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Agribusiness Development on Provitamin A Cassava Recipes among Female Youth in IFAD-Value Chain Development Programme in Southeast Nigeria

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Abstract: ***Nigeria has been ranked as the 6th miserable country in the world. Equally, youth unemployment in Nigeria maintains its all-time maximum of 55.4%. Also, millions of children and pregnant women suffer from vitamin A deficiency in Africa. Thus, motivating the biofortification of cassava tubers with carotene. A number of agribusiness opportunity exist in this carotene embedded cassava variety, the idea informed this study on Agribusiness Development on Provitamin A Cassava Recipes among Female Youth in IFAD-Value Chain Development Programme in Southeast Nigeria. Looking out to increase women and youth involvement in agriculture, the study primarily focused to identify the socioeconomic characteristics, profitability, socioeconomic characteristics influence, and factors militating against the development of provitamin A cassava recipe agribusiness in the southeast. The mean age of the female youth was found to be 35 years with 70.0% of them been married. The benefit-cost ratio of 2.03 is an indication that the enterprise development in provitamin A cassava recipe is a viable business with twice the ability to recoup its initial capital investment. The youth's monthly income before the training was ₦26,500.00 (73.61USD), while the net-gain of ₦58,488.24 (162.28USD) is an indication that the training contributed extra ₦31,988.24 (88.86USD) to the youth's monthly income stream. This has shown that this form of training should be adopted by different agencies and policymakers for programs targeting at rural poverty alleviation.***

Keywords: Agribusiness, Provitamin A cassava variety, Recipes, Part per million, Carotene, Benefit-cost ratio, Profitability, and Net-gain

1. Introduction

Globally, about 5 million children and about 10 million women have measurable eye damage due to vitamin A deficiency. Equally, the immune system of people with vitamin A deficiency is more susceptible to various diseases (HarvestPlus 2008). Thus, cassava has great potential for providing significant amounts of vitamin A to Nigerian diets as existing cassava varieties have beta-carotene concentrations between less than 1 µg/g and more than 15 µg/g. Harvestplus (2012) noted that "Cassava with high beta-carotene can be visibly distinguished from normal cassava by its yellowish colour". In cassava, β-carotene is the most abundant carotenoids that can be efficiently converted to vitamin A (Njoku, Egesi, Gracen, Offei, et al., 2014). The development and introduction of improved cassava varieties have been recognized as one of the important strategies for transforming the cassava industrial sector and to enhance the wellbeing of Nigerians especially among rural population (Dixon and Ssemakula, 2007). In 2011, National Root Crop Research Institute (NRCRI) and International Institute of Tropical Agriculture (IITA) were funded by Harvest-plus to genetically modify/fortify Cassava with Carotene which yields about 32 to 36 tons per hectare (Ilona P., Bouis H.E., Palenberg M., Moursi M., *et al.*, 2014). IITA (2014) suggested that "Vitamin A fortified Cassava is capable of solving the problem of Vitamin A deficiency especially among pregnant women and children". Thus, the 2011 collaboration between NRCRI and IITA produced varieties of pro-Vitamin A cassava called IITA – TMS IBA011368, IITA – TMS IBA1371, and IITA – TMS IBA011412 with carotene content of 6 – 8 part per million (ppm). Three (3) years later; further research was carried out to produce a variety known as NR/07/0220, IITA – TMS IBA070593, and IITA – TMS IBA070539 with carotene content of 10 ppm capable of solving Vitamin A deficiency in pregnant women and children by 20% and 30% respectively.

Agricultural programs aiming at poverty alleviation in the rural areas are now shifting attention to developing entrepreneurs especially among women and youths who are more or less considered vulnerable in the sector. Thus, Value Chain Development Programme – IFAD assisted trained and developed the capacity of young women between the age of 18 – 30 years on how to make various confectionaries such as Chips, Cake, Breads, Chinchin, Cassimoi (Moimoi made from provitamin A fresh cassava tubers), Combo-bite, among others from provitamin A cassava tubers. This noble gesture will help to ***increase women inclusiveness*** in the program participation.

Women participants in the program are continually being engaged in agri-business. Thus, Fusonie (1995) in Fleet (2016) defined agri-business as "the sum total of all the farming operations, plus the manufacturing and distribution of farm commodities". Davis (1995) in Fleet (2016) equally noted that agri-business is the "sum total of all operations involved in the manufacturing and distribution of farm supplies, on-farm production operations, storage, processing

and distribution of farm commodities and items made from them". Chait (2014) viewed agri-business as a "dynamic and systemic endeavor that serves consumers globally and locally through innovation and management of multiple value chain that delivers valued goods and services derived from the sustainable orchestration of food, fiber, and natural resources".

