Innovations

Econometric analysis of the impact evaluation of development interventions on ginger production system

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Abstract
Ginger is a therapeutic crop with global acceptability due to its medicinal and economic values. Its value chain has been staggering over time as a result of some underlined factors and their associated effects. In order to stimulate the performance of ginger value most especially, in rural communities where means of livelihood depend mostly on agriculture, development interventions needed to be put in place. In this study, the impact of interventions on ginger outputs were measured from the surveys conducted from some randomly selected Local Government Areas in Kaduna State. Descriptive statistics were used to describe the socio-economic profile of the respondents; cost and return analyses were employed to measure the profitability of the ginger production system and multiple regression techniques were used to estimate the impact of the interventions on ginger outputs. Findings from the study indicated that the ginger production system was dominated by female adults and was also a profitable scheme. This was affirmed by the monetary value obtained from the variable cost of production and increasing rate of returns from the ginger output. It was also asserted that most of the determinant factors that influenced the land productivity of the ginger growers were positively significant with attendant jobs creation.

Keywords: *Impact Evaluations, Development Interventions, Ginger output, Baseline, Endline, Multiple Regression Analysis, Socio-economic Characteristics.*

Introduction

Ginger is a crop grown expansively around the globe because of its pungent aromatic rhizome and its medicinal value. Its acceptability and economic value have grown over the years in Nigeria due to the health awareness associated with it (World Bank, 2007; Egbuchua and Enujeke, 2013). In Nigeria, it is typically cultivated in Kaduna State and listed by Nigerian Export and Promotion Council (NEPC, 2004) as one of the ten commodities that have the potentials for creating increased economic growth, opportunities for employment, increased income and wealth for the Country (Sidi et al, 2014; Ayodele and Sambo, 2014). However, the performance of ginger value chain has been staggering over time due to some factors such as inability of farmers to see the crop as a business venture; lack of interest by Nigerian authorities due to the effect of oil receipts on the economy compared to ginger; production inefficiencies, threats posed by value chain participation to small businesses

where standards on products and processes are challenging (Kaplinsky and Morris, 2001; Ponte, 2011; Kilimo Trust, 2012). Recently, the emergence of COVID-19 pandemic and the associated policies put in place by governments to curb the spread of virus also contributed to the ginger value chain shocks.

It has also been established that rural dwellers generally rely on agriculture, and as such productivity and efficiency of agricultural value chain are being enhanced. This automatically stimulates growth in the incomes and economies of rural populace (Laven et al., 2012, KADP, 2007). As a result of this, development interventions in agricultural sector now adopt value chain techniques to reduce poverty. In the light of the foregoing, interventions promoting the value chain integration should find a way of extenuating the factors responsible for the overwhelming performance of ginger value chain. This is achieved through the provision of necessary agricultural facilities and interventions that may be needed by ginger farmers. Thus, the need for this study in some selected Local Government Areas(LGAs) in Kaduna State. Specifically, the objectives of the study are to:

- describe the socio economic characteristics of ginger farmers in the area of study;
- evaluate the profitability of ginger production system;
- determine the factors influencing the ginger production system;
- identify the major constraints militating against the expansion of ginger farming
- identify the major marketing challenges faced by ginger farmers;
- measure the impact of development interventions on ginger farming operations

Geographical Distribution of Ginger Farmers by LGA$_S$

Table 1 below shows the geographical distribution of ginger farmers randomly from some LGAs in Kaduna State.

Table 1: Distribution of Ginger Farmers by LGAs

	Baseline (N = 341)		**Endline (N =212)**	
LGA	***Frequency***	***Percentage***	***Frequency***	***Percentage***
Chikun	22	6.45	12	0.94
Jaba	58	17.01	8	3.77
Jamaa	29	8.50	123	6.13
Kachia	36	10.56	74	34.91
Kaduna South	17	4.99	1	0.47
Kagarko	74	21.70	49	23.11
Kajuru	14	4.11	0	0
Kaura	11	3.23	10	4.72
Kauru	17	4.99	0	0
Lere	19	5.57	0	0
Sanga	18	5.28	0	0
Zangon	26	7.62	55	25.94

From Table 1, the highest number of ginger farmers at the baseline was from Kagarko LGA, representing 21.70% and the lowest from at baseline was from Kaura LGA, representing 3.23%. The highest number of ginger farmers at the endline was from Kachia LGA, representing 34.91% and the lowest number of respondents at the endline was from KadunaSouth LGA, representing 0.47%. Similarly, at the endline survey, there was no response rate from the ginger farmers in four LGAs (Kajuru, Kauru, Lere, and Zanga).

