annual sales from cowpea. Resource base is a major constraint facing majority of retailers in developing country like Nigeria. The highest total income (₦8,734,933.20) from cowpea sales goes to only 16% of the respondents. There is a positive relationship between income and marketing partly because higher incomes dispel fear of taking risks and partly because of the ability to purchase more stock and reinvestment. This is similar to the findings of Girei *et al*., (2015) in a study determination of conduct, performance and structure of cowpea marketing in Yola North and Yola South Local Government Areas of Adamawa State, Nigeria

revealed that the net income of wholesalers and retailers was ₦1,527.55 per ton and ₦855.38 per ton respectively. This finding has revealed that cowpea marketers practicing wholesaling are efficient in the marketing of the commodity by virtue of the positive sign of the net incomes.

4.2 Seasonality of price variation

Seasonality of price variation was depicted in figure 4.2. The maximum price of cowpea in the study area was found to be ₦21,500/ bag which was obtained in September. However, the minimum price in the study area was obtained in January at the rate of ₦12,000/ bag depicting fluctuation in prices across the seasons. The peak of the price was always in the second and third quarters of the year while the least price was observed in the first and fourth quarter of the year. The reason for the variation in price can be attributed to the economic principle of supply and demand.
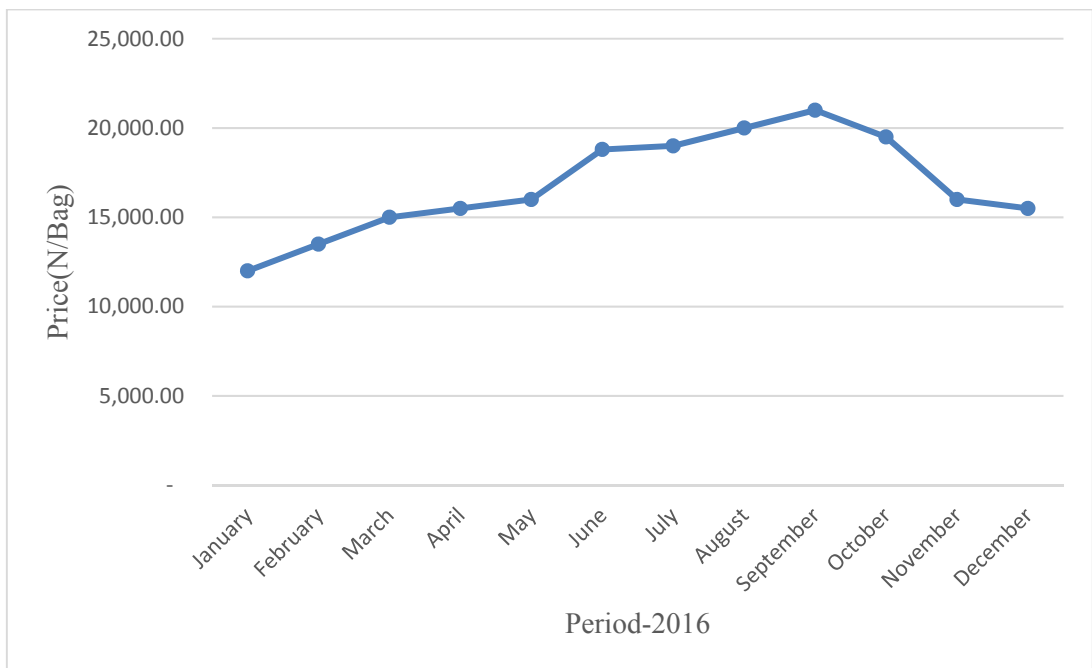
Fig. 2: Seasonality of price variation

Source: Field Survey, 2017

4.3 Descriptive statistics of cowpea prices

The result from table 4.2 showed the descriptive statistics of cowpea prices in Biu LGA. The price was high in Biu with the average price per bag of ₦20,430 followed by miringa market which was ₦18,863. Mandragrau had the lowest cowpea price of ₦15,390.

Table 4.2: Descriptive statistics of cowpea prices/ bag in Biu LGA

Variable	N	Mean	Std. Dev.	Min	Max
Biu	20	20,430	1429.428	19000	22600
Miringa	20	18,863	2082.382	15200	21000
Madafuma	20	16,735	18795.42	12000	19500
Mandragrau	20	15,390	1455.986	18000	20000
Buratai	20	15,650	1529.878	15200	22000

Source: Field Survey, 2017.

4.4 Structure of Cowpea Market

The structure of cowpea market was described based on volume of sales from marketing of cowpea. The result in Table 4.3 presents the volume of sales from cowpea marketing.

Table 4.3: Volume of sales from cowpea marketing

Volume of Sales	Number of Marketers	Percentage of Marketers(x)	Total Income(₦) from Cowpea Sales	Percentage of Total Income from Cowpea Sales	Cumulative Percentage of Total Income from Cowpea Sales (y)	xy
100,000	12	12.0	982,274.00	3.9	3.9	0.00468
101,000-200,000	13	13.0	2,488,901.20	9.8	13.7	0.01781
201,000-300,000	18	18.0	4,383,293.00	17.2	30.9	0.05562
301,000-400,000	16	16.0	8,734,933.20	34.4	65.2	0.10432
401,000-500,000	32	32.0	6,869,911.00	27.0	92.3	0.29536
501,000-600,000	9	9.0	1,965,432.00	7.7	100.0	0.09
Total	100	100	25,424,744.4	100	306	0.56779
Gini Coefficient						**0.4322**

Source: Field Survey, 2017

The result of Gini Coefficient in Table 4.3 showed Gini Coefficient of 0.4322. This implies that cowpea markets in the study area were relatively highly concentrated. Market survey further revealed that the markets were characterized by large number of buyers and sellers and products were differentiated by its size, colour and shape from which Igbo marketers prefer the white coloured cowpea, the Yoruba's prefer brown cowpea and generally the brown cowpea is always sold out before the white. There is freedom to enter or leave the market, as there are no major barriers to entry or exit. Therefore cowpea markets in Biu Local Government Area has a monopolistic competition structure. This result is conformed to the finding of Taru et al. (2010) who studied structural analysis of paddy markets in southern part of Taraba State, Nigeria. The result of the study indicated that the seller's concentration was high with high income inequality in paddy rice retail than wholesale in the area with Gini coefficient value of 0.74 and 0.53 respectively. This could result from the differences in their access to ownership and control of physical marketing facilities, funds availability and market behaviour and conducts. The market was also said to exhibit features of imperfect markets of "monopolistic competition".

