



**ANALYSIS OF SPATIAL AND TEMPORAL PRICE EFFICIENCY OF
COWPEA (*Vigna unguiculata* [L] Walp) IN SELECTED LOCAL GOVERNMENT AREAS OF
GOMBE STATE, NIGERIA**

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ABSTRACT

The study analysed spatial and temporal price efficiency of cowpea (*Vigna unguiculata* [L.] Walp) in selected Local Government Areas of Gombe State, Nigeria. A multi-stage sampling technique was employed in selecting 130 cowpea merchants based on number of cowpea merchants in each market. Data were obtained from both primary and secondary sources. Secondary data were obtained on monthly average retail prices per 100kg bag of Cowpea for the period (2012 – 2019) from Bureau of Statistics, Gombe State. Data collected were analysed using spatial and temporal price models and net seasonal rise in price. The result revealed the existence of both positive and negative inter market price differential. The highest and lowest price spread for Billiri were recorded in June, 2015 (₦11,360) and February, 2018 (₦13,700), whereas for Yamaltu Deba they were recorded in July, 2018 (₦18,400) and July, 2012 (₦12,400), respectively. This could be due to inadequate information on prices and supply in the various markets, inefficient transportation system and other physical facilities. The highest percentage net seasonal increase in Gombe, Billiri and Yamaltu Deba were recorded in August 2012 (136.98), September 2012 (102.23) and July 2012 (160.54) respectively. It could be concluded that the pricing system of cowpea marketing in the study area was inefficient. The study recommends the establishment of adequate market infrastructures including physical buildings, road networks and storage facilities. Policy aimed at making the food distribution system efficient should be implemented. Large and sustained investment by stakeholders in cowpea marketing is also recommended so as to make cowpea production and marketing a focal business away from its present subsistence state. This can be achieved through provision of low interest loan to marketers for processing and storage activities.

Keywords: Cowpea, Marketing, Spatial, Temporal and Variation.

INTRODUCTION

The agricultural sector plays a significant role in providing employment across Africa, it is the biggest single industry employing a large proportion of labour force particularly in sub Saharan Africa where it contributes substantially to Gross Domestic Product and export. For instance, in 2023 the agricultural sector accounts for 30.1% as share of the total employment in Nigeria, (National Bureau of Statistics (NBS), 2024). The development of agriculture and the marketing systems should be at the heart of the economic growth process in less developed countries such as Nigeria. For many agricultural commodities, three facts dominate the process of marketing; agricultural commodities tend to be produced at considerable distance from centres of consumption, are often harvested within a distinct and short interval of time and consumption tends to be relatively evenly spaced in time (Nuhu *et al.*, 2009). The ability of the marketing system to allocate agricultural products over space and time has been a serious challenge. Farmers as any producers will want to sell their products at a fair profit. Hence, in order to ensure maximum profit, farmers must make their production decisions considering the most favourable place, time and form in which their products could be marketed (Haji, 2014).



The Harvard Business School defines arbitrage as an investment strategy in which an investor simultaneously buys and sells an asset in different markets to take advantage of a price difference and generate a profit (Stobierski, 2021). Arbitrage is the process whereby a commodity is concurrently bought and sold in two separate markets to take advantage of a price variations between the two markets. Spatial pricing efficiency examines how prices in different markets over space are related, especially through transportation and other handling cost. An important step toward improving the functioning of markets in this case is to understand the nature and effects of transaction costs facing input suppliers, farmers, food retailers, and/or consumers (FAO, 2016). Post-harvest loss are direct physical and quality losses that reduce the economic value of crops, or may make them unsuitable for human consumption. In African countries, these losses have been estimated to range between 20% and 40%, which is highly significant considering the low agricultural productivity in several regions of Africa (Abass *et al.*, 2013). World Bank reported that, sub-Saharan Africa alone loses food grains worth about 4 billion United State Dollars every year (Ogundele, 2022; Zorya *et al.*, 2011). Despite nutritional and economic value of cowpea, its postharvest losses have been reported to exceed 45% worldwide (Ibrahim *et al.*, 2022). In Nigeria, Nigerian Institute of Social and Economic Research (NISER) post harvest food loss Survey 2013/14, showed that average food crop losses due to farm level activities was about 25%, the highest was recorded for cowpea (30.7%) and about 4.2% post harvest food losses of cowpea was due to marketing activities (Ogundele, 2022). Grain storage means the infrastructure and processes employed to keep harvested grain so as to balance seasonal production with all year round consumption, there by adding value through time, form and place utility while facilitating economic transportation and ensuring sufficient supply to final consumers (Kenkel, 2022).