Table 2: Distribution of Ginger Farmers' Sex-Age by LGAs

LGA	**Baseline Surveys**				**Endline Surveys**			
	Male Adult	Male Youth	Female Adult	Female Youth	Male Adult	Male Youth	Female Adult	Female Youth
Chikun	6	2	10	4	1	1	0	0
Jaba	22	6	18	12	2	0	6	0
Jamaa	9	4	9	7	3	1	8	1
Kachia	12	7	10	7	8	9	31	26
Kaduna South	4	1	10	2	1	0	0	0
Kagarko	35	7	26	6	5	10	27	7
Kajuru	5	1	8	0	0	0	0	0
Kaura	3	2	3	3	3	3	4	0
Kauru	2	3	8	4	0	0	0	0
Lere	14	1	4	0	0	0	0	0
Sanga	7	2	7	2	0	0	0	0
Zangon	5	4	14	3	7	16	25	7
Total	**124 (36.36 %)**	**40 (11.73 %)**	**127 (37.24 %)**	**50 (23.58 %)**	**30 (14.15%)**	**40 (18.87 %)**	**101 (47.64 %)**	**41 (19.34%)**

From Table 2 above, at the baseline, largest numbers of female adults were involved in ginger farming, representing 37.24% of the total number of respondents from the twelve LGAs under consideration. This was followed by male adults representing 36.36%; followed by female youths representing 23.58%; then followed by male youths, representing 11.73%. Similarly, at the endline, largest numbers of female adults were involved

in ginger farming, representing 47.64% of the total number of respondents from the twelve LGAs under consideration. This was closely followed by female youths, representing 19.34%; followed by male youths, representing 18.87%; then followed by male adults, representing 14.15%. This shows that female adults were more active in ginger farming than any other sex-age group in the study area

Definitions of Terms

Value Chain (VC): This is a sequence of consecutive value added steps and stakeholders that participate in the creation of a process from production level to delivery of the process (product) to the market (World Bank, 2007). In other words, it is a process required to move a product from a supplier to a customer (Kaplinsky and Morris, 2001)

Production System (PS): This is an organizational set up or procedure used to transform input to output.

Development Interventions (DI): These refer to operations of a project used in the real life provided it is effective at the evaluation phase.

Impact Evaluations (IE): Impact evaluations are empirical studies that quantify the causal effects of Interventions on outcomes of interest (Asian Development Bank, 2012; Khandker, et al, 2009).

Baseline: This refers to measurements of key indicators prior to project commencement, from which change and progress can be evaluated.

Methodology

Study Area

The study was conducted in 12 LGAs of Kaduna State for baseline surveys and 8 LGAs for midline and endline surveys. This could be due to the fact that ginger is mostly cultivated in the state when compared with other states in Northern part of the country.

Sampling Method and Data Collection

A set of well structured questionnaires consisting of closed and open ended questions were used to collect primary data from the respondents. The target audience for the study was focused on the women and youth ginger farmers.

The baseline, midline and endline surveys were used as cross sectional representative household surveys for the selected respondents in the study area. The baseline surveys were conducted to measure the estimates on which performance target and implementation scale can be based before intervention.

For the baseline surveys, 341 respondents were randomly selected and for midline and endline surveys, 212 respondents were selected. The data collected included the socio economic characteristics of ginger farmers, agricultural data, and prices of farm inputs, ginger output and challenges faced by the respondents among others.

Data Entry and Analysis

Data entry was carried out in Abuja and data cleansing was conducted twice, after data entry and during the analysis of data. Data analysis was conducted using SPSS and STATA statistical softwares.