4.5 Performance of Cowpea Market

The estimated marketing margins for the three categories of cowpea market participants (retailers, wholesalers and wholesaler/ retailers) is presented in Table 4.4. The result revealed that the marketing margins of retailers, wholesalers and wholesaler/ retailers were 27.3%, 30.8% and 28.4% respectively.

Table 4.4: Performance of Participants in Cowpea Marketing in Biu LGA

Marketers	Marketing Margin (%)
Retailers	27.3
Wholesalers	30.8
Wholesaler/Retailers	28.4

Source: Field Survey, 2017

This implies that there is a wide price variation along the marketing chain of cowpea for wholesalers than amongst retailers or wholesaler/ retailers. The result also portrayed that wholesalers had larger share of the overall marketing margin, which implies that the market performance of cowpea has a higher degree of business profitability and stability amongst the

wholesalers within the study area than among retailers and wholesaler/ retailers. Also there is a higher degree of business profitability and stability amongst wholesaler/ retailers than amongst retailers. The margin of below 50% indicates a fair return on investment in providing the marketing services. It could be concluded that the marketers get a fair share of the returns realized in the marketing of cowpea in the study area. This result goes with the findings of Sulumbe *et al*. (2015) in the analysis of the marketing of onion in Monguno Local Government Area of Borno State that there was a fair return on investment in onion marketing with marketing margin of 32% and 27% for wholesalers and retailers respectively.

4.6 Spatial Market Integration Analysis

4.6.1 Stationarity Test

A stationarity or unit root test is carried out to detect the presence and form of non stationarity. The unit root test results are presented in Table 4.5 using Augmented Dickey Fuller (ADF) test. The test was applied to each variable over the period of January and December 2015. Variables are non stationary at levels and any attempt to use them will lead to spurious regression results as suggested by Mesike *et al*. (2010). The variables were all stationary at their first difference at 1% level of significance and integrated of same order I (1) level. The null hypothesis (H_o) of unit root for all the time series was rejected at their first difference, since their ADF result test statistic was greater than the critical values at 1% level of significance (for example the ADF value for Biu LGA is -2.53311 which is greater than the critical value at 1%, -3.57772).

Table 4.5 Result of Unit Root for Cowpea Prices

Price of cowpea/markets	ADF statistics	Order of integration
Biu	-2.53311	Non stationary at level I (0)
	-7.16823	Stationary at first difference I (1)
Miringa	-2.70552	Non stationary at level I (0)
	-6.84242	Stationary at first difference I (1)
Mandafuma	-3.40996	Non stationary at level I (0)
	-5.53918	Stationary at first difference I (1)
Mandragrau	-3.36864	Non stationary at level I (0)
	-9.48487	Stationary at first difference I (1)
Buratai	-2.97345	Non stationary at level I (0)
	-6.62223	Stationary at first difference I (1)

*MacKinnon (1996) critical values for rejection of hypothesis of a unit root are -3.57772, -2.92516 and –2.60065 at 1%, 5% and 10%, respectively.

Source: Field Survey, 2017.

4.6.2 Johansen Co- integration Test

Johansen co-integration test addresses existence of long run relationship among the variables. The results, based on trace test likelihood ratio are presented in Table 4.6. From the result, the likelihood ratio indicated 3 co-integrating equations at 5% level of significance as the null hypothesis r = 0 is rejected. From the result, there exist unique long run equilibrium between the producing and consuming markets which is in line with Hallam and Zanoli (1993) that where only one co-integrating equation exists, its parameters can be interpreted as estimate of long run co-integrating relationship between variables concerned. The trace statistic values of markets Biu, Miringha and Mandragirau were 168.6316, 94.10032 and 57.27311 greater than critical values 88.80380, 63.87610 and 42.91525 at 5% respectively, shows the existence of cointegration. Also Kargbo (2005) stated that the higher the number of co-integrating vectors, the stronger the relationship between the variables in the system. The implication of this study is that cowpea market efficiency is enhanced as consuming market responds to price signals from producing markets leading to increased returns.

Table 4.6 Result of Johansen Co- integration Trace Test

Null hypothesis	Alternative Hypothesis	Trace Statistic	1% Critical value	5% Critical value	Hypothesized No of Cointegrating Equation(s)
r=0	r=1	168.6316	97.59724	88.80380	None **
r ≤ 1	r=2	94.10032	71.47921	63.87610	At most 1 **
r ≤ 2	r=3	57.27311	49.36275	42.91525	At most 2 **
r ≤ 3	r=4	22.37057	31.15385	25.87211	At most 3
r ≤ 4	r=5	6.288405	16.55386	12.51798	At most 4

** (*) denotes rejection of the hypothesis at 5% (1%) significance level. L. R. test indicates 3 co-integration equations at 5% level of significance.

LR = likelihood ratio

r = number of co-integrating relationships

Source: Field Survey, 2017.

4.6.3 Vector Error Correction Model

4.6.3.1 Vector Error Correction Model for the Assessment of Effects

A Vector Error Correction (VEC) model belongs to a category of multiple time series models most commonly used for data where the underlying variables have a long run stochastic trend, also known as co-integration. Existence of co-integration among cowpea markets in Biu LGA gave rise to estimation of Vector Error Correction Model. Table 4.7 present the result of long run estimate. The result indicated that the explanatory variables used in the model are the major determinants of cowpea market price.

The result further revealed that the coefficient of explanatory variables Mandragrau (-0.527807), Mandafuma (- 0.222926), Miringha (-0.132527) and Buratai (-0.277589) are significant at 1%. This implies that the significant coefficient shows that Mandragrau, Mandafuma, Miringha and Buratai prices co–move with Biu prices in the long run.