The alarming rate of increasing youth unemployment in Nigeria is a major concern of policymakers. Therefore, the need to develop entrepreneurs on provitamin A cassava variety among female youth participants in the programme, in this troubled time of Nigeria economy cannot be overemphasized. Despite the effort being made by the government at a different level to create jobs in Nigeria, youth unemployment as in the third quarter of 2018 increased to 55.4% (NBS, 2019). According to Asaju (2014), there is an urgent need to create employment for women and youths in Nigeria. "Unemployment brings about widespread criminality, societal ills and social vices such as hooliganism, armed robbery, and prostitution".

Nigeria is currently ranked second in Africa with an unemployment rate of 36.50% and fifth in the world with an unemployment rate of 38.50%. Thus, Hanke misery index (2019) used the summation of the unemployment rate, inflation rate, and bank lending rate, and percentage change in the gross domestic product (GDP) per capita to postulate this misery index which Nigeria ranked sixth miserable country to live in the world. This concern should motivate the youth and women to key into agriculture as it offers a wide range of business opportunities. These facts confirmed the need to develop entrepreneurs from this provitamin A cassava variety. Thus, the study objectives were primarily to:

a) Identify the socioeconomic characteristics of the female youth trained in provitamin A cassava recipe agri-business,
b) Calculate the profitability of provitamin A cassava recipe agri-business,
c) Ascertain the female youth socioeconomic characteristics influence on the profitability of provitamin A cassava recipe agri-business, and
d) Determine the factors militating against the development of the skills acquired on provitamin A cassava recipe agri-business in the southeast, Nigeria.

2. Methodology

The Study Area

Southeast of Nigeria is one of the six geopolitical zones in the country consisting of five states (Abia, Anambra, Ebonyi, Enugu, and Imo). The region is bordered by Cameroon to the east and the Atlantic Ocean to the south. The region has a population of 16,395,555 and a land area of 41,440 km² (NPC, 2006). The region is located on latitude 5° 45' 00" N and Longitude 8° 30' 00" E. Of all the five states in the region, only Anambra and Ebonyi state is participating in the IFAD assisted Value Chain Development Programme with Enugu state recently joining the project.

Sampling Procedure and Method of Data Collection

Based on the information on the population of the trained female youth as supplied by the Programme Gender Youth Mainstreaming Officer in charge of project database, only 20 youths have been trained (10 from each Anambra and Ebonyi state) on Pro-vitamin A cassava recipes. Thus, trained female youths were subjectively selected for the study.

Method of Data Analysis

A combination of analytical tools of descriptive statistics, budgetary model, multiple regression, and principal factor analysis using SPSS 23.0, excel and Stata 14.0 software were used to achieve the stated objectives of the study. Objective one was achieved with a descriptive statistic, objective two was achieved with a budgetary model, objective three was achieved with a multiple regression model, while objective four was achieved with a principal factor analysis model. The models were further specified in equation form as follows:

A. descriptive statistics model for objective one:

$$\bar{X} = \sum \frac{FX}{n} * \frac{100}{1} \ldots\ldots Eqn.\ 1$$

Where: $\bar{X}$ = Mean, F = Frequency, X = Variables, and n = Sample size.

B. Budgetary model for objective two:

$$NR = TR - TC\ (TFC + TVC) \ldots\ldots Eqn.\ 2.1$$

$$BCR = \frac{NPV}{NPC} \ldots Eqn.\ 2.2$$

$$NPV = \frac{CI}{(1+r)^t} \ldots Eqn.\ 2.3$$

$$NPC = \frac{CO}{(1+r)^t} \ldots Eqn.\ 2.4$$

Where: NR = Net returns, TR = Total revenue, TC = Total cost, TFC = Total fixed cost, and TVC = Total variable cost, BCR = Benefit-cost ratio, NPV = Net present value, NPC = Net present cost, CI = cash inflow, CO = cash outflow, r = rate of inflation at time t.

C. Multiple regression model: the implicit multiple regression model for objective three is stated as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e) \ldots . Eqn.\ 3$$

Where: Y = Profit, β_0 - β_8 = Parameter of estimate, X_1 = Age (years), X_2 = Agribusiness experience (years), X_3 = Years of school attendant (years), X_4 = Marital status (dummy: single = 1, married = 2, widow(er) = 3, separated/divorced = 4), X_5 = Enterprise size (Ha), X_6 = monthly income (₦), X_7 = Household size (No), and e = error term.