Analytical Techniques

(a) Descriptive statistics such as frequency distribution and percentage were used to describe the socio economic characteristics of the ginger farmers, identify their challenges and recapitulate the data collected from the field. Gross Margin Analysis (GMA) also was used to measure the profitability of ginger production system as specified:

$NR = TE - TC,$

where $NR = Net\ Return$ (₦)

$TE = Total\ Expenditure$ (₦)

$TC = Total\ Cost = TVC + TFC$

$TVC = Total\ Variable\ Cost; TFC = Total\ Fixed\ Cost$

$GM = GFI - TVC,$

where GM = Gross Margin (₦/Hectare)

GFI = Gross Farm Income (₦/Hectare)

TVC =Total Variable Cost (₦/hectare)

(b) Cost and Return analysis was employed to determine Operating Ratio (OR) and Return on capital Invested (RI) as follows:

$OR = \frac{TOC}{GI},$

where OR = Operating Ratio, TOC =Total Operating Cost and GI =Gross Income

$RI = \frac{GM}{TVC},$

where RI =Return on Capital Invested on Ginger production

$TVC = Total\ Variable\ Cost$

(c) Multiple Regression (MR) analysis model was used to determine the factors impacting ginger production system. This was achieved by fitting four different functional forms of MR: Linear, Semi-log, Double-log and Exponential as specified:

$$Y = c + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + \in$$

(Linear)

$$Y = c + b_1lnX_1 + b_2lnX_2 + b_3lnX_3 + b_4lnX_4 + b_5lnX_5 + b_6lnX_6 + b_7lnX_7 + b_8lnX_8 + b_9lnX_9 + b_{10}lnX_{10} + \in$$

(Semi-log)

$$lnY = c + b_1lnX_1 + b_2lnX_2 + b_3lnX_3 + b_4lnX_4 + b_5lnX_5 + b_6lnX_6 + b_7lnX_7 + b_8lnX_8 + b_9lnX_9 + b_{10}lnX_{10} + \in$$

(Double-log)

$$lnY = c + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + \in$$

(Exponential),

where $Y = Ginger\ ouput\ (kg)$

$c = coefficient\ of\ the\ parameters\ estimated$

$X_1 = Quantity\ of\ ginger\ seeds\ (kg)$

$X_2 = Quantity\ of\ NPK\ fertilizer\ (kg)$

$X_3 = Age\ (yrs)$

$X_4 = Household\ size$

$X_5 = Farm\ size\ (Ha)$

$X_6 = Labour\ cost$

$X_7 = Educational\ level$

$X_8 = Gender$

$X_9 = Farming\ Experience$

$X_{10} = Membership$ of co-operative society

$\in = the\ error\ term$

Results and Discussion

Table 3: Socio-economic Characteristics of Ginger Farmers

Characteristics	*Category*	*Frequency*	*Percentage*
Gender	Male Youth	40	11.73
	Male Adult	124	36.36
	Female Youth	50	14.66
	Female Adult	127	37.24
Age Group (years)	15-29	54	15.84
	30-35	94	27.57
	36-39	154	45.16
	60 and above	39	11.44
Marital Status	Single	22	6.45
	Married	289	84.75
	Divorced	2	0.59
	Widowed	27	7.92
	Separated	1	0.29
Educational Status	None	39	11.44
	Primary	44	12.90
	Secondary	137	40.17
	Tertiary	121	35.48
Social Disability	Difficulty in:		
	Remembering	1	0.29
	Seeing	2	0.59
	Walking	2	0.59
	Others	336	98.53
Household Size	Child	9	2.64
	Head	195	57.18
	Spouse	136	39.88
	Others	1	0.29
Farm Size	5-50 (ha)	341	100
Farm Training	LGAs	127	37.24
Membership of Cooperative society	Members	24	7.04
	Non-members	317	92.96

The socioeconomic characteristics of the ginger farmers are being discussed as presented in Table 3 above. The gender depiction shown by the result indicated that female adults (37.24%) and male adults (36.36%) dominated the ginger farming system. This implies that the production system of ginger in the study area was dominated by adults.