Table 4.7 Result of Vector Error Correction Model Showing the Long Run Effects

Markets	Coefficient	Standard error	t-value
Biu(-1)	1.000000		
Mandragrau(-1)	-0.527807	0.21077	-2.50418***
Mandafuma(-1)	- 0.222926	0.04192	-5.31789***
Miringha(-1)	-0.132527	0.01073	-12.35107***
Buratai(-1)	-0.277589	0.09469	-2.93155***
Constant	-1.392634		

Source: Field Survey, 2017.

4.6.3.2 Vector Error Correction Model Showing the Short Run Effects

It is important to know the extent to which markets are integrated; this requires distinguishing between the short and long run impacts of price changes from one period to the other. The speed of adjustment, the length of time needed for prices to be transmitted from one market to another can be studied by dynamic adjustments. The result of vector error correction model showing the short run effects is presented in Table 4.7. The result indicated that the model has a good fit as the independent variable jointly explain 93 percent of the movement in the dependent variable.

Table 4.8 Vector Error Correction Model Showing the Short Run Effects

Error Correction:	D(Biu)	D(Mandragrau)	D(Mandafuma)	D(Miringa)	D(Buratai)
CointEq1(ECM(-1))	-0.2538***	-0.1051***	-0.0249**	-0.6753**	-0.7805
	(0.08166)	(0.29864)	(0.35073)	(0.38696)	(0.31530)
D(Biu(-1))	0.4982	-0.4382	0.0616	-0.2342	-0.4996
	(0.22872)	(0.83641)	(0.98231)	(1.08378)	(0.88308)
D(Mandragrau(1))	-0.067048	0.101643	0.141048	0.009117	-0.039995
	(0.08070)	(0.29511)	(0.34658)	(0.38238)	(0.31157)
D(Mandafuma(-1))	0.22066	0.052032	0.320968	-0.021330	-0.162183
	(0.07839)	(0.28666)	(0.33667)	(0.37144)	(0.30266)
D(Miringa(-1))	0.371005	-0.045556	-0.278749	0.581840	-0.661436
	(0.08244)	(0.30148)	(0.35407)	(0.39064)	(0.31830)
D(Buratai(-1))	0.088940	0.293893	0.280771	0.235683	-0.374331
	(0.04190)	(0.15324)	(0.17997)	(0.19856)	(0.16179)
Constant	0.001722	-0.004202	-0.009457	0.000815	-0.014484
	(0.00552)	(0.02020)	(0.02372)	(0.02617)	(0.02133)
R-squared	0.931439	0.602322	0.626143	0.551603	0.624718
Adj. R-squared	0.907871	-0.471880	-0.439871	-0.540033	0.392590
Sum sq. resids	0.041259	0.551786	0.761073	0.926425	0.615077
S.E. equation	0.035908	0.131314	0.154219	0.170149	0.138640
F-statistic	39.52131	0.737856	0.850117	0.519836	1.398876
Log likelihood	90.95212	33.89995	26.82545	22.50017	31.51106
Akaike AIC	-3.588733	-0.995452	-0.673884	-0.477280	-0.886866
Schwarz SC	-3.102135	-0.508855	-0.187287	0.009317	-0.400269
Mean dependent	-0.004144	-0.007343	-0.014940	-0.005227	-0.004519
S.D. dependent	0.118301	0.126834	0.151234	0.159357	0.145542

Note**:** Standard error in parenthesis

Source: Field Survey, 2017.

The error correction coefficient for cowpea prices was (-0.2538), it measures the speed of adjustment of cowpea prices towards long run equilibrium. It carries the expected negative sign significant at 5% level and less than one which is appropriate. The coefficient indicates a feed back of about 25% of the previous months disequilibrium from the long run elasticity i.e deviation of cowpea prices from producing and consuming markets. It is deduced that closer markets are more cointegrated than those that are spatially separated and the rate at which disequilibrium is corrected (VECM value) is low with distant markets. It is evident that error correction value for Mandragrau, Miringa and Buratai markets are 11%, 67% and 78%,

respectively. The implication of this result is that they are producing markets in Biu LGA and there exist spatial price linkages with the producing market.

4.7 Problems Associated with Cowpea Marketing

Table 4.9 presents result of the problems associated with cowpea marketing in the study area, it reveals that, insecurity, inadequate storage facilities, insect pest infestation, high cost of transportation, inadequate market infrastructure, poor credit facilities and lack of uniform measure were the major problems identified as militating against cowpea marketing in the study area. Amongst all, the problems of insecurity (94%), inadequate storage facilities (93%) and insect pest infestation (91%) are the first three major problems. The combined effect of these problems on the marketing system could bring about a distortion in the structure, 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.

Table 4.9 Problems Associated with Cowpea Marketing in Biu LGA

Marketing Problem	Frequency	Percentage
Insecurity	94	94.0
Inadequate storage facilities	93	93.0
Insect pest infestation	91	91.0
High cost of transportation	78	78.0
Inadequate market infrastructure	77	77.0
Poor credit facilities	72	72.0
Lack of uniform measure	68	68.0

*percentage base on multiple response

Source: Field Survey, 2017.

Security related problems were a major problem to the marketers. The problem was as a result of the security challenges being faced by the whole North-eastern zone of Nigeria. Marketers in the study area were devastated by the growing level of insecurity in the country. It has reduced the sales volumes of marketers drastically. Table 4.8 also reveals that majority of the marketers had a problem of inadequate funding as required by marketers to finance all cowpea marketing activities. However a large number of marketers face serious shortage of funds to finance their cowpea marketing activities.

Inadequate storage facilities are another problem faced by cowpea marketers. Almost 93% of the marketers indicated inadequate storage facilities as one of the constraint encountered during marketing of cowpea in the study area. The implication of inadequate storage facilities is that it may constrain the systems capacity to hold stock of cowpea from peak supply periods in correspondence to even demand requirements through the cowpea production cycles. Such storage constraints are often manifested in large seasonal price variations.