D. The explicit function of equation 3 is stated in the four forms of linear, exponential, semi-log and double-log and the lead equation will be selected based on the functional form with the highest R^2, the highest number of significant variables (t-ratio), highest F-stat, and in conformity with the a priori expectation.

Linear form: $L = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ \ldots\ \beta_7 X_7 + e$ … Eqn. 4

Exponential form:

$$LnL = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ \dots \ \beta_7 X_7 + e \dots Eqn. 5$$

Semi-log form:

$$L = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 \ \dots \ \beta_7 LnX_7 + e \dots$$

Eqn. 6

Double-log form (Cobb Douglas):

$$LnL = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 \ \dots \ \beta_7 LnX_7 + e \dots Eqn. 7$$

E. Principal Component Factor Analysis model for objective four is stated as:

$$Xij = \delta i1Fi1 + \delta i2Fi2 + .. \delta jmFiK + eij \dots .. Eqn. 5$$

Where: Xij = observation on variable Xj for the ith sample number, FiK = score on factor FK (K = 1, 2, 3 …m), F1-Fm = common factors, eij = the value on the residual variable Ej for the ith sample number., and δji…..δjm = factor loading (regression weight)

The associated assumption will be applied accordingly while the suitable number of factors will subjectively be selected based on varimax rotated factor matrix obtained using SPSS version 23.0 software. The explanatory techniques using Principal component factor model with interactions and varimax rotation will be adopted. The factor loading under constraint (beta weight) represented a correlation of the variables (constraints areas) factors that has the same interpretation as any correlation coefficient Kaiser's criterion using factor loading of 0.30 and above in naming and interpretation. At the end; the varimax will be rotated into 3 factors which include; socioeconomic, economic and institutional factors.

3. Result and Discussions

Socioeconomic Characteristics of Youths Trained in Pro-vitamin A Cassava Recipes Development in South East, Nigeria

Information on the socioeconomic characteristics of the trained youths on the development of recipes from Pro-vitamin A cassava in the Federal Government value Chain Development Programme (IFAD assisted) in southeast Nigeria indicates that the mean age of youths trained was 35 years. This finding actually corresponds with the programme age specification for youth participants, (Value Chain Development Programme Implementation Manual, 2014). The majority (70.0%) of these youths were married with a mean household size of 8 persons. The study equally observed that 50.0% of the youths trained attended secondary school, while 30.0% and 20.0% attended tertiary and primary education respectively. The educational qualification among the youths is very impressive which is to say that, they (trained youths) can abide by some specifications and instructions attributed to the development of the recipes. The study further ascertained their monthly income level before the training. Thus, finding shows that the mean income was ₦26,500.00 (73.61USD using N360 for 1USD exchange rate). Later on in the study, monthly income before the training was used to compare the youth's income level after the training from the profitability analysis.

Table 1: Distribution of Female Youth Trained on Provitamin A Cassava Recipes according to their Socioeconomic Characteristics.

Sn	Variable	Frequency	Percentage (%)	Mean ($\bar{X}$)
1	**Age (years)**			
	≤ 30	10	50.0	
	31 – 40	3	15.0	**35.35**
	41 and above	7	35.0	
2	**Marital status**			
	Single	3	15.0	
	Married	14	70.0	
	Widow	3	15.0	
	Divorce/Separated	-	-	
3	**Household size (No)**			
	<=5	7	35.0	**8.40**
	6 – 10	10	50.0	
	11 and above	3	15.0	
4	**Level of education**			
	Primary	4	20.0	
	Secondary	10	50.0	
	Tertiary	6	30.0	
5	**Monthly income before the training (₦)**			
	≤ 10000	3	15.0	
	10001 – 20000	7	35.0	**26,500.00**
	20001 – 30000	4	20.0	
	30001 – 40000	6	30.0	
	40001 and above	-	-	

Source: Field Survey Data, June 2019.

Estimation of the Profitability of Provitamin A cassava recipe Enterprise:

Estimation on the profitability of the provitamin A cassava recipes agribusiness development shown in table 2 presented a total revenue receipt of ₦115,050.00 (319.58USD). As at the second quarter of 2019, the Nigeria Bureau of Statistics (NBS, 2019) reported an inflation rate of 11.31%, thus, considering the inflation rate of 0.1131 at this present time, the net present value of the recipes (cash inflow) is ₦103,359.98 (287.11USD). The total cost (TC) incurred in the business was ₦56561.76 (157.12USD). The net present cost (cash outflow) at 11.31% inflation rate was ₦50814.63 (141.15USD). The benefit-cost ratio was used to ascertain the viability of the enterprise for policy implication, the study shows that the business has the capacity to recoup the investment capital by 2.03 times. Equally, the study had a net gain of ₦58,488.24 (162.28USD) and return on investment of 0.93 respectively. indicating that the business makes N0.93 (334.40USD) for every ₦1 (360USD) investment made. Considering the monthly income level of ₦26,500.00 (73.61USD) before the training and the net gain of ₦58,488.24 (162.28USD) from the recipe business, using the difference in mean (₦58,488.24 - N26,500.00), the programme contributed extra ₦31,988.24 (88.86USD) to the income status of the youths.