Temporal price efficiency examines prices variations through the year by the relationship of current price and expected price to storage cost. Therefore, a seasonal crop is allocated through the year by the relationship of current price and expected future price adjusted for storage cost (Tomek & Kaiser, 2014).

This study was therefore designed to measure spatial and inter-temporal price efficiency of cowpea in selected Local Government Areas of Gombe State, Nigeria. It will specifically determine the inter-market price differentials in relation to transport and other handling costs and inter-temporal efficiency in relation to storage costs and suggest measures that could improve spatial and temporal efficiency of agricultural markets in the study area.

The broad objective of the study was to analyse spatial and inter-temporal price efficiency of cowpea (*Vigna unguiculata* [L.] Walp) in selected Local Government Areas of Gombe State, Nigeria. Whereas, the specific objectives were to:

- i. analyse inter market price differentials in relation to transport and other handling costs; and
- ii. estimate expected price rise for cowpea for the period of study.

METHODOLOGY

The Study Area

Gombe State located on longitudes 9° 30' E and 12° 30' E and latitudes 8° 45' N and 11° 45' N and has a land area of 18,768 square kilometre. The state is located in the Sudan Savannah region of the country. The western and northern parts of the state are noted for their undulating planes dissected by rivers and streams while ranges and hills are predominant features of the southern and eastern parts. Sudan Savannah climate prevails and the soil is characterised by stony and basement complex. The surface soil is free draining sandy loam and moderately deep which are suitable for cereals and legumes. The climate is hot and dry for some given period of time. It experiences an alternating dry and wet season; the rainy season begins mostly from May/June and ends at September/October. Average annual rainfall of 850mm and maximum shade temperatures of 104°F has been recorded around April with humidity as low, varying from 20-30%. Average temperature is warm, not exceeding 30°C. The vegetation is guinea savannah grass land with concentration of wood lands in the southeast and southwest. The highest part lies along the western boundary with height of 494m above sea level and lowest part lies along the eastern region with a height of 433 above sea level (Gombe



State Ministry of Finance and Economic Development, (GMFED), 2006; National Population Commission (NPC), 2006). The state is the confluence of economic activities of the North Eastern part of Nigeria. It has a projected population of 3,772,2389 persons from population of 2,365,040 as at 2023 with a 3.5% annual growth rate, (Federal Republic of Nigeria (FRN) (2009). Gombe LGA, a market consuming community is multi-ethnic, mainly made up of Bolewa, Fulani, Tangale, Tera, Tula and Waja and it is mainly urban and a consumer settlement. Yamaltu-Deba and Billiri LGA's are both known for their high production and marketing of Cowpea (GMFED, 2006; NPC, 2006). The markets selected include; Gombe central, Tundun Hatsi and Pantami markets from Gombe LGA; Kuri, Dadin-kowa and Kwadon markets from Yamaltu-Deba LGA and Billiri, Bore and Ayaba markets from Billiri LGA which are all known for high intensity of cowpea marketing. Gombe central, Tundun Hatsi and Pantami markets are urban markets while Kuri, Dadin-kowa, Kwadon, Billiri, Bore and Ayaba markets are rural markets

Sampling Procedure and Sample Size

Multi-stage sampling procedure was employed. Gombe State was selected as the study area being known for cowpea production and marketing. The second stage involved purposive selection of three Local Government Areas (LGAs), one from each of the three zones of Gombe State that are prominent for cowpea production and marketing. In the third stage, three markets from each of the three LGAs were selected based on accessibility, quantity and intensity of cowpea marketers making a total of nine markets. The final stage involved simple random selection of respondent base on quota sampling from each selected market. The 10% condition for maximum sample size was adopted (Lamarana, 2024). A total population of 1090 was obtained as the population of cowpea wholesalers and retailers in the study area (Table 1). A simple random sampling base on proportionality as adopted from Adebayo (2008) in Mohammed (2019) was then employed to determine the number of respondents from each market as follows; $S_i = \frac{p_i}{P} \times Q$

Where; S_i = Sample size for each market, p_i = Population of cowpea marketers in each market, P = Total population of cowpea marketers in the study area, Q = Total questionnaires that would be administered.