The majority of the farmers could also be categorized into productive age group (36-39), representing 45.16% of the total selected respondents. The implication of this is that increased
production is guaranteed in the study area since they have more potential for greater productivity than the older group.

Large numbers of the respondents were married ginger growers, representing 84.75% of the farmers with only single category less than 10% of the entire farmers selected. This could be attributed to the burden of

family responsibilities on the part of the married folks. Besides, it is generally believed in the rural setting that one of the reasons for marriage is to engage family members in farming operations. This therefore establishes the need for the active involvement of married people.

Most of the farmers had secondary school education which could be taken to be noticeable level of literacy. The level of education of the farmers determines the type of decision taken in terms of production and land managerial capacity in ginger production in the study area.

The level of social disabilities among the ginger farmers was not significantly pronounced (1.47%). Thus, the social disability of status of the farmers could not have impacted negatively on the ginger production system in the study area.

The Head and spouse groups dominated the household characteristics of the farmers representing 57.18% and 39.88% respectively. This could be a good development to improved ginger production since the duet has 'responsibility status' that controls the labour used for ginger production and the quantities of farm produce reserved for household consumption.

Farming experience is a function of farm training which serves as an underline factor that determines production level in agriculture. The more exposed a farmer is in terms of training, the better the production capacity.

The majority of the farmers representing 93% of the entire farmers did not belong to any cooperative group. This might be that they were not well informed about huge benefits they could derive for being members of a cooperative society.

The ceiling of the farm size used for growing ginger was 50 hectares of farmland. This implies that the farmlands cultivated by the farmers were relatively very expansive, and could be attributed to gifted or inherited farmlands. Since there is also a relationship between farm size and farmers' productivity, it means that the larger the farmland the higher the farmers' level of productivity (all things being equal).

Table 4: Profitability of Ginger Farming Production System (Cost and Return Analysis)

	Baseline (2020)			**Endline (2022)**		
Variable Costs	**Avg Qty /Ha**	**Units**	**Avg Exp(₦)/Ha**	**Avg Qty/Ha**	**Units**	**Avg Exp/Ha (₦)**
PRE-PLANTING						
Land clearing	1	ha	4536793.84	79.53	ha	2689400
Tractor service	1	ha	4536193.84	5.01	ha	253000
Bullock service	1	ha	22159.79	-	-	-
Manual ploughing	270	ha	10840528.72	106.45	ha	5893350
Cost of ginger	9851	kg	38063236	84765	kg	7778000
Cost of NPK	122098	kg	2374655	58160	kg	4211801
Cost of urea	231030	kg	2335353	13150	kg	2709500
Cost of organic manure	2734625	kg	301703	722020	kg	6073900
Cost of 1st liquid herbicide	3104	litrs	889350	473.65	litrs	861603
Cost of 2nd liquid herbicide	948	litrs	307100	23.75	litrs	37400
Cost of liquid fungicide	47	litrs	18200	6	litrs	8100

Cost of sachet fungicide	5	kg	35000	1	kg	1000
Cost of mulching material	13381	bundles	3315800	4764	bundles	2028500
Planting Operations						
Labour cost	290.9	ha	8344796.88	108.09	ha	5167248
Post-Planting						
Cost of mulching labour	102.05	ha	950258.94	64.70	ha	2472700
Cost of NPK application	106	ha	537530	50.84	ha	277700
Cost of urea application	85.9	ha	361580	22.88	ha	82800
Cost of organic manure	105.05	ha	728184	722020	ha	920200
Cost of 1st herb application	149.25	ha	735410	67.67	ha	322950
Cost of 2nd herb application	83.45	ha	353500	5.07	ha	15000
Cost of 3rd herb application	1	ha	8226.64			
Cost of fungicide sachet application	1	kg	4000	24.15	ha	109000
Cost of manual weeding	13.5	ha	4267857.41	92.52	ha	3615500

