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Full Length Research Paper

Assessment of soybean products acceptability and consumption in Orumba South Local Government Area of Anambra State Nigeria

***Ugwu D. S. and Nwoke U. M.**

Department of Agric. Economics and Extension Enugu State University of Science and Technology PMB 01660 Enugu, Nigeria

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This study set out to assess the extent of soybean products acceptability and consumption in Orumba South Local Government Area. Random sampling was used to collect data from 180 respondents using descriptive tools, such as mean, frequencies and percentages and likert scaling. Research questions were formulated and utilized. In addition related literatures were reviewed in relation to the knowledge base of the people about the processing and utilization of soybean products. Data collected were analyzed and the result show that soybean products have been accepted and consumed by a great number of people for the fact that its nutritive value have been made known to them. Many people have been educated on the processing and using of soybean products in different ways through interactions with fellow human beings and mass media like television. Available soybean products were found to include soybean powdered milk, soybean liquid milk and soybean flour. Some soybean products such as soybean oil, soybean cake and soybean meal were not available. It was recommended that food specialist extension workers should be sent to rural areas in order to educate the rural people on the methods of processing those soybean products that are not available in the area. Secondly, government should provide the rural people with facilities needed for the processing of these products such as grinding mills and expellers at subsidized rates as well ad and develop markets for soybean products to enable the people take advantage in the commercialization of these processed products to promote rural development.

Keywords: Acceptability, consumption, soybean products, Anambra State.

INTRODUCTION

Soybean is a farm crop that belongs to the family of legumes. It is scientifically called *(Glycine Max (L) Merrill).* It is an annual herbaceous plant which is bushy, erect and with leafy plant structure. Its height is 40 – 100cm. It is believed that soybean has been part of the history of China for about 5,000 years, but now the production of soybean is circulating to different parts of the world. The number of seeds per pod is 2 – 5.

According to Fennel, (1996) soybeans were first introduced into Nigeria in 1908, but the first successful cultivation was in 1973 with the Malayan variety, which was found suitable for commercial production in Benue state in Central Nigeria.

Singh et al. (1987) and Weingartner (1987) revealed that soybeans have been used as food for centuries and its exceptionally good nutritional value is well known. They noted that soybean contains 40% high quality protein, 20% edible vegetable oil and a good balance of amino-acid and has therefore tremendous potential to improve nutritional status and welfare of the families of resource - poor farmers.

According to Mpepereki et al. (1996), benefits of soybean over other grain legumes commonly grown by

*Corresponding author email: ugwuds@yahoo.com
Tel: 234-8035673526

small-holders, such as groundnut (Arachis hypogea), cowpea (Vigna unguiculata) and common bean (Phaseolus vulgaris) include lower susceptibility to pests and diseases, better grains storage quality, a large leaf biomass, which gives a soil fertility benefit to subsequent crops and a secure commercial market for the crop. Nigeria is the largest producer of soybeans for food in West and Central Africa.

Osho (2003), though still largely regarded as a relatively new crop, soybean has made a successful incursion into the diet of many Nigerians, particularly children and nursing mothers. Soybean derivatives such as soy-gari, soy-milk, soy-ogi, soy-ebiripo and soy-lafun have been developed and found to be good substitutes for more conventional food ingredient like melon, cow-milk and cowpea. Therefore, the value of soybean both for satisfying human dietary needs and for compounding livestock feeds cannot be overlooked. There is need to stimulate and encourage the production of soybeans.

However, studies by Ogundipe and Osho (1990) and Osho et al. (1994) have shown that despite the high nutritional value of soybean relative to other legumes, lack of knowledge of its uses has limited its adoption, consumption and production in Non-traditional areas of cultivation.

Meanwhile, Africa's serious malnutritional problem is especially acute in terms of protein deficiency. Livestock constitute the major source of protein for human consumption but a combination of factors including the fall in foreign exchange earnings, the recent persistent drought and the poor performance of indigenous animals have led to situation where the prices of such conventional livestock products such as meat, eggs and milk have risen beyond the reach of the ordinary man. There is, therefore, an urgent need to seek for alternative source of high quality cheap protein. Soybean has the potential to meet part of this need.

The bean is said to have more protein than beef, more calcium than milk and more of a fatty substance called Lecithin than eggs. The soybeans protein have been developed for use in hospital diets, particularly for post – operative diets and soybean flour protein concentrates and isolates have been incorporated into infant foods, such as rice-and – wheat based foods, in order to increase protein content. The soy flour is used to make bread, pudding, pancakes, soup thickener and other foods.