Table 1: Selection Procedure of Cowpea Marketers in the Study Area

LGA	Market	Sample Frame	Sample Size
Gombe	Tudun Hasti	472	56
	Gombe central	248	30
	Pantami	32	4
Billiri	Billiri	86	10
	Bore	42	5
	Ayaba	26	3
Yamaltu-Deba	Dadin-Kowa	84	10
	Kuri	56	7
	Kwadon	44	5
Total		1090	130

Source: Pilot Survey, 2021

Method of Data Collection

Primary data were collected from both wholesale and retails of cowpea marketers using structured questionnaires complemented with oral interview to obtain information on storage, transportation and handling costs. The questionnaires were administered to members of Grain Merchant Association/Unions in the study area during the month of February, 2022. The secondary data were time series data for monthly average retail prices per 100kg bag of Cowpea for the period 2012 – 2019 obtained from Bureau of Statistics, Gombe State.



Method of Data Analysis

Spatial Price Model

The analysis employs a model of spatial price relationship adopted as employed by Yusuf *et. al.* (2020). In the model, Gombe was considered as the reference market where the parity price was calculated. The model is represented as follows:

$PP_{ij} = P_i - (HC_{ji} + TC_{ji} + AS_{ji})$, Where:

PP_{ij} = the calculated parity price of one tonne of cowpea from the *i*th market (Gombe) in relation to the *j*th markets, 1 and 2 which are Billiri and Yamaltu-Deba respectively

P_i = the actual retail price of one tonne of cowpea at the *i*th market.

HC_{ji} = handling cost involved in moving one tonne of cowpea from the *j*th to the *i*th market

TC_{ji} = transport cost for moving one tonne of cowpea from the *j*th to the *i*th market

AS_{ji} = the charge for the assemblers service in moving one ton of cowpea from the *j*th to the *i*th market.

The actual price spread between any two markets would be:

$PS_{ij} = PP_{ij} - P_j$, Where:

PS_{ij} = the price spread for one tonne of cowpea between the *i*th market and the *j*th market

P_j = the actual retail price of one tonne of cowpea in the *j*th market

PP_{ij} = the calculated parity price of one tonne of cowpea from the *i*th market (Gombe) in relation to the *j*th markets, 1 and 2 which are Billiri and Yamaltu-Deba respectively

Temporal Price Model and Net Seasonal Rise in Price

Economic theory has postulated that, in a perfectly competitive market, post-harvest price of cowpea would equal cost of storing it and thus, provides the opportunity for traders to make more than normal profit (Sani *et. al.*, 2023; Yusuf *et. al.*, 2020). In trying to investigate the impact of inter – temporal price relationship for cowpea in the study area, inter-temporal price model was used for the analyses (Tomek & Kaiser, 2014; Yusuf *et. al.*, 2020). Thus, the expected seasonal price rise in a perfect market is given as:

$E(P_{ti}) = P_{t0} + t(R + I + C + D)$, Where:

$E(P_{ti})$ = expected price per 100kg of cowpea stored in *i*th month

t = time in months; *t* = 0, 1, 2, 11 months

P_{t0} = price of 100kg of cowpea stored at harvest; *t* = 0

R = rent per month per 100kg of cowpea stored

I = interest on capital needed for 100kg of cowpea

C = Cost of chemicals used in storing 100kg of cowpea

D = depreciation on sack used in storing 100kg of cowpea

The net seasonal rise in price (i.e rise above or below the price considered consistent with storage cost) for any period is given by;

$NSRP_{ti} = P_{ti} - E(P_{ti})$ Where: $NSRP_{ti}$ = net seasonal rise in price in *i*th month

P_{ti} = price of 100kg of cowpea stored in *i*th month; *i* = 0, 1, 2 11 months

In a perfectly competitive assumption, the net seasonal rise or increase in price should be equal to zero, implying that the net seasonal price rise should equal computed storage cost.