Harvesting Operation						
Cost of Harvest	327	ha	9511291.83	110.67	ha	6875850
Cost of harvesting bags	7869	bgs	1540850	11007	bgs	2754140
Post-Harvest Operations						
Cost of selling fresh ginger	87065	kg	184615	59650	kg	249150
Cost of processing/labour	1147910	kg	4423124	635220	kg	2769970
Cost of transporting selling dried ginger	88740	kg	1056845	87290	kg	362100
Grand Total Expenses (GTE)	**-**	**-**	100830606.46	**-**	**-**	6229097 8
Grand Total Returns(GTR)	**-**	**-**	247977144.32	**-**	**-**	1457830 84

Gross Returns Margin (GRM)	-	-	147146537.86	-	-	83492106
Operating Ratio (OR)			0.41			0.42
Return on Capital Invested (RI)			1.46			1.34

Table 4 shows the gross margin analysis, cost & return analysis of ginger production system in the study area. At the baseline, relatively high gross returns, ₦247,977,144.32 was estimated from the sales of ginger by the farmers, after investing the sum of ₦100,830,606.46 into the farming operations as gross income. The net returns (GRM) ₦147,146,537.86 realized, indicated that the ginger farmers successfully maximized profits and minimize losses in the monetary value realized from the variable cost of production. The operating ratio for the ginger farming was 0.41 which indicates that 41% of gross income was used for operating expenses. The return on capital invested (1.46) shows that for every ₦1 invested in ginger production, there is a corresponding percentage return of 146%. This clearly shows that ginger production in the study area was a productive and profitable project.

Similarly, at the endline, relatively high gross returns, ₦145783084 was estimated from the sales of ginger by the farmers after investing the sum of N84797480 into the farming operations as gross income. The net returns (GRM), N60985604 indicated that the ginger farmers successfully maximized profits and minimized losses in the monetary value realized from the variable cost of production. The operating ratio for the ginger farming was 0.42 indicating that 42% of gross income was used for operating expenses. The return on capital invested (1.34) showed that for every ₦1 invested in ginger production, there was a corresponding percentage return of 134%. This shows that ginger production in the study area was a productive and profitable project despite the fact that the volume of investment at the endline was strictly less than that of baseline.

Table 5: Regression Outcome on Determinants of Ginger Farm Output

Variables	Linear^	Semi-log	Double-log	Exponential
Constant (c)	620.4543 (3.2302)***	540.2301 (3.0532)**	4.7809 (8.9901)***	4.9800 (21.4532)***
Quantity of Ginger Seeds(X_1)	0.4708 (5.2343)***	106.6723 (5.1208)***	0.3564 (5.0633)***	0.0006 (4.5644)***
Quantity of NPK Fertilizer(X_2)	1.7756 (0.7801)*	18.4402 (0.7800)	-0.0341 (-0.4523)	0.0031 (0.3521)
Age(X_3)	5.6812 (3.8043)***	-200.5689 (-4.8012)***	-0.2672 (-2.9543)***	-0.0071 (-2.3111)***
Household Size(X_4)	16.3523 (1.1012)**	-55.7823 (-1.5245)	-0.1345 (-1.3446)	-0.0030 (-1.2578)
Farm Size(X_5)	34.6867 (2.5634)**	60.7832 (1.6733)*	0.2345 (2.9523)***	0.0710 (2.1645)**
Labour Cost(X_6)	74.6767 (0.8821)*	125.8921 (2.8667)	0.1673 (1.8012)*	0.0922 (1.4513)
Educational Level (X_7)	63.4800 (3.0412)**	158.8923 (3.3409)***	0.3800 (3.2666)***	0.1645 (2.7290)
Gender (X_8)	-724.4357 (2.8434)	-4.7223 (-2.6402)**	-548.6204 (0.6400)	-3.0612 (-1.3402)
Farming Experience (X_9)	3.0534 (0.6401)**	56.6543 (1.7245)	0.1012 (1.4244)	-0.0000 (-0.0432)
Membership of Co-operative Society (X_{10})	-3272.45 (2.4000)	0.7812 (1.0611)	0.8976 (2.6210)	0.5821 (1.8845)*
R^2	0.8965	0.8789	0.7555	0.6567
F-value	(40.23)***	(32.23)***	(30.23)***	0.3334