Soybeans are also processed for oil. About one-fifth of the bean is oil. In the early 1970s, over 80% of the soybean oil produced in United States was used in edible products such as margarine and cooking oils. Industries use soybean oil to make such products as paints and inks. Also lecithin from soybean is used in candy, bread and drugs. In addition, soybeans are rich in vitamins, minerals and acids. These acids can also be called biological active substances or anti-nutritional factors and examples are lipoxygenase, trypsin inhibitors, phyticacids and haemaglutinin.

However, Nigerian food scientists have discovered the high nutritional content or value of this crop and they are now creating awareness and advertising to people on the uses of this crop soybeans. Also, Adjebeng-Asem and Osho (2002) said that numerous efforts have been undertaken by research institutes, NGO and industries to promote the production of the crop in Nigeria to bridge the gap of limited adoption and production in Non-traditional areas.

Problem Statement

Soybean has been used as food for centuries because of its good nutritive value. According to Singh et al. (1987) and Weingartner (1987), the bean has about 40% protein content and contains about 20% by weight of edible oil. In addition, the bean is rich in vitamins, minerals and acids.

Meanwhile, Africa's serious malnutritional problem is especially acute in terms of protein deficiency. Livestock constitute the major source of protein for human body, but a combination of factors including the recent persistent drought and the poor performance of indigenous animals have led to the situation where the prices of such conventional livestock products such as meat, eggs and milk have risen beyond the reach of ordinary man. In view of this problem an alternative source of high quality cheap protein was sought for and soybean was found to have the potential to meet part of this need.

Soy-protein has been developed for use in hospital diets particularly for post-operative diets and soy flour protein concentrates and isolates have been incorporated into infant food as rice to increase their protein contents.

The realization of the good nutritive value of soybean by the Nigerian food scientists necessitated the awareness campaign mounted by the various arms of government in recent times to educate the populace on the processing, production and consumption of the soybean products. This notwithstanding, it was deemed necessary to answer the following research questions:

- To what extent have people been educated on the processing, use and importance of soybean products?
- What are the processed soybean products available for consumption in most rural communities in Nigeria?
- To what extent have people consumed and accepted soybean products in Nigeria?

In order to address these pertinent issues, the assessment of soyabean product acceptability and consumption in Orumba South LGA of Anambra State was carried out.

Objectives of the Study

The primary objective of this research is to assess the level of soybean products acceptability and consumption in Orumba South Local Government Area. The specific objectives are to:

1. describe the socio-economic characteristics of soybean farmers/producers and marketers in Orumba South L.G.A.
2. identify and describe the various types of soybean products and their uses in the study area.
3. assess the knowledge base of the people in the locality about processing and utilization of soybean products in Orumba South L.G.A.
4. determine the level of acceptability and consumption of soybean products in the area.
5. identify the problems/constraints in processing and use of soybean products in Orumba South LGA.
6. make recommendations based on the findings of the study.

Literature Survey

Acceptability of Soybean

Soybean *(Glycine Max L.)* is a legume that grows in tropical, subtropical and temperate climates. Approximately half of the world's soybeans are produced in the developing world, and the other half in the developed world. It is believe that soybean is one of the oldest crops grown by man.

In 1920s, the United States produces about three-fourths of the World's soybean crop. In the early 1970s, it grow more than I billion bushels (27 billion kilograms) a year on about 42 million acres (17 million hectares).

Besides the United States, the countries that are leading in soybean growers include: Brazil, China, Indonesia and Russia. The crop is also grown in Argentina, Canada, Columbia, Japan, Mexico, Nigeria, Paraguay, South Korea, Taiwan and Thailand (Houghtin, 1984). According to FAO of (2005), the total land area under soybean cultivation in the world was 95.2million hectares and total production was 212.6 million tons. In relation to Africa, FAO (2005) showed that soybean was grown on an average of 1.16 million hectares with an average production of 1.26 million tons in 2005. Africa countries with the largest area of production were Nigeria (601,000 ha) South Africa (150,000 ha), Uganda (144,000 ha). Nigeria's soybean production increased from about 28 metric tons in 1985 to about 200,000 tons in 1995. The 1995 crop was worth an estimated US $60 million.