The result indicated that the majority (72%) had no access to credit to finance their cowpea marketing activities while only about (28%) had access to credit. This low access to credit could be attributed to the fact that government seldom grants financial credit to large numbers of marketers. Ekong (2003) asserts that credit is a very strong factor that is needed to acquire or develop any enterprise; its availability could determine the extent of production capacity.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study analysed cowpea marketing in Biu Local Government Area of Borno State. The specific objectives of the study were to: examine the socio-economic characteristics of cowpea marketers; determine the structure of cowpea market; analyse the performance of the market; determine the spatial market integration of cowpea, and identify problems associated with marketing of cowpea in the study area. Five markets were selected for the study namely Biu, Miringha, Mandragrau, Mandafuma and Buratai. Twenty marketers were randomly selected from each of the five markets to make up 100 respondents for the study. Questionnaire and oral interview were used to collect data from the respondents and the data were analysed using descriptive statistics, Gini Cofficient, marketing margin and cointegration analysis.

The findings of the study indicated that 62% of the respondents were males with 36% of the respondents fall within the age of 31 – 50 years of age. The result further showed that 96% of the respondents were married and 12% attained tertiary education. The household size of the majority (41%) had ranged from 3 – 6 (persons) with cowpea marketing experience of 20 years and above for only 2% of the respondents. Gini Coefficient for all cowpea marketers was 0.4322 indicating moderate concentration in the cowpea markets in the study area. Marketing margin for retailers, wholesalers and wholesaler/ retailers are 27.3%, 30.8% and 28.4%, respectively.

Co-integration analysis revealed that long run equilibrium exist between the producing and consuming markets. The error correction coefficient for cowpea prices was (-0.2538), it measures the speed of adjustment of cowpea prices towards long run equilibrium. It carries the expected negative sign significant at 5% level and less than one which is appropriate. The coefficient indicates a feed back of about 25% of the previous months disequilibrium from the long run elasticity i.e deviation of cowpea prices from producing and consuming markets. Insecurity, inadequate storage facilities and insect pest infestation are the first 3 major problems faced by cowpea marketers in the study area.

5.2 Conclusion

It can be concluded from the study that cowpea markets in Biu Local Government Area display strong long run integration of prices. The reason for the long run integration of these markets is adduced to the flow, ease and use of market information between these markets and the presence of arbitrage. The study also concluded that cowpea markets in the study area is moderately concentrated with Gini Coefficient of 0.4322. The low level of market concentration is an indication of presence of monopolistic competition structure in the cowpea market.

It is also concluded that a wide price variation along the marketing chain of cowpea for wholesalers than amongst retailers or wholesaler/ retailers was revealed. Wholesalers had larger share of the overall marketing margin, which implies that the market performance of cowpea has a higher degree of business profitability and stability amongst the wholesalers within the study area than among retailers and wholesaler/ retailers. Also there was a higher degree of business profitability and stability amongst wholesaler/ retailers than amongst retailers. It can be concluded that marketing of cowpea was constrained by insecurity, inadequate storage facilities and insect pest infestation among others.

5.3 Recommendations

Based on the findings of this study, the following recommendations were provided:

- There is need for female to partake in cowpea marketing to compliment their male counterparts.
- The government needs to play an important role in improving security situations in the study area.
- Government and non governmental agencies should empower the marketers through the provision of micro credit facilities to encourage more people to go into cowpea marketing.

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Appendix I

QUESTIONNAIRE

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Department of Agricultural Economics

University of Maiduguri

Topic: Analysis of Cowpea Marketing in Biu Local Government Area.

Instruction: Please kindly fil or tick as Appropriate

SECTION A: Socio- Economic Characteristics

1. Gender (i) Male (ii) Female
2. Age …....................(years)
3. Marital Status…………….
4. Highest Educational Qualification
   (i) Primary
   (ii) Secondary
   (iii) Tertiary
   (iv) Quranic
   (v) Others (Specify)
5. Household size……………………
6. How many years have you been marketing cowpea?
7. What is your main occupation?
   (i)   Farming
   (ii)   Trading
   (iii) Paid labour
   (iv)   Others (specify)

SECTION B: Structure and Performance of Cowpea Market

8. What type of market participant are you?
   (i)   Retailer
   (ii)   Wholesaler
   (iii) Wholesaler/ Retailer
   (iv)   Others (specify)
9. Is there any barrier to entry and out of the market?
10. What are the numbers of cowpea buyers and sellers?
11. What factor influence price determination?

    (i)   Road condition
    (ii)   Distance
    (iii) Demand and supply conditions
    (iv)   Others (Specify)
12. Major sources of cowpea supply
    (i)   Own farm product
    (ii)   Individual farmer

(iii)   Farmer groups

(iv)   Others (specify)

13. Do you belong to any association   YES   NO

14. If yes what services do these associations provide to their members?

SERVICES	Yes	No
Loan and credit		
Transport		
Information on prices		
Rules on weight and measures		
Cooperative buying		
Others (specify)		

15. Which months are prices highest or lowest?

Markets	Purchasing price	Selling price	Highest price and month	Lowest price and month
Biu				
Miringha				
Buratai				
Mandafuma				
Mandragirau				

16. In which months are volumes traded highest………………………
    Bags sold per day………………….

17. In which months are volumes traded lowest………………………..
    Bags sold per day………………….

18. What factors affect volumes traded?

Factors	Yes	No
Transport difficulties		
Limited supply		
Too many other traders		
Lack of finance or credit		
Not enough customers		
Not enough capital		

Others (specify)

19. How do you determine the price of cowpea?

Mode	Yes	No
Negotiation with a commission agent		
Negotiation with a buyer		
A price set by market association		
The current market price		

MARKET COSTS AND PRICES

20. How many mudus are there in 100kg bag of cowpea?
21. What is the storage cost of 100kg bag of cowpea?
22. What is the cost of empty bag of cowpea?
23. What is the cost of loading and unloading of 100kg bag of cowpea?
24. What is the cost of thread and needle used for sewing the top of the bag?
25. What is the cost of handling 100kg bag of cowpea?
26. What is the cost of grading 100kg bag of cowpea?
27. What is the cost of sorting 100kg bag of cowpea?
28. What is the cost of bagging 100kg bag of cowpea?
29. How much do you pay as tax/ market fee?
30. How much does it cost you to transport 100kg bag of cowpea?
31. Where do you buy your product?
    i.   Farm gate
    ii.   Rural assemblers
    iii. Other marketing agents
32. What is the price of cowpea in the following markets?