Interest rate on capital needed for 100kg of cowpea is determined as;

$An = P(1 + r n)$, where:

An = accrued amount at the end the month; *P* = Principal amount;

R = Interest rate per annum (16.5%); *n* = number of months (*n* = 1)

$$r = \frac{R}{100} \div 12 \text{ months}$$

Depreciation on Sack Used in Storing 100kg of Cowpea is determined as;

$$D = \frac{PV - SV}{N}$$

Where: *D* = Depreciation, *PV* = Present value, *SV* = Salvage value, *N* = Number of years



RESULTS AND DISCUSSION

Inter Market Price Differential of Cowpea

The results of the monthly price spreads between each of the supplying markets (Billiri and Yamaltu Deba) and the reference market (Gombe) are presented in Table 2 and 3 respectively. Negative price spread indicates difference less than transfer cost, while positive price spread indicates difference greater than transfer cost. Except in two instances where the price spread for Billiri was zero, the price spread was either positive (116) instances or negative (74) instances out of 192 price spreads calculated for both Billiri and Yamaltu Deba markets. The highest and lowest price spread for Billiri were recorded in June of 2015 (₦11,360) and February, 2018 (-₦13,700) respectively. Whereas, highest and lowest price spread for Yamaltu Deba were recorded in July of 2018 (₦18,400) and July, 2012 (-₦12,400), respectively (Table 2 and 3). From Table 2, the mean annual price spread was positive for the period of 2014 to 2017 while negative in 2012, 2013, 2018 and 2019 for Billiri and range between highest values of ₦5,807 in 2015 and lowest values of -₦3,193 in 2018. While from Table 3, the mean annual price spread was positive for all the period studied except in 2018 and 2019 for Yamaltu Deba with the range between high value of ₦2,333 and low value of -₦3,092. These positive prices spreads imply imperfections in the market and a departure from competitive conditions which, according to economic theory provides a potential opportunity for middle men to realise excessive profits, (Nuhu *et al.*, 2009; Yusuf *et al.*, 2020). They also noted however, that positive price spreads may not only result from exploitative practices of traders but are likely to be as a result of the nature of production and defects in the marketing system. Markets in this part of the country are assumed to lack market information on changes in supply and demand conditions as a result of the significant lags associated with production which may results to price linkages being imperfect. Spatial price relationships are determined largely by transfer cost between regions. Transfer costs, which include loading or handling as well as transportation charges, are often high in relation to the farm value of agricultural commodities. Farm prices differ depending on the distance of the production area and the principal or consuming market areas.

Producer prices are invariably lower and tend to be more unstable in distant areas (Nuhu *et al.*, 2009; Yusuf *et al.*, 2020). When transportation and marketing charges represent a high proportion of the consumer price, small change in retail demand can result in large percentage changes in producer returns. FAO (2015) observed that in developing countries, inefficient supply chains and transport logistics significantly raise consumer prices and reduce farmer profit. For instance, in Yamaltu Deba, (which is closest to Gombe) there are more positive price spreads (62 instances, prices exceed transfer cost) than Billiri (54 instances) out of 96 instances for each supplying market. The further away the supplying market is from the consuming market, the more negative price spread (i.e. less gain) and vice-versa (Nuhu *et al.*, 2009; Yusuf *et al.*, 2020). The ranges of price spread from negative to positive implies that price spreads are less than or exceeds cost of transfer, which means loss or gain. Some of the positive price spread meant marketers made more than normal gain and a part could be considered as a premium for extra risk inherent in grain marketing. It can therefore be said that the market was inefficient looking at the ranges of price spreads through the eight years studied. These results are similar to findings of Nuhu *et al.* (2009), Ani *et al.* (2017) and Kaka, *et al.* (2020), in their separate studies but differs from that Sunga (2017), and Zalkuwi *et al.* (2019).



