IMPROVEMENT OF NUTRITION AND HEALTH STATUS OF VULNERABLE GROUPS THROUGH ENUGU STATE COMMERCIAL AGRICULTURE DEVELOPMENT PROJECT ON PINEAPPLE

UDENSI, EDWIN O.
efednoz@ gmail.com.
AGRICULTURAL EDUCATION PROGRAMME (ESUT.)

Abstract
The design for the study was a descriptive survey research. Three agricultural zones, Awgu, Enugu-Ezike and Nsukka were the Area of the study. Five thousand, four hundred and forty five registered farmers identified 373 members of the vulnerable groups comprising 239 males and 134 females as the population for the study. The people were randomly selected. Three experts did face validation on the instrument for data collection. Three - week interval test re-test reliability was done using Pearson product moment correlation coefficient. The score was 0.70. Enugu State Agriculture Development Project (ENSCADP) was a Federal government initiative that chose pineapple value chain among micro, small and medium scale enterprises to increase to 30% the feeding and health demands of the people. Pineapple, Ananas comosus, is a perennial herbaceous plant of the botanical family-Bromeliaceous. It is claimed that pineapple contains nutrients, which on regular consumption prevents cough, colds, strengthens bones, keeps gum healthy, lower risk of macular degeneration, alleviates arthritis and improves digestion. Therefore, the study centred on improvement of health status of vulnerable groups through Enugu State commercial Agriculture Development project on pineapple. The purpose of the study was to determine the extent pineapple products improve the health status of the vulnerable groups. Based on the results recommendations were made among which was that pineapple products should be included in food menu of hospitals, vulnerable groups, homes and centres among others.

Keywords: ***pineapple, nutrition, health, farmers, vulnerable groups*.**

Introduction

Enugu State Commercial Agriculture Development Project was a Federal Government of Nigeria initiative to diversify into non-oil sources of economic growth. The project aimed at improving agricultural production by supporting the commercialization of agriculture. The project's development objectives were among others, to improve the nutritional and health status of the people. In the (ENSCADP, 2017) submission, the key performance indicators, pineapple value chains production among small and medium scale was to be increased to 30% to meet the feeding needs and health demands of the consumers. The project was billed to last from July 2009 to May 2017 (Egba, 2011). The International Development Association (IDA), an international financial institution which offers

concessional loans and grants to the world's poorest developing countries, sponsored the project.

Pineapples are of the *Plantae* kingdom. They are of the family-*Bromeliaceae*, sub-family-*Bromeliodeace* and *Ananas comosus***,** species. Pineapple, *Ananas comosus* L. Merr is a perennial herbaceous plant of the botanical order *Poales.*

According to Gambo (2011), pineapples are of great importance. They provide vitamins and minerals. Pineapple consumption prevents cough, cold, strengthens bones, keeps gum healthy, lowers risk of macular degeneration, alleviates arthritis and improves digestion. Pamplona-Roger (2014), observed that this tropical fruit has one of the richest foods in manganese, a trace element, actively involved in formation of reproductive cells in both male and female. Fresh pineapple juice consumed before meals, reduces appetite and constitutes a good complement to weight-loss diets. It is also, slightly diuretic (facilitates urines production) and a good source of folates (Pamplona-Roger, 2016). Pineapple extract is used for production of wine, ice cream, vinegar, yogurt, alcoholic beverages and flavourings.

Pineapple production benefits are many. The farmers enjoy the following: provision of gainful employment, good source of income, improved standard of living, supply of raw materials to feed and food industry, supply of raw materials to agro-based firms such as the fruit juicing and canning firms, supply of pineapple provides revenue to the government (Udensi, 2015). Pineapple is locally grown for fresh, tasty, juicy flesh that provides not only vitamins and minerals but together with fibre that aids digestion and metabolism. It is of value industrially in pharmaceutical as meat tenderizer, in paper production as raw material; textile and confectioneries. Pineapple is made into a concentrate and used in soft drink industries as flavour. Planting of pineapple, serve in checking erosion in tropical rainforest areas (Pamplona-Roger, 2014).