***, **,* are statistical significance levels at 1%, 5% and 10% respectively.^ is the lead equation.

The results of multiple regression of the factors that determined ginger farm output were shown in Table 5. The linear functional form is the lead equation as it provides the best fit. It was selected because it has the highest number of significant variables, values of coefficient of determination (R^2) and F values. The F value is significant at 10% level of significance, which largely confirms the significance of the multiple regression equations. The coefficient of determination (R^2) is 0.8965. This shows that the explanatory variables in the model explained about 89.65% of the total variation in ginger farmer output. The regression results indicated that quantity of ginger seeds, quantity of NPK fertilizer, age, household size, farm size, labour cost, educational level and farming experience were positively significant. However, other variables such as gender and cooperative membership were negatively significant. The discussions on the results obtained are highlighted below:

Determinant Factors	**Significance level**	**Relationship with ginger output**	**Inference**
Quantity of Seeds	1%	Positive and significant	The more ginger seeds planted by the farmers, the more the ginger output. This falls in line with the expectations of the farmers.
Quantity of NPK fertilizer	5%	Positive and significant	This means the more the appropriate quantity of NPK fertilizer used, the better the ginger ouput.
Age	1%	Positive and significant	Most of the farmers were at their productive ages. Young farmers are known to have more physical strengths and mental capacities to cope with the challenges needed for daily farming operations.
Household size	5%	Positive and significant	The greater the family size, the bigger the farmlands that would be cultivated by the farmers. There is a direct relationship between household size and farmland labour force.
Farm size	5%	Positive and significant	All things being equal, the size of farmland actually determines the ginger yield. The bigger the farmland, the bumper the ginger output.
Labour cost	10%	Positive and significant	This indicates that the amount of labour used by the productive farmers has direct impact on the ginger output. Agricultural production system depends on physical clout.
Educational level	5%	Positive and significant	The education level of a farmer influences his/her output. The more educated farmers are, the more their intellectual capacities improve farm output.
Gender	None	Negative	More of the female farmers were involved in ginger production with increased output than their males counterparts.
Farming Experience	5%	Positive and significant	The coefficient of farming experience was significant. The more farming experiences farmers have in terms of training, the higher the productivity and net returns.
Membership of Co-operative Society	None	Negative	Membership of cooperative society in the study area was not significant, meaning that most of the ginger farmers were not members of a society group. The implication is that farmers who were non-cooperative members would not have been privileged to access credit facilities.

Table 6: Discussions of Determinant Factors on Ginger Production System

Table 7: Major Factors Constraining the Expansion of Ginger Farm

	Baseline		Midline	
Challenges	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Inadequate Access to Improved Planting Materials	50	14.66	39	18
I Do Not Want to Expand	34	9.97	212	100
Inadequate Access to Land	43	12.61	28	13
Inadequate Access to Inputs	129	37.82	114	54
High Cost of Input	147	43.10	179	84
High Cost of Labour	126	36.95	129	61
Low Soil Fertility	14	4.11	39	18
Pests and Diseases	5	1.47	4	2
Poor Climate Conditions	13	3.81	29	14
Inadequate Marketing Opportunities	16	4.69	28	13
Household engagement in Other Activities	5	1.47	30	14
Lack of Access to Credit	170	49.85	94	44
Lack of Storage Fcailities	3	0.88	14	7
Others	18	5.28	5	2

Ginger farm expansion constraints are shown in Table 9 from multiple responses obtained from the ginger farmers at baseline and midline. The corresponding response rates for each of the challenges were also displayed and comparisons made between the baseline and midline. This was to measure level of improvement. The worst scenario was associated with the constraint of not having access to credit at baseline (49.85%), but there was an improvement at midline (44%). This was followed by high cost of input at baseline (43.10%), but no improvement at midline (84%). The finest scenario in terms of the challenges faced by the ginger farmers included pests and diseases (1.47%) and household engagement in other activities (1.47%) at baseline, but no improvement at midline. These identified challenges by the ginger farmers were threats to increased production of ginger in the study area.