Markets	Buying Price/ 100kg bag	Selling price/ 100kg bag	Buying Price/ mudu	Selling Price/ mudu
Biu				
Buratai				
Mandragirau				
Mandafuma				
Miringha				

33. What is the distance in kms of your product market?

Markets	Biu
Biu	
Buratai	
Miringha	
Mandafuma	
Mandragirau	

SECTION C: Marketing Problems

34. What are the problems encountered in cowpea marketing
    i.   High cost of transportation
    ii.   Lack of uniform measure
    iii.   Inadequate storage facilities
    iv.   Poor credit facilities
    v.   Inadequate market infrastructure
    vi.   Insect pest infestation
    vii.   Others (specify)

………………………………………………………………
………………………………………………………………
………………………………………………………………

Appendix II

S/no.	Retailers	Wholesale	Wholesale/Retailers

	% share of each class of sellers	Cumulative % of the sales	% share of each class of sellers	Cumulative % of the sales	% share of each class of sellers	Cumulative % of the sales
1	0.01511	0.01511	0.0414	0.0414	0.0391	0.0391
2	0.05438	0.06949	0.0376	0.0789	0.0586	0.0977
3	0.01511	0.08459	0.0188	0.0977	0.0586	0.1563
4	0.01511	0.0997	0.0376	0.1353	0.0391	0.1953
5	0.00906	0.10876	0.0752	0.2105	0.0195	0.2148
6	0.03021	0.13897	0.0376	0.2481	0.0273	0.2422
7	0.03021	0.16918	0.0188	0.2669	0.043	0.2852
8	0.01511	0.18429	0.015	0.282	0.043	0.3281
9	0.03021	0.2145	0.0752	0.3571	0.0156	0.3438
10	0.04834	0.26284	0.0301	0.3872	0.0391	0.3828
11	0.01511	0.27795	0.0564	0.4436	0.0078	0.3906
12	0.06042	0.33837	0.0564	0.5	0.0117	0.4023
13	0.01511	0.35347	0.0564	0.5564	0.0156	0.418
14	0.01511	0.36858	0.0226	0.5789	0.0313	0.4492
15	0.03021	0.39879	0.0263	0.6053	0.0313	0.4805
16	0.02417	0.42296	0.0301	0.6353	0.0195	0.5
17	0.01511	0.43807	0.0414	0.6767	0.0156	0.5156
18	0.04532	0.48338	0.0451	0.7218	0.0391	0.5547
19	0.03021	0.5136	0.0376	0.7594	0.0313	0.5859
20	0.03021	0.54381	0.0301	0.7895	0.0391	0.625
21	0.02417	0.56798	0.015	0.8045	0.0078	0.6328
22	0.01813	0.5861	0.0113	0.8158	0.0469	0.6797
23	0.02115	0.60725	0.0188	0.8346	0.0391	0.7188
24	0.03625	0.64351	0.0075	0.8421	0.0195	0.7383
25	0.03021	0.67372	0.0075	0.8496	0.0391	0.7773
26	0.02115	0.69486	0.0226	0.8722	0.0391	0.8164
27	0.02417	0.71903	0.0376	0.9098	0.0781	0.8945
28	0.01511	0.73414	0.0451	0.9549	0.0156	0.9102
29	0.01209	0.74622	0.015	0.9699	0.0391	0.9492
30	0.03021	0.77644	0.0301	1	0.0391	0.9883
31	0.03625	0.81269			0.0117	1
32	0.04834	0.86103				
33	0.01511	0.87613				
34	0.04532	0.92145				
35	0.01511	0.93656				
36	0.01511	0.95166				
37	0.01209	0.96375				
38	0.02417	0.98792				
39	0.01209	1				

Biu market

Null Hypothesis: BIU has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.533114	0.1143
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BIU)
Method: Least Squares
Date: 08/19/16   Time: 12:01
Sample (adjusted): 1/07/2015 11/25/2015
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BIU(-1)	-0.251525	0.099295	-2.533114	0.0149
C	27.08056	10.97856	2.466677	0.0175
R-squared	0.124797	Mean dependent var		-0.417188
Adjusted R-squared	0.105348	S.D. dependent var		11.88969
S.E. of regression	11.24598	Akaike info criterion		7.719521
Sum squared resid	5691.247	Schwarz criterion		7.798250
Log likelihood	-179.4087	Hannan-Quinn criter.		7.749147
F-statistic	6.416667	Durbin-Watson stat		1.915131
Prob(F-statistic)	0.014860			

At 1 level

Null Hypothesis: D(BIU) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.168232	0.0000

Test critical values: 1% level   -3.581152
                      5% level   -2.926622
                      10% level -2.601424

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BIU,2)
Method: Least Squares
Date: 08/19/16   Time: 12:02
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BIU(-1))	-1.077409	0.150303	-7.168232	0.0000
C	-0.459254	1.788183	-0.256827	0.7985

R-squared	0.538705	Mean dependent var		9.27E-16
Adjusted R-squared	0.528221	S.D. dependent var		17.64585
S.E. of regression	12.12026	Akaike info criterion		7.870139
Sum squared resid	6463.635	Schwarz criterion		7.949645
Log likelihood	-179.0132	Hannan-Quinn criter.		7.899923
F-statistic	51.38355	Durbin-Watson stat		2.029509
Prob(F-statistic)	0.000000			

Buratail at level

Null Hypothesis: BURATAI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.973454	0.0448
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BURATAI)
Method: Least Squares
Date: 08/19/16   Time: 12:03
Sample (adjusted): 1/07/2015 11/25/2015
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

	Coefficient	Std. Error	t-Statistic	Prob.
BURATAI(-1)	-0.347872	0.116993	-2.973454	0.0047
C	37.71015	12.97018	2.907449	0.0056

R-squared	0.164212	Mean dependent var	-0.523571
Adjusted R-squared	0.145639	S.D. dependent var	12.60536
S.E. of regression	11.65134	Akaike info criterion	7.790341
Sum squared resid	6108.919	Schwarz criterion	7.869071
Log likelihood	-181.0730	Hannan-Quinn criter.	7.819967
F-statistic	8.841428	Durbin-Watson stat	1.702935
Prob(F-statistic)	0.004719		