Enugu State Commercial Agriculture Development project (ENSCADP) initiated pineapple project in Enugu State with one of the objectives centred on the improvement of the nutritional and health status of the people. Enugu State is endowed with excellent resources such as favourable climatic and edaphic conditions for promoting production of such indigenous fruits (Ubi & Ubi, 2017). The production of various types of food sources including pineapple is for balanced diet that promotes nutritional and health status. According to Attard-Montalto and Saha (2014) protein-energy malnutrition (PEM) follows a prolonged period of nutritional deprivations, and body protein and muscle mass decrease as a result of

catabolism out stripping anabolic processes. Green (2014) maintained that total body fat is decreased, though its deposition in the liver may be increased. Green, further narrated that minerals, especially potassium, are reduced, the total body water is increased, especially in the extracellular space. Pineapple has been analysed to contain various vitamins and minerals as well as amino-acid needed for correction of various deficiencies.

Riley and Simmons (2013) were of the opinion that electrolyte disturbances, hypoglycemia, hypothermia (fall in body temperature below 35^{o}C), dehydration, anemia, infection and vitamin deficiencies (especially A, D, E) must be corrected together with nutritional supplementation. Recovery, they reported, is characterized by the nutritional recovery, syndrome, with a progressive gain in weight (10g /kg/day) and an increased interest in the surroundings.

In considering the nutritional and health status of the vulnerable people and pineapple, one would look at the nutritional analysis of pineapple. Pamplona-Roger (2014), stated that pineapple which has been properly matured contains approximately 11% carbohydrates per 100g of raw edible portion, most of which are sugars. Pamplona-Roger (2014), pointed out that pineapples fat and protein contents are negligible. The prevalent vitamin contents are vitamins C, B_1, and B_6. Also are the facts that folates, minerals like manganese (1.65mg/100g), copper, potassium, magnesium and iron are contained in pineapple (Pamplona-Roger, 2014). Ubi and Ubi (2017), expressed that generally, pineapple is a good source of vitamins and minerals, and that about 100g edible portion of pineapple has B_6 6%, thiamine 3.6%, Riboflavin 1.2%, potassium 3mg {sic} iron 5%, protein 0.3%, fat 0.1%, water 86%, carbohydrates 13%, crude fibre 0.5%. USDA (2015) gave pineapple analysis result as follows: the nutrient of 100g MD2 fresh pineapple as water 87%, carbohydrate 12.6g, phosphorus 8mg, calories 48kcal, fibre 1.4g, potassium 115mg, protein 0.54g, calcium 12mg, sodium 1mg, fat 0.12g; iron 0.28mg, vitamin C 36mg, cholesterol 0g, magnesium 12mg and vitamin A 56 iu. Pamplona-Roger (2014) gave a general purpose composition per 100g of raw edible portion as energy-49kcal protein 0.39g; carbohydrates 11.2g; fibre 1.2g, vitamin A 2.0µg RE. Vitamin B_1 0.092mg, vitamin B_2 0.036 mg; Niacin 0.05mg NE; Vitamin B_6 0.087mg; folate 10.6µg; Vitamin B_{12} - 0; Vitamin C 15.4mg; Vitamin E 0.1mg TE; calcium 7mg; phosphorus 7mg; magnesium 14mg; iron 0.37mg; potassium 113mg; Zinc 0.08mg; Total fat 0.439 and saturated fat 0.032g.

Good nutrition is of great importance because the vulnerable groups easily fall prey to disease associated with malnutrition. These vulnerable groups include children, pregnant women, elderly people, malnourished people and people who are ill or immune-compromised (WHO, 2014). Vulnerability is the degree to which a population, individual or organization is unable to anticipate, cope with, resist and recover from the impacts of disasters (www.who.int/enviroment-health-emergencies...). In the vulnerable, Kloss (2010), revealed that the Vitamins that tended to be low were vits A_1, B_6 (pyridoxine) and C. The minerals that were often deficient were iron, calcium and mangnesium. Incidentally pineapple fruits have enough of these nutrients.