Since then, soybean production consumption and acceptability have continued to increase. The numbers of soyabean farmers also increased tenfold to about 500,000 though the entire soybean they produced are being used domestically.

Osundahunsi et al. (2007) said that acceptability of soybean products has been enhanced by modification of processing methods. Today, soybean is planted on more than 70 million acre annually in the US more than any other single crop except corn (in most years; (NASS, 2003).

Processing of Soybean Products

Soybean can be processed into different products such as soybean oil, soybean meal/cake, soymilk, soybean fortified 'gari' and tapioca, soy- ebiripo, soy-tortilla and cereal-based traditional weaning food etc. Variations in processing methods also yield a host of co-product. Soybean processing involves series of steps to produce commodities for food, industrial and animal feed uses. These include: (i) threshing (ii) transport from fields to the threshing or drying sites and to store houses or to collection centres and finally to processing industries where they are processed into different products. (iii) drying (iv) cleaning or elimination of impurities and debris from the harvested crops, (v) packaging (vi) storage (vii) final processing into other products (Dugje I.Y et al., 2009).

Soy-milk Processing

Ahmed (1984) and Soyabe (2006) described the process of production of soymilk from soybeans. According to the author, soymilk is made by soaking soybeans over night in water, drain, rinse and discards the water. In a food processor or blender, process beans with water until smooth. Strain into a pot through a double layer of a fine sieve. Add ginger and sugar to taste. Boil soymilk for about 20 minutes. Stir frequently to prevent skin from forming. Remove ginger, then flavour with vanilla. Stir in sugar to taste. Cool to room temperature, then refrigerate. The milk is a white or cream emulsion which resembles cow milk (Conventional milk) in both appearance and consistency.

Osundahunsi et al. (2007) revealed that acceptability of soybean products has been enhanced by modification of processing methods. Some of the modified soymilk extraction method includes application of heat, soaking of soybean in ethanol or alkali and acid grinding. Iwe and Agu (1993) suggested the use of natural flavourants to improve soymilk production.

Dashiell et al. (1990) reported that the increasing popularity of soymilk as a beverage world wide is credited to health benefits, example low cholesterol and lactose, its ability to reduce bone loss and menopausal symptoms

prevention, and reduction of heart disease and certain cancers.

Fortification of Soybean with Maize

In Nigeria and other countries in Africa, maize grains are fermented to give "Ogi" (Oke 1976). Maize protein is deficient in lysine and tryptophan but has fair amounts of sulphur-containing amino-acids, (Bello-Perez et al, 2003). Fortification of soybean product with maize has the potential of creating a valuable food product. Improvement of the qualities of tortilla (Maize product) through soybean fortification has been reported (Obatolu et al 2007).

Fortification of Soybean with Cocoyam

Ebiripo is solely made from cocoyam which is known to be poor in protein and other nutrients. This product can then be regarded as being poor nutritionally. Therefore there is need to improve the nutritional status of the food by way of fortification. The combination of cocoyam and soybean in the processing of ebiripo brings about a nutrient complementability.

Soybean Flour Processing

Soybean flour is prepared by picking whole soybean grains boiled for about 25 minutes, hand peeled to remove the peels and sun dried for 2 days, and ground into flour.

Soy-oil Processing and Refining

Soybean oil can be extracted through two different processes- (a) Solvent extraction (hexane) (b) Mechanical extraction.

(a) **Solvent Extraction of Soy-Oil from Soybeans**

Tysinger et al. (2003) revealed that soybean oil production involves several steps that are necessary to render the oil suitable for human consumption. These production steps may be broadly characterized as (i) soybean preparation (ii) Oil extraction and (iii) Oil refining. Soybean preparation generally includes steps of cleaning, drying, cracking and dehulling.

The great majority of commercial soybean oil production processes extracts or separate the oil from the soybean meal by solvent extraction process.

In solvent extraction process, the beans are flaked during preparation to provide a large surface area. Then the flakes go to extraction tower, oil is washed from flakes in extraction tower. A solvent, commonly hexane, is then pumped through the soybean flakes to wash out more oil and to dissolve the oil in the hexane, making new oil-solvent mixture; oil-solvent mixture is sent to the tank for use in extractor. Solvent mixture washes oil down into collecting tank and filters, and evaporator separate approximately 99.5% of the oil from the meal. The hexane is then separated from the oil and recycled.