Table 8: Major Marketing Challenges faced by Ginger Farmers

	Baseline		Midline	
Challenges	**Frequency**	**Percentage**	**Frequency**	**Percentage**
High Cost of Transportation	19	5.57	46	22
Low Prices in Accessible Markets	61	17.89	90	42
High Market Fees/Taxes	20	5.87	20	9
Poor Transportation Infrastructure	10	2.93	36	17
Trade Restrictions	4	1.17	18	8
Not Able to Meet Quality Requirements of Buyers	42	12.32	6	3
Unpredictable Prices	192	56.30	72	34
Lack of Price Information	22	6.45	45	21
Inability to Find Buyers	7	2.05	30	14
Farmers Organization not at Selling Commodities	2	0.59	5	2
Late/Slow Payment From Buyers	12	3.52	34	16
Others	55	16.13	57	27

The major marketing challenges faced by the ginger farmers in study area were reported by the ginger farmers, and they are shown in Table 10. Among other problems identified by the farmers, the unpredictable prices seemed to be the most pronounced at the baseline (56.30%), but there was an improvement at the midline (34%). The second most pronounced marketing challenge (low prices in accessible market) at baseline (17.89%) became major problem at midline without an improvement (42%). These indentified challenges by the ginger farmers were marring indicators against the marketing potentials of the ginger farmers in the study area.

Table 9: Expected Areas of Training for Improved Knowledge

Areas of Training for improved Knowledge	Frequency	Percentage	Rank
Farm planning	8	3	10th
Land Preparation	15	5	7th
Seed Varietal Selection	24	8	4th
Soil Water Conservation Practice	4	1	13th
Planting Techniques	25	8	4th
Weed Control	46	14	2nd
Safe Use of Herbicides	29	9	3rd
Fertilizer Applications	49	15	1st
Pest and Diseases Control	5	2	11th
Harvesting Techniques	5	2	11th
Post Harvest Management	11	3	8th
Storage Management	18	6	6th
Marketing	9	3	9th
Record Keeping	21	7	5th

Apart from the farmers that were not interested in any training for improved knowledge, a large number of them actually indicated their desires to acquire additional knowledge. This was attested to in the areas of fertilizer applications, which ranked first and weed control, which ranked second among the constraints. These areas of interest by the farmers were very germane to ginger productive and profitable systems because they have direct relationship with bumper harvest if appropriately applied. In essence, with the ginger farmers' choices of areas of training for improved knowledge, it was evidenced they were experienced ginger farmers.

Observation

The ginger farmers in the study area were prying for areas of training for improved knowledge, but virtually all of them were nonchalant to expansion of ginger production system at endline. The underlined factors attributed to this could be the market challenges of low prices in accessible markets and unpredictable prices

Table 10: Impact of Interventions on Farming Operations

Farm-Activities	Frequency of Farmers that Created Jobs	Frequency of Jobs Created
Jobs in NPK Application		
Number people engaged for NPK Fertilizer Application	96	226
Number of Females engaged	22	55
Number of Youths engaged	91	210
Number of Female Youths engaged	18	44
Jobs in UREA Application		
Number people engaged for UREA Fertilizer Application	155	82
Number of Females engaged	7	15
Number of Youths engaged	38	76
Number of Female Youths engaged	7	13
Jobs in Organic Manure Application		
Number people engaged for Organic Manure Application	170	638