Nutritionally, pineapple plays vital roles in daily dietary requirements of children and adult as a good source of vitamins and fibre for active and reproductive life (Attard-Montalto & Saha, 2014). According to Nwafor (2013), it is a paradox that in the midst of plenty, poverty reigns with high level of malnutrition, 43% of under-five children in Nigeria are stunted, compared to 39% for all developing countries, 26% in Ghana, 25% in Benin Republic, 29% in Kenya. Nigeria ranked 158th out of 182 countries in the Human Development Index (HDI) with life expectancy of 52years; risk of maternal death of 1 in 18 and under five mortality of 186 per 1000 live births (UNDP, 2013). The use of Enugu State Commercial Agriculture Development project to combat hunger, improve the nutritional and health status of the vulnerable groups in Enugu State is a strategy that the International Development Association (IDA) deemed fit to help Nigeria.

Statement of the problem

The cry for food in the developing countries is much. Nigeria having 43% of the under-five years children stunted in growth calls for solution because nutritional shortages can result in defects in the brain and nervous system, (FAO, 2014). Fruits and vegetables are abundant in Nigeria and need be made available to these vulnerable groups, because all the nutrients required to ward off the defects are in them. Although concentrations have been on the production of cereals and root crops, to the neglect of fruits and vegetables, time has come when fruit production should be taken a bit serious, hence the use of fruits like pineapple that its nutrient content have been verified to supplement the nutritional requirements of the people. This study therefore was to improve the nutritional and health status of the vulnerable groups in Enugu State with parallel efforts to increase pineapple production.

Purpose of the Study

The general purpose of the study was to improve the nutritional status as well as the health status of the vulnerable groups through pineapple production in Enugu State. Specifically the study addressed the following:

1. the extent pineapple products of Enugu State Commercial Agriculture Development project (ENSCADP) have improved the nutritional status of the vulnerable groups;
2. the extent pineapple products of ENSCADP have improved the health status of the vulnerable groups.

Research Questions:

The following research questions guided the study.

1. What are the extent to which pineapple products of ENSCADP have improved the nutritional status of the vulnerable groups?
2. What are the extent to which pineapple products of ENSCADP have improved the health status of the vulnerable groups?

Hypotheses:

The following null hypotheses tested at 0.05 level of significance were formulated to guide the study.

Ho_1 There is no significant difference in the mean responses of males and females on the extent to which pineapple products have improved the nutritional status of vulnerable groups in Enugu State.

Ho_2 There is no significant difference in the mean responses of males and females on the extent to which pineapple products have improved the health status of the vulnerable groups in Enugu State.

Research Method

The study adopted a descriptive survey research design. This is because it describes events just as they were. In conjunction with this, Uzoagulu (2011) described descriptive research design as one that describes events as they are without any manipulation of what was observed. This design was found appropriate.

The study was conducted in Enugu State, which is located in South East of Nigeria. The State has six agricultural zones, but three were involved in the production of pineapple. The three agriculture zones were Awgu, Enugu-Ezike and Nsukka. The study was restricted to these agricultural zones.

The population for the study was 480 commodity interest groups (CIGS) comprising 5,445 commercial farmers out of which 3,497 were males and 1948 were females. These commodity interest groups helped to identify 373 members of the vulnerable groups that constituted the respondents. These were 239 males and 134 females. These respondents were randomly selected in the three agricultural zones. The instrument used for data collection was a well worded and structured questionnaire items which contained relevant item statements based on the objectives of the study. The instrument had sections I and II. Section I contained the demographic information while section II contained the questionnaire item statements on nutritional and health status. There were twenty two item statements modeled to elicit response to the extent to which pineapple products improved the nutritional and health status of the vulnerable groups. The questionnaire had a five-point rating scale of very high extent (VHE) -5, high extent (HE)-4, some extent (SE)-3, Low extent (LE)-2, and very low extent (VLE)-1, The value range for VHE was 4.50-5.0, HE (3.50 – 4.49), SE (2.50 -3.49), LE (1.50 – 2.49) and VLE (1 – 1.49). Three experts did face validation of the instrument, one from Department of Measurement and Evaluation in Enugu State University of Science and Technology while two were from Agricultural Education Department, University of Nigeria Nsukka. The instrument was also given a three-week interval test re-testing using Pearson Product Moment correlation coefficient. The reliability test gave r = 0.70.