According to the authors, the crude oil resulting from the solvent extraction must then be subjected to one or more additional treatments, collectively called "refining" to remove various materials in order for the oil to be suitable for consumption. These materials include hydrated and non-hydrated phospholipids, free fatty acids, and various colour and flavour components. Crude soybean oil contains phosphorus compounds called hydratable phospholipids and small amounts of calcium and magnesium that complex with a portion of the phospholipids to form non-hydratable phospholipids.

According to Rohdenburg et al. (1993), hydratable phospholipids are normally removed by a process known as "degumming" in which the oil is agitated or otherwise intimately combined with water to precipitate gums from the oil. The gums are then removed by centrifugation. The degummed oil is under vacuum to remove any water.

Tysinger et al. (2003) stated that the removal of non-hydratable phospholipids is considerably more difficult and expensive, requiring further chemical treatment, typically chemical refining to break down the chemical bonds between the calcium or magnesium ions and the phospholipids, followed with extensive bleaching of the oil. In most processes, free fatty-acids are removed from the oil by a process known as caustic refining, also called chemical or alkali refining, in which oil is mixed with a caustic material, such as sodium or potassium hydroxide, which undergoes a saponification reaction with the acids, forming soaps that are removed by centrifugation. Non-hydratable phospholipids are removed along with the free fatty-acids.

Conventional refining processes also involve some bleaching of the soybean oil to remove color pigments that adversely affect the colour of the oil. Finally, chemicals that add flavors to oil are removed by a process known as "deodorization", which is essentially a form of distilling, in which the oil is subjected to high temperatures under a vacuum for a short period of time, which is sufficient to remove the flavor – causing components but not sufficient to break down non-hydratable phospholipids.

b) **Mechanical Extraction of Oil from Soybean**

Tysinger et al. (2003) reported that soybean oil can also be extracted mechanically in which the soybeans are subjected to high temperatures and pressures. For ex-

ample, the dehulled beans may be extruded through a screw extruder to frictionally heat the beans and rupture the oil cells. Within the screw extruder, the beans are subjected to high pressures and frictionally generated high temperatures for a short period. The crushed oil-containing meal is then expelled or mechanically pressed to separate oil from the meal. About 25%, of the total soybean oil is left in the meal by this process.

Tysinger et al. (2003) and Silkeberg et al. (2000) further described the process in which free fatty acids and other impurities may be removed from mechanically extracted soybean oil by physical refining. In physical refining, the oil is vacuum distilled at high temperatures e.g. from about 450^{o}F to about 500^{o}F, to separate more volatile components from the oil. This process is used to remove free-fatty acids and other impurities from the oil.

Processing of Soybean Meal

Soybean meal is what is remaining after the extraction of oil from soybean. The de-oiled flakes, which contain the protein is then toasted to remove the trypsin inhibitor. This product is commonly referred to as dehulled soybean meal, low oil, high carbohydrate product with about 48% crude protein. It can be blended with grounded soybean hulls to produce a meal with about 44% protein. The toasted flakes and hulls are steam-cleared, cooled and screened. After screening, it is pasteurized and stored in sacks as soybean meal or full-fat-soya. Full-fat-soya, produced without the fat extraction step, but treated to reduce anti-nutrient content also used in aquaculture feeds.

Preparation of insitu-extracted soybean meal (ISE – SBM) is described (Haas and Scott, (2007)) flakes were dried in a convention oven to less than 1% moisture, determine gravimetrically. In a typical reaction 2.25kg of dried flakes is then mixed by gentle rolling at room temperature in a sealed container with 5.75L of 0.1N dry NaoH in anhydrous methanol. After 5.5hr the agitation is stopped and the liquid removed by filtration. The flakes were then washed twice by suspension for 5 minutes in 3.2l of anhydrous methanol and recovered by filtration.

Problems and Prospects of Soybean Processing

A key problem associated with utilization and processing of soybean is the presence of certain anti-nutritional factors which may inhibit the availability of the desired nutrients such as protein and minerals. Some of the prominent anti-nutritional factors in soybean include trypsin inhibitors, hemaglutinin, phytic acid, goitrogen, urease activity and flatulence causing factors (Starchyose and raffinose) (Osho and Dashiell, 1995). The significance of soybean trypsin inhibitors (TI) lies in their implication in inhibiting the pancreatic enzymes (trypsin and chymotrypsin) resulting in reduction in protein digestibility both in humans and animals. It also causes hypertrophy of the pancreas in smaller animals like cats and chicks. In addition to trypsin inhibitors, several other anti-nutritional and/or allergenic compounds associated with carbohydrate fraction exist in soybean glycinin, Beta - conglucinin, Oligosaccharides, lectins and Saponins, (Liener, 1994). Some specific types of carbohydrates in soybean meal can impart a “beany” taste and may influence its palatability.