At 1 level

Null Hypothesis: D(BURATAI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.622363	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BURATAI,2)
Method: Least Squares
Date: 08/19/16   Time: 12:04
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BURATAI(-1))	-0.998357	0.150755	-6.622363	0.0000
C	-0.534074	1.902001	-0.280796	0.7802

R-squared	0.499179	Mean dependent var	-9.27E-16
Adjusted R-squared	0.487796	S.D. dependent var	18.00850
S.E. of regression	12.88840	Akaike info criterion	7.993037
Sum squared resid	7308.876	Schwarz criterion	8.072543
Log likelihood	-181.8398	Hannan-Quinn criter.	8.022820
F-statistic	43.85569	Durbin-Watson stat	1.999722
Prob(F-statistic)	0.000000		

Madafuma market

At level

Null Hypothesis: MADAFUMA has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.409966	0.0156
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MADAFUMA)
Method: Least Squares
Date: 08/19/16   Time: 12:05
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MADAFUMA(-1)	-0.445193	0.130557	-3.409966	0.0014
D(MADAFUMA(-1))	0.475145	0.159062	2.987174	0.0046
C	49.21954	14.89190	3.305122	0.0019

R-squared	0.237886	Mean dependent var	-1.426257
Adjusted R-squared	0.202439	S.D. dependent var	13.90431
S.E. of regression	12.41742	Akaike info criterion	7.939071
Sum squared resid	6630.271	Schwarz criterion	8.058331
Log likelihood	-179.5986	Hannan-Quinn criter.	7.983747
F-statistic	6.710993	Durbin-Watson stat	2.014788
Prob(F-statistic)	0.002907		

At 1 level

Null Hypothesis: D(MADAFUMA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.539184	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MADAFUMA,2)
Method: Least Squares
Date: 08/19/16   Time: 12:06
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MADAFUMA(-1))	-0.821679	0.148339	-5.539184	0.0000
C	-1.171926	2.050956	-0.571405	0.5706

R-squared	0.410840	Mean dependent var		-6.18E-16
Adjusted R-squared	0.397450	S.D. dependent var		17.82443
S.E. of regression	13.83605	Akaike info criterion		8.134937
Sum squared resid	8423.199	Schwarz criterion		8.214443
Log likelihood	-185.1036	Hannan-Quinn criter.		8.164721
F-statistic	30.68256	Durbin-Watson stat		1.928693
Prob(F-statistic)	0.000002			

Mandaragrau market
At level

Null Hypothesis: MANDARAGRAU has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.368643	0.0172
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MANDARAGRAU)
Method: Least Squares
Date: 08/19/16   Time: 12:11
Sample (adjusted): 1/07/2015 11/25/2015
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MANDARAGRAU(-1)	-0.391295	0.116158	-3.368643	0.0016
C	40.67429	12.38567	3.283980	0.0020

R-squared	0.201388	Mean dependent var		-0.579057
Adjusted R-squared	0.183641	S.D. dependent var		14.05951
S.E. of regression	12.70313	Akaike info criterion		7.963195

Sum squared resid	7261.629	Schwarz criterion	8.041925
Log likelihood	-185.1351	Hannan-Quinn criter.	7.992822
F-statistic	11.34775	Durbin-Watson stat	2.239424
Prob(F-statistic)	0.001557		

At 1 level

Null Hypothesis: D(MANDARAGRAU) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.484978	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MANDARAGRAU,2)
Method: Least Squares
Date: 08/19/16   Time: 12:12
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MANDARAGRAU(-1))	-1.343111	0.141604	-9.484978	0.0000
C	-0.794645	1.992608	-0.398797	0.6920
R-squared	0.671556	Mean dependent var	8.86E-16
Adjusted R-squared	0.664091	S.D. dependent var	23.29730
S.E. of regression	13.50257	Akaike info criterion	8.086142
Sum squared resid	8022.055	Schwarz criterion	8.165648
Log likelihood	-183.9813	Hannan-Quinn criter.	8.115926
F-statistic	89.96480	Durbin-Watson stat	2.037987
Prob(F-statistic)	0.000000		

Miring
At level

Null Hypothesis: MIRINGA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.705529	0.0806
Test critical values: 1% level	-3.577723	
5% level	-2.925169	
10% level	-2.600658	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MIRINGA)
Method: Least Squares
Date: 08/19/16   Time: 12:14
Sample (adjusted): 1/07/2015 11/25/2015
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MIRINGA(-1)	-0.288070	0.106474	-2.705529	0.0096
C	30.91855	11.88527	2.601416	0.0125

R-squared	0.139906	Mean dependent var	-0.672507
Adjusted R-squared	0.120793	S.D. dependent var	16.21689
S.E. of regression	15.20593	Akaike info criterion	8.322870
Sum squared resid	10404.92	Schwarz criterion	8.401599
Log likelihood	-193.5874	Hannan-Quinn criter.	8.352496
F-statistic	7.319888	Durbin-Watson stat	1.803441
Prob(F-statistic)	0.009597		

At 1 level

Null Hypothesis: D(MIRINGA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.842429	0.0000
Test critical values: 1% level	-3.581152	
5% level	-2.926622	
10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MIRINGA,2)
Method: Least Squares
Date: 08/19/16   Time: 12:15
Sample (adjusted): 1/14/2015 11/25/2015
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MIRINGA(-1))	-1.031038	0.150683	-6.842429	0.0000
C	-0.708454	2.445756	-0.289667	0.7734

R-squared	0.515519	Mean dependent var	0.000000

Adjusted R-squared	0.504508	S.D. dependent var	23.54422
S.E. of regression	16.57305	Akaike info criterion	8.495938
Sum squared resid	12085.31	Schwarz criterion	8.575444
Log likelihood	-193.4066	Hannan-Quinn criter.	8.525722
F-statistic	46.81884	Durbin-Watson stat	2.010916
Prob(F-statistic)	0.000000		