Table 2: Estimation of the Profitability of Provitamin A cassava recipe Enterprise

Variable	Item	Qnty.	Price (N)	Amount (N)
Revenue				
	Combo-bite type 1	1000	50	50,000.00
	Combo-bite type 2	300	100	30,000.00
	Cassimoi type 1	58	50	2,900.00
	Cassimoi type 2	40	100	4,000.00
	Chinchin type 1	80	50	4,000.00
	Chinchin type 2	10	100	1,000.00
	Pro vitamin A Fufu	16	500	8,000.00
	Gari	13	1000	13,000.00
	Tapioca	43	50	2,150.00
Total revenue				**115,050.00**
Net Present Value				**103359.98**
Variable cost				
	Vit, A flour	64.2kg	250	16,050.00
	Beans	8kg	550	4,400.00
	Oil	25 liters	500	12,500.00
	Ingredients (onion, pepper, salt, nutmeg, etc.)	160	20	3,200.00
	Gas	8kg	400	3,200.00
	Foil	8	517	4,136.00
	Packaging materials	-	-	1500.00
	Label	-	-	3000.00
	Labour	25 man-day	350	8,750.00
TVC				**52,236.00**
Fixed cost				
	Dep. on extruder (5yrs.)	1	166.67	166.67
	Dep. on frying pan (3yrs.)	2	69.44	138.88
	Dep. on the gas cylinder (5yrs.)	1	133.33	133.33
	Dep. on sealing machine (3yrs.)	1	180.56	180.56
	Dep. on the table (2yrs.)	2	83.33	166.66
	Dep. on the chair (2yrs.)	6	62.50	375
	Dep. on rolling board & pin (2yrs.)	1	125	125
	Dep. on measuring spoon (2yrs.)	1	4.44	4.44
	Dep. on hand glove (2yrs.)	1	3.33	3.33
	Dep. on a perforated spoon (2yrs.)	1	8.33	8.33
	Dep. on the bucket (2yrs.)	2	6.22	12.44
	Dep. on bowls (2yrs)	2	5.56	11.12
	Shop rent /month	-	2000	2000
	Electricity	-	500	500
	Security levy		500	500
TFC				**4325.76**
TC (TVC + TFC)				**56561.76**
Net Present Cost				**50814.63**
Benefit-cost ratio				**2.03**
Net gain				**52545.35**
RoI				**0.93**

Field Survey Data, June 2019. (₦1 = 360USD)

Influence of Socioeconomic Characteristics on the Profitability of Provitamin A Cassava Recipe Agribusiness Development

The linear functional form with the highest number of significant variable and in conformity with the a priori expectation was chosen as the lead equation. Thus; the equation for the multiple regression analysis was stated as follows:

Y = 52091.2781 - 1859.7543X1 - 4874.4608X2 + 5404.2957X3 - 559.8550X4 + 1.0111X5

The coefficient of multiple determinant (R^2 = 0.5218) indicates that 52.18% variation in profit from provitamin A cassava recipe in Southeast was as a result of the joint actions of the socioeconomic variables (regressors), while the remaining 47.82% was as a result of the error beyond the control of the female youths in the recipe business. Thus:

The coefficient of age (1859.7543) was negative and significant at 1% level of probability, this implies that as the age of female youth increases by a unit, profit from provitamin A cassava recipes will reduce by ₦1859.75. Thus, age influenced the profit of the enterprise negatively. This was expected because of the ability to take a risk in any business decline with age.

The coefficient (94874.4608) of marital status was negative and not significant at any level of probability, this implies that marital status does not influence the profit of female youth from provitamin A cassava recipes in agribusiness development in Southeast.

The coefficient of household size (5404.2957) was positive and significant at 5% level of probability, this implies that as the household size increase by a unit, the profit from

provitamin A cassava recipes will increase by ₦5404.30. This is because family labour will substitute for hired labour and the money spent on labour wages will be saved and integrated into the business. Since household size supplies free labour, it, therefore, means that household size influenced profit from the business.

The coefficient of the level of education (559.8550) was negative and not significant at any level of probability. The implication is that education does not influence the profit from the business in Southeast, Nigeria.