The researcher administered the instrument to respondents using three assistants in each of the agricultural zones, while the researcher supervised the processes. The 373 respondents co-operated in answering the questions and thereby returned the filled instruments that were used for the study. Data collected were analysed using mean with standard deviation for the research questions while t-test statistics was used in testing the hypotheses at 0.05 level of significance.

Research Question 1:

What are the extent to which pineapple products of ENSCADP have improved the nutritional status of the vulnerable groups in Enugu State

Table 1: Mean and standard deviation of the extent to which pineapple products of ENSCADP have improved on the nutritional status of male and female vulnerable groups in Enugu State

S/N	Item Statements	Respondents			
	Consumption of Pineapple constituted:	Males $\bar{X}$	(N-239 SD	Female $\bar{X}$	(N-134 SD
1	Feeding on suitable diet	3.75	0.44	3.53	0.51
2	Feeding on ideal diet	3.80	0.40	3.70	0.50
3	Feeding on balance diet	3.83	0.38	3.61	0.48
4	Reduction of protein- energy malnutrition (PEM)	3.92	0.81	3.65	0.47
5	Reduction of incidence of Marasmus and Kwasiokor	3.50	0.50	3.80	0.58
6	Increase in available foods	3.58	0.49	3.91	0.56
7	Helping to meet the recommended daily allowance (RDA) of vitamins needed	3.58	0.48	3.56	0.48
8	Helping to meet the RDA of minerals needed	3.80	0.40	3.56	0.52
9	Meeting optional daily amount of 1000-6000mg vit C	3.63	0.48	3.96	0.57
10	Meeting the RDA of 1.6mg riboflavin	3.98	0.78	3. 51	0.61
11	Boosting the immunes	3.67	0.48	3.52	0.59
	Grand mean	3.73	0.51	3.67	0.53

The data in **Table 1** revealed that of the eleven item statement responded to by both males and females that constituted the vulnerable groups, their mean scores ranged from 3.50 to 3.90, all in the response category of high extent, which indicates that the pineapples of the commercial Agricultural Development Project have, to a high extent improved the nutritional status of the people. The standard deviation of all item statements ranged from 0.38 to 0.81, implying that the respondents were close to each other on the extent to which pineapple products of Commercial Agriculture Development Project have improved the nutritional status of the vulnerable groups.

H_{O1}: There is no significant difference between the mean responses of males and females on the extent to which pineapple products have improved the nutritional status of vulnerable groups in Enugu State.

Table 2: Summary of t-test analysis for the mean responses of males and females on the extent to which pineapple products have improved the nutritional status of the vulnerable groups in Enugu State.

Respondents	N	$\overline{x}$	SD	DF	LS	tcal	t-crit	Decision
Male	239	3.73	0.51	371				
Female	134	3.67	0.53		0.05	1.31	1.96	NS

Table 2 shows that the calculated t-value is 1.31 at 371 degree of freedom and at 0.05 level of significance. Since t-calculated is less than the t-critical table value of 1.96, the null hypothesis is not rejected as postulated. Therefore, there is no significant difference in the mean responses of males and females on the extent to which pineapple products have improved the nutritional status of vulnerable groups in Enugu State.

Research Question 2. What are the extent to which pineapple products of ENSCADP have improved the health status of the vulnerable groups in Enugu State?