Co-integration test

Date: 08/19/16   Time: 14:01
Sample (adjusted): 2/04/2015 11/25/2015
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: BIU BURATAI MADAFUMA MANDARAGRAU MIRINGA
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.01 Critical Value	Prob.**
None *	0.823297	168.6316	97.59724	0.0000
At most 1 *	0.575332	94.10032	71.47921	0.0000
At most 2 *	0.555892	57.27311	49.36275	0.0010
At most 3	0.312026	22.37057	31.15385	0.1284
At most 4	0.136051	6.288405	16.55386	0.4246

 Trace test indicates 3 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.01 Critical Value	Prob.**
None *	0.823297	74.53124	44.01643	0.0000
At most 1	0.575332	36.82721	37.48696	0.0123
At most 2 *	0.555892	34.90254	30.83396	0.0024
At most 3	0.312026	16.08217	23.97534	0.1417
At most 4	0.136051	6.288405	16.55386	0.4246

 Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

| | | | MANDARAGRA | | @TREND(1/08/ |
BIU	BURATAI	MADAFUMA	U	MIRINGA	14)
0.068386	0.233290	-0.412676	-0.004437	0.100919	0.039070
-0.074102	0.096564	0.053907	0.000913	0.049963	-0.000185
0.254916	0.183753	-0.095713	0.074014	-0.281445	-0.046684
-0.098749	0.059458	-0.000314	-0.074084	0.048522	-0.033125
-0.367301	-0.067973	0.129777	0.072278	0.198945	-0.106606

Unrestricted Adjustment Coefficients (alpha):

D(BIU)	-1.671673	-4.216961	-2.184435	2.926690	2.434615
D(BURATAI)	-2.022202	-5.297641	-5.368877	-0.118024	0.890883
D(MADAFUMA)	2.781891	-5.917654	-3.933284	1.235030	0.965278
D(MANDARAG RAU)	-0.206236	1.130873	-5.092559	4.108404	-0.927040
D(MIRINGA)	-4.693212	-7.222996	-1.354917	3.618104	2.466843

1 Cointegrating Equation(s):   Log likelihood   -687.5934

Normalized cointegrating coefficients (standard error in parentheses)

| | | | MANDARAGRA | | @TREND(1/08/ |
BIU	BURATAI	MADAFUMA	U	MIRINGA	14)
1.000000	3.411388	-6.034538	-0.064875	1.475734	0.571314
	(0.42884)	(0.57575)	(0.19177)	(0.28173)	(0.21388)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.114318	
	(0.15730)	
D(BURATAI)	-0.138290	
	(0.15465)	
D(MADAFUMA)	0.190241	
	(0.15079)	
D(MANDARAG RAU)	-0.014104	
	(0.15601)	
D(MIRINGA)	-0.320948	
	(0.20319)	

2 Cointegrating Equation(s):   Log likelihood   -669.1798

Normalized cointegrating coefficients (standard error in parentheses)

| | | | MANDARAGRA | | @TREND(1/08/ |
BIU	BURATAI	MADAFUMA	U	MIRINGA	14)
1.000000	0.000000	-2.194389	-0.026847	-0.079980	0.159724
		(0.48287)	(0.24298)	(0.34301)	(0.27134)
0.000000	1.000000	-1.125685	-0.011148	0.456035	0.120652
		(0.16000)	(0.08051)	(0.11366)	(0.08991)

Adjustment coefficients (standard error in parentheses)

D(BIU)	0.198166	-0.797191
	(0.21257)	(0.53227)
D(BURATAI)	0.254275	-0.983321
	(0.19598)	(0.49072)
D(MADAFUMA)	0.628750	0.077555
	(0.18021)	(0.45124)

D(MANDARAG RAU)	-0.097903	0.061089
	(0.22869)	(0.57263)
D(MIRINGA)	0.214288	-1.792361
	(0.25397)	(0.63594)

3 Cointegrating Equation(s):	Log likelihood	-651.7285

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRA U	MIRINGA	@TREND(1/08/ 14)
1.000000	0.000000	0.000000	0.244476	-1.208575	-0.198863
			(0.11428)	(0.08806)	(0.12179)
0.000000	1.000000	0.000000	0.128037	-0.122915	-0.063298
			(0.15210)	(0.11720)	(0.16209)
0.000000	0.000000	1.000000	0.123644	-0.514310	-0.163411
			(0.08441)	(0.06504)	(0.08996)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.358682	-1.198587	0.671612
	(0.56294)	(0.64126)	(0.87695)
D(BURATAI)	-1.114338	-1.969867	1.062802
	(0.42511)	(0.48425)	(0.66223)
D(MADAFUMA)	-0.373907	-0.645196	-1.090559
	(0.42974)	(0.48952)	(0.66945)
D(MANDARAG RAU)	-1.396077	-0.874682	0.633492
	(0.54198)	(0.61738)	(0.84429)
D(MIRINGA)	-0.131102	-2.041331	1.677086
	(0.68569)	(0.78108)	(1.06817)

4 Cointegrating Equation(s):	Log likelihood	-643.6875

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRA U	MIRINGA	@TREND(1/08/ 14)
1.000000	0.000000	0.000000	0.000000	-1.479239	-0.407354
				(0.16062)	(0.22087)
0.000000	1.000000	0.000000	0.000000	-0.264667	-0.172488
				(0.09662)	(0.13286)
0.000000	0.000000	1.000000	0.000000	-0.651198	-0.268855
				(0.07090)	(0.09750)
0.000000	0.000000	0.000000	1.000000	1.107120	0.852808
				(0.49178)	(0.67623)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.647690	-1.024573	0.670694	-0.374932
	(0.56868)	(0.62041)	(0.83346)	(0.20457)
D(BURATAI)	-1.102683	-1.976884	1.062839	-0.384491
	(0.45179)	(0.49288)	(0.66214)	(0.16252)
D(MADAFUMA)	-0.495865	-0.571764	-1.090947	-0.400357
	(0.44997)	(0.49090)	(0.65948)	(0.16187)
D(MANDARAG RAU)	-1.801779	-0.630406	0.632203	-0.679338
	(0.51344)	(0.56014)	(0.75250)	(0.18470)
D(MIRINGA)	-0.488387	-1.826207	1.675951	-0.354098
	(0.69156)	(0.75447)	(1.01356)	(0.24878)