The coefficient of monthly income before the training (1.0111) was positive and significant at 1% level of probability. This implies that as the female youth's monthly income increases by a unit, profit from provitamin A cassava recipe agribusiness will equally increase by ₦1.01.

Table 3: Influence of socioeconomic characteristics on recipes profitability

Variable	Linear	Exponential	Semi log	Double log
Intercept	52091.2781 (3.38)	-14618.1494 (-0.22)	10.8589 (30.61)	9.7785 (6.27)
Age	-1859.7543 (-2.88)**	-106350.2586 (-3.22)**	-0.0421 (-2.83)*	-2.3245 (-3.06)**
Marital status	-4874.4608 (-1.23)	-6033.8412 (-1.42)	-0.0867 (-0.95)	-0.1102 (-1.13)
Household size	5404.2957 (2.63)*	61239.3184 (2.84)*	0.1159 (2.45)*	1.2960 (2.61)*
Level of education	-559.8550 (-0.18)	-943.0108 (-0.30)	0.0100 (0.14)	0.0024 (0.03)
Monthly income before the training	1.0111 (3.01)**	32448.9097 (3.00)**	0.0000 (2.70)*	0.6700 (2.70)*
R^2	0.5218	0.5218	0.5139	0.5139
F-stat.	3.06**	3.06**	2.96**	2.96**
n	20	20	20	20

Source: Field Survey Data, June 2019. The figures in parenthesis are the t-ratios *significant at 5% and **significant at 1%.

Factors Militating against the Development of the skills acquired on Provitamin A cassava Agribusiness in Southeast.

The factors rotated in the model to determine the degree of relationship and or effect of the factor using Varimax were categorized into three (3) components of Socioeconomic Factors, Economic Factors, and Institutional Factors. Based on the matrix or rotation and variables with the strongest positive or negative correlation in a column. The first factor accounted for 45.0% of variance of factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the study area, the second factor accounted for 18.30% of variance of factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the study area, and the third factor accounted for 17.84% of variance of factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the study area. The three factors explained 81.13% of the variance of the factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the Value Chain Development Programme in Southeast Nigeria.

Factor 1 (**Socioeconomic Factor)**: age, sex, level of education, high cost of labour, absence of local fabricators, and low knowledge of rural people in the use of the products constitute the major socioeconomic factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the Value Chain Development Programme in Southeast Nigeria.

Factor 2 (**Economic Factor)**: household size, income size, lack of market for the product, and most of the products are not yet accepted local market constitute the major economic factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the Value Chain Development Programme in Southeast Nigeria.

Factor 3 (**Institutional Factor)**: marital status and inadequate fund market constitute the major institutional factors militating against the development of the skills acquired on provitamin A cassava recipes agribusiness in the Value Chain Development Programme in Southeast Nigeria.

Table 4: Factors militating against agri-business development from provitamin A Cassava

Sn	Factors	Rotated Components Matrix[a]		
		Factor 1 Socioeconomic	Factor 2 Economic	Factor 3 Institutional
1	Age	-0.700		0.658
2	Sex	-0.631		
3	Marital status			-0.826
4	Household size		0.855	
5	Income size	0.564	0.669	
6	Level of education	0.659	0.452	0.327
7	High cost of labour	0.878		0.409
8	Inadequate fund		0.499	0.765
9	Absence of local fabricators	0.942		
10	Lack of market for the product	-0.335	-0.779	0.427
11	Most of the products are not yet accepted local market		-0.892	
12	Low knowledge of rural people in the use of the products	0.864	0.315	

Source: Field Survey Data, June 2019

Eigen Value $\geq$ 0.5 indicates the major significant principal constraints the development of the skills acquired on provitamin A cassava recipes agribusiness. Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

Note: Factor loading of 0.5 was used. Variables with factor loadings of less than 0.30 were discarded.

4. Conclusion

Development of provitamin A cassava recipes agribusiness among female youths' participants in the Federal government Value Chain Development Programme (IFAD assisted) in southeast participating states cannot be overemphasized since the percentage of unemployment in

Nigeria especially among the youth is alarming. This will equally help to increase the number of women and youth inclusiveness in the programme. There is an urgent call to popularize the consumption of provitamin A cassava products since research has proven that the biofortified cassava variety has the capacity to reduce vitamin A deficiency among children and pregnant women by 30% and 20% respectively (IITA, 2014). Interestingly, the enterprise makes a net profit of ₦58,488.24 (162.28USD) that is far above the recently approved ₦30,000.00 (83.33USD) minimum wage in Nigeria by ₦28,488.24 (79.19USD). Such a measure should be adopted by various programs targeted at reducing poverty in rural areas, especially among women and youths.

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