According to Iwe and Ngoddy (2000), most commercially available soybean production intended for human such as tofu, soybean milk, soybean - based infant formular, soybean protein isolated and concentrates and textured meat analogues have received sufficient heat treatment that cause inactivation of at least 80% of the trypsin insribitiors (TI) present in raw soybeans. This level of TI destruction is well above the threshold of 50 to 60% inactivation found to be necessary for eliminating significant growth inhibition and pancreatic hypertrophy in rats (Rackis et al., 1976).

Efforts have been made to inactivate or remove trypsin inhibitors from soybean, Osho and Dashiell (1995), Keshun (1999) and Iwe and Ngoddy (2000) reported that many approaches had been based largely on heat treatment.

Poet et al. (1990) and Camire et al. (1990) reported that PDI could be used as a chemical indicator for inactivation of anti-nutritional factors and effect of functional properties.

Many of these anti-nutritional factors can be selectively removed by solvent (aqeous alcohol) extraction or by isoelectric leaching method that produces a range of product with elevated protein content. These products include soy protein concentrate and soy isolate, which have protein contents of ± 70% and ± 90% respectively.

One of the most important factors inhibiting the acceptance of soybean and products is the “beany” flavor problem (Wolf, 1975). This flavor is hardly evident in the raw whole beans but develops after the breakdown of the cell structure and is still evident after cooking (Nandaine et al., 1987).

After the rupture of the soybean cell, the inactive lipoxygenase is activated by its contact with oxygen and the enzyme lipoxygenase then catalyses the oxidation by molecular oxygen of polyunsaturated lipids containing a cis-cis 1:4 pendadiene molety, resulting in rancid off-flavours and poor storage stability (Hinchdiffe, 1975).

The oxidation products is further decomposed to middle aldehydes and alcohols and these are major contributors to the undesirable beany flavor and sometimes bitter taste in soybean products (Fujimaki et al., 1865, Wolf, 1975). In order to deactivate lipoxygenase in soybeans by soaking them in ethanoic

solution at 25° C for 24 hrs. Finally chemicals that add flavours to soybean products are removed by a process known as a "deodorization", which is essentially a form of distilling, in which product is subjected to high temperature under a vacuum for a short period of time, which is sufficient to remove flavour – causing components (Tysinger et al., 2003).

However, Hymowitz and Bernard collaborating scientists in the international soybean program (INTSOY) have recently announced the development of soybean lines that are free of the Kuntz inhibitors. These lines may reduce the cost of processing needed to make soybean suitable for human food and animal feed.

RESEARCH METHODOLOGY

Area of the Study

The study was done in Orumba South Local Government Area (LGA) of Anambra State, Nigeria. Orumba South is one of the 21 Local Government Areas in Anambra state.

Geography

It is situated at the latitude 6° 5´ North and 7° 11´ East of longitudes. Orumba South local government area shares boundaries on the North with Orumba North local government area, North-West with Aguata L.G.A, North-East with Orji River L.G.A of Enugu State. Relative humidity ranges from 700mm – 900mm and temperature of 28°c – 29°c. It is in the rainforests belt with two (2) annual peak rainfall (mid June – July and September). There is little rainfall between (October to February – March).

Demography

Orumba South has a landmass of about 250 sq km with a total population of about 87,747 (National Population Census, 2006). The people are ethnically is Igbos with little of other tribes like Hausa and Fulani as a result of good forage grasses and range land for cattle and sheep production.

Politically, Orumba South is made up of 16 autonomous communities namely: Umunze, Akpu, Umuomaku, Eziagu, Ezira, Ubaha, Ihite, Nkerehi, Nawfija, Ogboji, Ogbunka, Owere – Ezukala, Agbudu, Onneh, Isulo, and Enugwu-Umuonyia. Orumba South has its headquarter at Umunze.

Socio-economic activities

The major occupations are farming and trading in all types of general goods and agricultural produce. Also livestock farming is appreciably practiced with major livestock such as goat, sheep and poultry.