Table 2: Price Spread of Cowpea (₦/Kg) between Gombe and Billiri Markets

Month/Year	2012	2013	2014	2015	2016	2017	2018	2019
JAN	-2500	3500	-150	8720	2510	1600	1500	-6000
FEB	-3300	2700	650	6560	2510	2400	-13700	-6000
MAR	-1700	2700	1050	3360	2510	2400	2060	-7000
APR	300	-500	1050	3360	1710	0	-900	-2500
MAY	-4500	3500	250	3360	1710	800	-900	-1000
JUN	-4100	-500	250	1136	3310	0	-2100	1500
JUL	-8500	-3700	250	7360	3310	800	-5700	-3000
AUG	3500	-2100	1050	7360	3310	1600	-5700	-2000
SEP	-1300	-6100	1850	5760	3310	1600	-4900	-2000
OCT	-500	-4500	1050	5760	3310	-1840	-7940	-3000
NOV	9100	-4500	1050	5760	910	-800	4060	-4000
DEC	3500	-4500	1850	960	910	-5840	-4100	-1000
Mean	-833	-1167	850	5807	2443	226	-3193	-3000
S. E	1321	1027	181	808	269	623	1412	704
Min	-8500	-6100	-150	960	910	-580	-13700	-7000
Max	9100	3500	1850	1160	3310	240	4060	1500

Source: Bureau of Statistics, Gombe State, 2022 and Author's Computation, 2023

Table 3: Price Spread of Cowpea (₦/Kg) between Gombe and Yamaltu Deba Markets

Month/Year	2012	2013	2014	2015	2016	2017	2018	2019
JAN	400	7600	350	9860	210	3300	3600	-12200
FEB	-1200	5200	-50	-540	210	3300	-16000	-12200
MAR	-2400	2800	350	-1180	210	3300	400	-12200
APR	-400	6000	350	-540	-190	100	1200	-1400
MAY	-4400	10000	-50	2660	-590	1700	-800	-10200
JUN	-4400	2000	-50	1860	3410	100	-800	1100
JUL	-12400	2000	1150	1860	1010	900	18400	2100
AUG	-400	1200	350	7460	210	1700	4800	3100
SEP	3600	-2800	1150	5860	210	1700	3200	2000
OCT	7600	-3600	750	5860	210	-700	-2400	600
NOV	10800	-400	350	3460	210	-7100	-2400	-400
DEC	6000	-2000	1950	2660	1810	-700	-10400	2600
Mean	233	2333	550	273	577	633	-100	-3092
S. E	1790	1224	174	985	309	820	2405	1876
Min	-12400	-3600	-50	-1180	-590	-7100	-16000	-12200
Max	10800	10000	1950	9860	3410	3300	18400	3100

Source: Bureau of Statistics, Gombe State, 2022 and Author's Computation, 2023



Expected Price Rise (EP_{ti}) and Net Seasonal Rise in Price ($NSRP_{ti}$) Relationship

The expected price rise (EP_{ti}) represents the expected price of a grain stored in any particular month including the cost incurred in storage. Tables 4, 5, and 6 showed the net seasonal rise in price expressed as a percentage greater or less than expected price for Gombe, Billiri and Yamaltu Deba respectively over a period of eight years (2012-2019). The result indicated a considerable amount of variation in seasonal prices between months within a year. Cowpea is usually harvested in November to January and seasonal price movements (Tables 4, 5, and 6) showed that high and low points are consistent with the harvest period. For instance, the percentage net seasonal increase in price were positive for the month of November (61.01) and December (26.75) 2012 in Gombe LGA while it was negative for November 2013 to 2019 (-48.59, -19.87, -32.68, -12.40, -27.73, -36.58, and -45.23) as well as December 2013 to 2019 (-49.32, -39.64, -33.73, -13.72, -28.84, -62.53 and -55.75). The highest percentage net seasonal increase in Gombe (2012 to 2019) was recorded in August (136.98) of 2012. In Billiri, the highest percentage net seasonal increase in price was obtained in September 2012 (102.23) while it was negative for the month of November 2012 to 2019 (-29.26, -14.85, -27.37, -26.81, -5.98, -21.23, -45.78 and -17.47) as well as December 2012 to 2019 (-19.63, -16.09, -52.31, -10.21, -7.44, -6.19, -50.66 and -31.05). In Yamaltu Deba, the highest percentage net seasonal increase in price was in July 2012 (160.54). In the month of November, only in 2015 (0.53), 2016 (12.43) and 2017 (7.20) was the price spread positive while in December it was positive only in 2016 (19.50). Therefore, purchasing at harvest and storing until the off season may not necessarily result in the highest profit per unit (Nuhu *et al.*, 2009; Yusuf, *et al.*, 2016). As profits are not the only incentive which a market offer (Organisation for Economic Co-operation and Development (OECD), 2009). Thus, adequate and reliable information are necessarily important to attain high profit.