Table 3: Mean and standard deviation of the extent which pineapple products have improved the health status of the vulnerable groups in Enugu State.

S/N	**Item statements** **Consumption of pineapple has contributed to**	**Respondents**			
		Males (N-239)		**Female**	**(N-134)**
		X	**SD**	**X**	**SD**
1	Low infection rate among children and pregnant women	3.50	0.44	3.58	0.48
2	Correcting problems of electrolyte disturbances	3.75	0.50	3.32	0.53
3	Minimizing sickness seizures	3.55	0.49	3.50	0.48
4	Minimizing peripheral neuropathies (Lack of pyrodoxine)	3.58	0.48	3.49	0.51
5	Reducing incidence of bleeding gums	3.65	0.50	3.58	0.49
6	Enhancement of wound healing	3.50	0.48	3.53	0.61
7	Increase in resistance to low grade fever	3.80	0.40	3.48	0.63
8	Lessening of cracks and sores in the corners of the mouth	3.75	0.45	3.92	0.40
9	Lessening of frayed or scaling lips	3.75	0.43	3.53	0.50
10	Facilitate urine production	3.80	0.45	3.40	0.66
11	Minimize sterility due to insufficiency of germinal cells	3.48	0.50	3.50	0.51
	Grand mean	**3.65**	**0.47**	**3.53**	**0.53**

The data in **Table 3** revealed that all the eleven item statements on the health status of the vulnerable groups had mean values that ranged from 3.48 to 3.80 for males and 3.32 to 3.92 for females. The response category fell into two divides, some extent and high extent. This showed that the males and females agreed to some extent and to high extent that pineapple products improved the health status of the vulnerable groups.

The values of the standard deviation for males ranged from 0.43 to 0.50 while that of females ranged from 0.40 to 0.66. These values no doubt showed that the respondents were close to the mean and to one another in their responses.

Ho_2: There is no significant difference between the mean responses of males and females on the extent to which pineapple products have improved the health status of the vulnerable groups in Enugu state.

Table 4: Summary of t-test analysis for the mean responses of males and females on the extent to which pineapple products have improved the health status of the vulnerable group in Enugu State.

Respondents	N	means	SD		Df	T-cal	t-crit	Decision
Male	239	3.65	0.47	371				
Females	134	3.53	053		0.05	1.31	1.96	NS

Table 4 indicated that the t-calculated value is lower than the t-table value of 1.96. This showed that there was no significant difference in the mean rating of males and females on the extent to which pineapple products have improved the health status of the vulnerable groups in Enugu State. Therefore, the hypothesis is of no significant difference was upheld for the items.

Discussion of Results

The results of the study showed that vulnerable groups nutritional status can be improved through pineapple products-whole pineapple, the juice, pineapple extract and the concentrates. It complements balanced diet, constitutes a suitable diet as well as an ideal diet. This is in consonance with Ubi and Ubi (2017) who postulated that pineapple is a food source that promotes balanced diet and improves the nutritional status of the people. The implications are that the vulnerable groups especially the children and the pregnant women, need this source of food because the various vitamins, minerals and trace elements required

for food elements to be absorbed in the body are found in pineapples. The author observed that consumption of pineapples provides even carbohydrates and protein thereby reducing problem-energy malnutrition (PEM). This collaborated with Ubi and Ubi's (2017) submission that 100g edible portion of pineapple contains 0.3% protein and 13% carbohydrates. The results no doubt lend credence to the established nutritional policy of the United Nations that evolved daily recommended allowance (RDA) of several nutrients for the body. Three united nations agencies, the Food and Agriculture Organizations (FAO), the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF)- have been particularly active as regards the general nutritional problems since their foundation. They agree that there should be increase in the available foods to the vulnerable groups.