Date: 08/19/16   Time: 13:58
Sample (adjusted): 2/04/2015 11/25/2015
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: BIU BURATAI MADAFUMA MANDARAGRAU MIRINGA
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.823297	168.6316	88.80380	0.0000
At most 1 *	0.575332	94.10032	63.87610	0.0000
At most 2 *	0.555892	57.27311	42.91525	0.0010
At most 3	0.312026	22.37057	25.87211	0.1284
At most 4	0.136051	6.288405	12.51798	0.4246

 Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.823297	74.53124	38.33101	0.0000
At most 1 *	0.575332	36.82721	32.11832	0.0123
At most 2 *	0.555892	34.90254	25.82321	0.0024
At most 3	0.312026	16.08217	19.38704	0.1417
At most 4	0.136051	6.288405	12.51798	0.4246

 Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

BIU	BURATAI	MADAFUMA	MANDARAGRAU	MIRINGA	@TREND(1/08/14)
0.068386	0.233290	-0.412676	-0.004437	0.100919	0.039070
-0.074102	0.096564	0.053907	0.000913	0.049963	-0.000185
0.254916	0.183753	-0.095713	0.074014	-0.281445	-0.046684
-0.098749	0.059458	-0.000314	-0.074084	0.048522	-0.033125
-0.367301	-0.067973	0.129777	0.072278	0.198945	-0.106606

Unrestricted Adjustment Coefficients (alpha):

D(BIU)	-1.671673	-4.216961	-2.184435	2.926690	2.434615
D(BURATAI)	-2.022202	-5.297641	-5.368877	-0.118024	0.890883
D(MADAFUMA)	2.781891	-5.917654	-3.933284	1.235030	0.965278
D(MANDARAGRAU)	-0.206236	1.130873	-5.092559	4.108404	-0.927040

D(MIRINGA)	-4.693212	-7.222996	-1.354917	3.618104	2.466843

1 Cointegrating Equation(s):   Log likelihood   -687.5934

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRAU	MIRINGA	@TREND(1/08/14)
1.000000	3.411388	-6.034538	-0.064875	1.475734	0.571314
	(0.42884)	(0.57575)	(0.19177)	(0.28173)	(0.21388)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.114318
	(0.15730)
D(BURATAI)	-0.138290
	(0.15465)
D(MADAFUMA)	0.190241
	(0.15079)
D(MANDARAGRAU)	-0.014104
	(0.15601)
D(MIRINGA)	-0.320948
	(0.20319)

2 Cointegrating Equation(s):   Log likelihood   -669.1798

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRAU	MIRINGA	@TREND(1/08/14)
1.000000	0.000000	-2.194389	-0.026847	-0.079980	0.159724
		(0.48287)	(0.24298)	(0.34301)	(0.27134)
0.000000	1.000000	-1.125685	-0.011148	0.456035	0.120652
		(0.16000)	(0.08051)	(0.11366)	(0.08991)

Adjustment coefficients (standard error in parentheses)

D(BIU)	0.198166	-0.797191
	(0.21257)	(0.53227)
D(BURATAI)	0.254275	-0.983321
	(0.19598)	(0.49072)
D(MADAFUMA)	0.628750	0.077555
	(0.18021)	(0.45124)
D(MANDARAGRAU)	-0.097903	0.061089
	(0.22869)	(0.57263)
D(MIRINGA)	0.214288	-1.792361
	(0.25397)	(0.63594)

3 Cointegrating Equation(s):   Log likelihood   -651.7285

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRAU	MIRINGA	@TREND(1/08/14)
1.000000	0.000000	0.000000	0.244476	-1.208575	-0.198863
			(0.11428)	(0.08806)	(0.12179)
0.000000	1.000000	0.000000	0.128037	-0.122915	-0.063298
			(0.15210)	(0.11720)	(0.16209)
0.000000	0.000000	1.000000	0.123644	-0.514310	-0.163411

	(0.08441)	(0.06504)	(0.08996)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.358682	-1.198587	0.671612
	(0.56294)	(0.64126)	(0.87695)
D(BURATAI)	-1.114338	-1.969867	1.062802
	(0.42511)	(0.48425)	(0.66223)
D(MADAFUMA			
)	-0.373907	-0.645196	-1.090559
	(0.42974)	(0.48952)	(0.66945)
D(MANDARAG			
RAU)	-1.396077	-0.874682	0.633492
	(0.54198)	(0.61738)	(0.84429)
D(MIRINGA)	-0.131102	-2.041331	1.677086
	(0.68569)	(0.78108)	(1.06817)

4 Cointegrating Equation(s):   Log likelihood   -643.6875

Normalized cointegrating coefficients (standard error in parentheses)

BIU	BURATAI	MADAFUMA	MANDARAGRA U	MIRINGA	@TREND(1/08/14)
1.000000	0.000000	0.000000	0.000000	-1.479239	-0.407354
				(0.16062)	(0.22087)
0.000000	1.000000	0.000000	0.000000	-0.264667	-0.172488
				(0.09662)	(0.13286)
0.000000	0.000000	1.000000	0.000000	-0.651198	-0.268855
				(0.07090)	(0.09750)
0.000000	0.000000	0.000000	1.000000	1.107120	0.852808
				(0.49178)	(0.67623)

Adjustment coefficients (standard error in parentheses)

D(BIU)	-0.647690	-1.024573	0.670694	-0.374932
	(0.56868)	(0.62041)	(0.83346)	(0.20457)
D(BURATAI)	-1.102683	-1.976884	1.062839	-0.384491
	(0.45179)	(0.49288)	(0.66214)	(0.16252)
D(MADAFUMA				
)	-0.495865	-0.571764	-1.090947	-0.400357
	(0.44997)	(0.49090)	(0.65948)	(0.16187)
D(MANDARAG				
RAU)	-1.801779	-0.630406	0.632203	-0.679338
	(0.51344)	(0.56014)	(0.75250)	(0.18470)
D(MIRINGA)	-0.488387	-1.826207	1.675951	-0.354098
	(0.69156)	(0.75447)	(1.01356)	(0.24878)