The net seasonal rise in price can be used to make hypothetical estimates of per unit profit of storing cowpea (Nuhu *et al.*, 2009; Yusuf, *et al.*, 2016). In Table 4, 5 and 6, the yearly average net seasonal rise in price of cowpea in 2012 was 47.88%, 28.05% and 55.58% in Gombe, Billiri and Yamaltu Deba markets respectively greater than expected price increase which indicates that considerable profit was made. However, results from this study indicates that only in eight of the twenty four instances for the three markets studied (Gombe; 2012, Billiri; 2012, 2015, 2017 and Yamaltu Deba; 2012, 2015, 2016, 2017) had the yearly average percentage net seasonal increase in cowpea prices exceeded the calculated expected increase (Tables 4, 5 and 6). This is an indication that traders might not have been making per unit profit in cowpea for almost all part of the eight years studied. This seems to suggest that traders' monthly purchases are about equal to monthly sales. The risk in storage, couple inadequate storage structures and high demand for cash by farmers at harvest after large investments during the production season necessitates for farmers to supply large amount of the product to the market at harvest. If improve storage techniques and technology can be provided, as well as loans for harvest activities, farmers can greatly benefit from storage activities which would generally improve the agricultural sector. This finding is similar to that of Nuhu *et al.* (2009), and Yusuf *et al.* (2016) but differs with the studies of Islam *et al.* (2020), Flaskerud and Johnson (2020), as they did not employ this method to study temporal price variations.



Table 4: Net Seasonal Rise in Price (NSRPti) Expressed as a Percentage Greater or Less than Expected Price for Cowpea in Gombe LGA 2012 – 2019

MTH/YR	2012	2013	2014	2015	2016	2017	2018	2019	MEAN
JAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEB	-1.91	-5.58	-7.21	-1.85	-1.76	-1.83	-50.9	-1.43	-9.06
MAR	-7.44	-7.1	-6.13	-3.63	-3.47	-3.59	-3.52	-2.83	-4.71
APR	9.03	-23.82	-10.36	-5.35	-5.11	-2.58	-5.19	-36.24	-9.95
MAY	42.75	-6.26	-1.48	11.59	-6.7	6.37	-6.81	-5.5	4.25
JUNE	40.22	-26.17	-3.1	9.67	7.05	4.56	-8.36	-46.83	-2.87
JUL	37.78	-27.29	5.38	7.82	5.31	10.52	-9.87	-47.54	-2.24
AUG	137	-28.38	3.7	6.02	3.63	13.76	-11.33	-48.23	9.52
SEPT	133	-47.07	2.08	-2.67	2.01	11.92	-12.74	-45.16	5.17
OCT	96.41	-47.84	-4.27	-4.23	0.43	-2.1	-46.32	-44.52	-6.56
NOV	61.01	-48.59	-19.87	-32.68	-12.4	-27.73	-36.58	-45.23	-20.26
DEC	26.75	-49.32	-39.64	-33.73	-13.72	-28.84	-62.53	-55.75	-32.1
MEAN	47.88	-26.45	-6.74	-4.09	-2.06	-1.63	-21.18	-31.6	

Source: Bureau of Statistics, Gombe State, 2022 and Author's Computation, 2023

Table 5: Net Seasonal Rise in Price (NSRPti) Expressed as a Percentage Greater or Less than Expected Price for Cowpea in Billiri LGA 2012 – 2019