The results of this study also agree with WHO (2014) report on immune-compromised population, that fruits including pineapple boost the immunes of the vulnerable groups. Besides, Green (2014) collaborated with the observation that consumption of pineapple has contributed to correcting the problems of electrolyte disturbances among the vulnerable, in the submission minerals, especially potassium (available in pineapple at 3mg/100g edible portion), are reduced while the total body water is increased, in the extra cellular space. Riley and Simmons (2013) submitted that electrolyte disturbances, hypoglycaemia, hypothermia, dehydration, anaemia, infection and vitamin deficiencies (especially A,D,E) must be corrected together with nutritional supplementation, and pineapple products are locally available for the corrections.

The study revealed that pineapple enhances healing of wounds. According to Mundogar (2014), lightly boiled ground pineapple are used to clean infested wounds, because it eliminates dead tissues not affecting life tissues, acts as disinfectant and accelerates cicatization. The results also showed that consumption of pineapple products contributed to increase in resistance to low-grade fever. This is in tandem with, Gastronomia's (2014), postulation that pineapple cures *cystitis* and fevers. It is also in synergy with the evidence of Mundogor (2014), that the pineapple product is an aid to heart protection and for fever.

Pamplona-Rogers (2014) analysis of pineapple revealed that the general purpose composition of vitamin B_2 in pineapple is 0.036mg/100g of raw portion and deficiency of vitamin B_2 manifests in low riboflavin absorption in the body. Simons (2014) submitted that riboflavin deficiency leads to angular *stomatitis*, *cheilosis* and *keralitis*. These symptoms manifests as cracks and sores in the corners of the mouth and loss of hair in agreement with

the results, pineapple lessens the cracks and sores in the corners of the mouth. This is also supported by Pamplona-Roger (2014), who described vit B_6 deficiency as lack of pyridoxine that results in seizures and peripheral neuropathies with occasional *cheilosis* and *seborrhoea.*

The results of the study further showed that consumption of pineapple had contributed to reducing the incidence of bleeding gums. Attarf-Montalto (2016), attributed the bleeding gums to deficiency of vit C. Attard-Montalto opined that the deficiency results in symptoms initially observed at 6-12 months with fretfulness, easy brusing, pseudoparalysis owing to *subperisteol haenatomas* and bleeding gums. Ubi and Ubi (2017) had expressed that about 100g edible portion of pineapple has vit C 20%, while Pamplona-Roger (2014), confirmed it by his general purpose composition analysis of 100g raw edible protion of pineapple, that the product has 15. 4 mg of vit C. pineapple is a natural food and Kloss (2010) opined that the best way to obtain the nutrients that are needed in the body is from natural foods the way nature prepared them and not from pills.

The contributions of pineapple as natural food are as much as the nutrient contents of the product. Ubi and Ubi (2017) observed that zinc is contained at 0.08mg per 100g edible portion of pineapple which agreed that zine prevents prostate cancer in men.

Conclusion

It is difficult to distinguish between the impact of malnutrition and diseases on the vulnerable groups because the deficiency of nutrients leads to deterioration in health status. Improvement in food supplies and availability of special foods have highly contributed to the reduction of deficiency diseases. Public health workers believe in the impact of nutrition on child's health and other vulnerable group members as revealed by a composition of death rates among these groups. Pineapple has a myriad of nutrients that could be of significance to improving the nutritional and health status of the medicinal groups. Among the different nutritional and vulnerable properties of pineapple, are helping in elimination of vitamins deficiency, *cystitis* and fever among others, because pineapple is diuretic (helps in facilitating of urine).

Recommendations

1. Pineapple production should be encouraged by every family by planting the crowns or suckers from the pineapple heads consumed.
2. Commercial farmers should increase the size of their cultivated areas to make more pineapple available.
3. Pineapple products should be emphasized in various educational programmes and curricula of tertiary institutions offering agriculture.
4. Pineapple production should be included in the enterprises and entrepreneurial skill acquisition programmes of the State.
5. Pineapple products should be included in the food menu of hospitals, vulnerable groups, homes and centres.
6. Communities with arable lands should form commodity interest groups (CIG) and co-operative society to garner, harness and generate capitals to start pineapple production.

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