Number of Females engaged	50	284
Number of Youths engaged	104	567
Number of Female Youths engaged	49	250
Jobs in First Herbicide Application		
Number people engaged for 1st Herbicide Application	148	222
Number of Females engaged	14	15
Number of Youths engaged	125	217
Number of Female Youths engaged	212	15
Jobs in Second Herbicide Application		
Number people engaged for 2nd Herbicide Application	209	13
Number of Females engaged	1	1
Number of Youths engaged	9	12
Number of Female Youths engaged	1	1
Jobs in Third Herbicide Application		
Number people engaged for 3rd Herbicide Application	0	-
Number of Females engaged	0	-
Number of Youths engaged	0	-
Jobs in Powder Herbicide Application		
Number people engaged for Powder Fertilizer Application	169	76
Number of Females engaged	4	4
Number of Youths engaged	45	74
Number of Female Youths engaged	4	4
Jobs in Manual Weeding		
Number of Occasion of Manual Weeding	212	389
Number people engaged for Manual Weeding	199	2,619
Number of Females engaged	158	2,218
Number of Youths engaged	171	1,890
Number of Female Youths engaged	151	1,659
Jobs in Liquid funigicide Application		
Number people engaged for Liquid Fungicide Application	210	2
Number of Females engaged	0	-
Number of Youths engaged	1	2
Number of Female Youths engaged	0	-
Jobs in Sachet/Powder Application		
Number people engaged for Powder Application	211	-
Number of Females engaged	0	-
Number of Youths engaged	0	-
Number of Female Youths engaged	0	-
Jobs in Liquid Pesticide Application		
Number people engaged for Pesticide Application	212	-
Number of Females engaged	0	-
Number of Youths engaged	0	-
Number of Female Youths engaged	0	-
Jobs in Mulching		
Number people engaged for Muching	191	1,066
Number of Females engaged	152	558
Number of Youths engaged	210	917

Number of Female Youths engaged	52	429
Aflasafe Application		
Number people engaged for Aflasafe Application	94	45
Number of Females engaged	4	5
Number of Youths engaged	34	39
Number of Female Youths engaged	4	5
Jobs in Harvesting Ginger		
Number people engaged for Harvesting of Ginger	209	3,376
Number of Females engaged	142	903
Number of Youths engaged	208	2,830
Number of Female Youths engaged	138	657
Jobs in Processing Ginger		
Number people engaged for Processing of Ginger	206	1,769
Number of Females engaged	118	810
Number of Youths engaged	169	1,473
Number of Female Youths engaged	111	607

Impact of interventions on ginger farming operations was expected to generate job opportunities. Table 10 showed the number of jobs created by the ginger farmers and different category of people that benefited from the jobs in the study area. The total number of ginger farmers that created the jobs through farming operations was 4014 with 27,383 beneficiaries. Out of the recorded number of the job beneficiaries, 4,868 were females, representing 17.78% of the total number of the job beneficiaries; 8,305 were youths, representing 30.33% of the total number of jobs; 3, 686 were female youths, representing 13.46% of the total jobs and other indeterminate status were 10,523, representing 38.43% of the total jobs created by the ginger farmers.

Conclusion and Recommendations

This study has investigated the impact of development interventions on ginger production system in some selected LGAs in Kaduna State, Nigeria. The findings from the study inferred that the socio-economic characteristics of the ginger farmers in the study area variegated with adults (males and Females) dominating the ginger production system. It was also revealed that most of the ginger farmers were in the married status. The gross margin, cost and return analysis conducted on the study showed that the ginger production system was a profitable scheme. This was evidenced from the monetary value generated from the variable cost of production and increasing rate of returns on ginger output. Multiple regression determinants of factors influencing the land productivity of ginger farmers showed that all the variables considered were significantly positive excluding membership of cooperative society and gender with non significant coefficients. Some of the constraints militating against ginger farming expansion and marketing challenges faced by farmers were identified for possible interventions. The study also affirmed that large numbers of jobs were created by the ginger farmers which must have resulted to poverty reduction, healthy economic growth and increased purchasing power in the study area. This has clearly attested to the fact that the main purpose for the study was well achieved.

The study therefore recommends the following:

- The youths and singles in the study area should be encouraged to delve into ginger production system because of its profitability and economic viability;
- More development interventions should be given to ginger farmers in the study area to create more jobs;
- Ginger farmers in the study area should be encouraged to form and join cooperative groups to enhance their financial, economic and productive capacities;

- Efforts should be made by relevant authorities and agencies to address the constraints militating against the expansion of ginger farming in the study area by providing access to credit facilities, farm inputs and improved planting materials;
- The major marketing challenges faced by farmers should also be addressed by relevant government agencies by reducing the cost of transportation and high market taxes, removing trade restrictions and providing good transportation network to farm settlements;
- Further investigations should be made to find out why most of the ginger farmers in the study area are indifferent to expansion of ginger production system at endline.

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