MTH/YR	2012	2013	2014	2015	2016	2017	2018	2019	MEAN
JAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEB	4.51	-1.71	-13.00	17.56	-1.83	-4.93	-4.48	-2.07	-0.74
MAR	-12.91	-3.37	-14.51	43.69	-3.59	-6.68	-5.42	0.74	-0.26
APR	-14.44	-4.97	-18.68	40.56	-1.65	3.47	2.38	-13.02	-0.79
MAY	50.14	-6.52	-4.06	71.96	-3.36	10.35	0.61	-21.63	12.19
JUNE	44.64	-8.02	-5.64	1.02	5.55	11.29	2.60	-34.44	2.13
JUL	74.15	8.63	3.14	31.95	3.78	15.00	11.82	-11.27	17.15
AUG	71.29	-1.97	-3.58	29.31	2.07	15.83	9.98	-12.90	13.75
SEPT	102.23	-3.47	-10.10	26.77	0.41	13.91	5.84	-14.48	15.14
OCT	65.84	-13.56	-11.49	24.33	-1.19	10.20	-21.77	-16.00	4.54
NOV	-29.26	-14.85	-27.37	-26.81	-5.98	-21.23	-45.78	-17.47	-23.59
DEC	-19.63	-16.09	-52.31	-10.21	-7.44	-6.19	-50.66	-31.05	-24.20
MEAN	28.05	-5.49	-13.13	20.84	-1.10	3.42	-7.91	-14.47	

Source: Bureau of Statistics, Gombe State, 2022 and Author's Computation, 2023



Table 6: Net Seasonal Rise in Price (NSRPti) Expressed as a Percentage Greater or Less than Expected Price for Cowpea in Yamaltu Deba LGA 2012 – 2019

MTH/YR	2012	2013	2014	2015	2016	2017	2018	2019	MEAN
JAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEB	14.39	11.26	-4.67	103.38	1.78	-1.78	10.94	-1.90	16.67
MAR	20.21	28.53	-6.33	105.02	3.50	-3.50	7.51	-3.74	18.90
APR	17.95	-24.25	-10.73	94.16	3.52	10.64	2.84	-37.12	7.13
MAY	92.96	-25.56	1.48	97.44	3.55	14.98	7.76	-7.20	23.18
JUNE	89.47	3.65	-0.21	100.59	5.15	19.18	5.89	-48.01	21.96
JUL	160.54	1.91	0.82	96.33	-2.63	23.24	-58.37	-48.91	21.62
AUG	155.99	6.12	4.42	42.40	-4.04	24.21	-15.57	-49.79	20.47
SEPT	115.65	4.40	-2.37	39.50	-2.39	22.24	-11.93	-47.01	14.76
OCT	41.34	8.44	-6.42	36.72	-0.79	14.6	-33.16	-46.59	1.77
NOV	-23.56	-15.74	-20.31	0.53	12.43	7.20	-22.05	-47.46	-13.62
DEC	-17.97	-5.98	-50.94	-14.55	19.5	-16.65	-28.07	-57.70	-21.54
MEAN	55.58	-0.6	-7.94	58.46	3.3	9.53	-11.19	-32.95	

Source: Bureau of Statistics, Gombe State, 2022 and Author's Computation, 2023

CONCLUSION AND RECOMMENDATIONS

The study concluded that the pricing system of cowpea marketing in the study area are inefficient. Also, both positive and negative inter market price differential were present which could be due to inadequate information on prices and supply in the various markets, inefficient transportation system and other physical facilities. Considerable amount of variation was observed in seasonal prices between months within a year. Cowpea is usually harvested in November to January and seasonal price movements showed that high and low points are consistent with the harvest period. Only in eight, of the twenty four (24) instances for the three selected LGA markets studied had the yearly average seasonal increase in cowpea prices exceeded the calculated expected price increase. Marketing merchants might not have been making profit during most part of the period of study. The study recommends the establishment of adequate market infrastructures including physical buildings, road networks and storage facilities. Policy aimed at making the food distribution system efficient should be implemented. Large and sustained investment by stakeholders in cowpea marketing is also recommended so as to make cowpea production and marketing a focal business away from its present subsistence state. This can be achieved through provision of low interest loan to marketers for processing and storage activities.

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