Sampling Techniques

Six (6) communities towns out of 16 in total were randomly selected for the study. The selected communities were Umunze, Isulo, Ezira, Owerre-Ezukala, Nkerehi and Ihite.

Ten (10) each of soybean products sellers, breast feeding mothers and rural dwellers were randomly selected from each of the 6 communities. This gave a total of 180 respondents that constitute the sample for the research.

Data Collection

Data were generated from both primary and secondary sources. Primary data were collected with the aid of well structured questionnaire. The questionnaires was designed to capture relevant background information of the respondents, their acceptability and consumption of available soybean products as well as the problems militating against the processing of some of the soybean products. Secondary data were sourced mainly from the review of available literature, both published and unpublished. It consists of the review of relevant textbooks, journals, magazines and the internet, among other sources.

Data Analysis

Data generated were analyzed using descriptive tools such as percentages, mean, frequency and likert scaling.

Frequency and percentage were used to analyse the socio-economic characteristics of the respondents and the problems/constraints in processing and utilization of soybean products in the study area.

Mean and Likert scaling were used to identify the various types of soybean products and them uses; assess the knowledge base of the people about processing and utilization of soybean products as well as the level of acceptability and consumption of soybean products. Likert scaling was based on a four point rating scale of strongly agree (SA), agree (A), strongly disagree (SD) and disagree (D) with assigned nominal values of 4, 3, 2 and 1 respectively. In determining the cut-off point for decision, any item that received a mean score rating of 3.0 and above was regarded/adjudged as 'agreed' while the item that received a mean score lower than 3.0 was regarded as 'disagreed'.

Table 1. Socio-economic characteristics of the respondents

Variable	Frequency	Percentage (%)
Age:		
Below 20	25	13.9
21 - 30	30	16.7
31 - 40	70	38.9
41 – 50	40	22.2
50 and above	15	8.3
Gender:	84	46.7
Male	96	53.3
Female		
Marital Status:	98	54.4
Married	38	21.1
Single	20	11.1
Divorced	24	13.4
Widow		
Level of Education:	6	8.9
No formal education	40	22.2
Primary education	30	16.7
Secondary education uncompleted	74	41.1
Secondary education completed	20	11.1
Tertiary education		
Family Size:	45	25
0 – 4	45	25
4 – 6	60	33.3
6 – 8	30	16.7
Above 8		

Source: Field Survey, 2010.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

These are with respect to age distribution, gender, marital status, educational level, occupation, family size etc. Results of the findings are presented in the table 1 above. From table 1 above, 38.9% of respondents fell within the age range of 31 – 40 years while 22.2% of them fell within the age group of 41-50. Again 16.7% of the respondents belonged to 21-30 age group and 13.9% of them were below 20 years while the respondents above 50 years constitute 8.3%.

In all, majority of the respondents were the age group of 31- 40 years which is regarded as the active productive age, meaning that the population is active. It also implies that processing and use of soybean products are in the hands of this age group which constitute the active population. It further implies that soybean product acceptability and consumption can be further enhanced or encouraged in Orumba South L.G.A of Anambra state. With respect to gender, 46.7% of the respondents are male while 53.3% of the respondents are female. This shows that although females are in the majority, soybean product consumption is not restricted to any gender. It has equally shown that the acceptability of the crop within area is high, indicating that the crop is very popular within Orumba South LGA of Anambra state.

Survey results showed that 54.4% of the respondents were married and 21.1% of them were single, 11.1% of them were divorced and 13.4% of the respondents were widowed while this shows that both the married, single, divorced, and widows accepted and consumed soybean products in Orumba South L.G.A

Furthermore, the distribution of respondents based on their educational level showed that 8.9% had no formal education while 22.2% had primary education, 16.7% had secondary education uncompleted while 41.1% of them completed their secondary education. Only 11.1% of them attained tertiary education.

From the above, a greater number of soybean product consumers, marketers and processors in Orumba South L.G.A. are educated. Since the population is literate, it makes the diffusion and adaption of any technology on

Table 2. Mean distribution of the available soybean products for consumption.

S/n	Items	SA	A	D	SD	Mean(X)	Remarks
	Scores:	4	3	2	1		
	Soybean products processed and used in the locality:						
1	Soybean oil	24	36	60	70	2.2	Disagree
2	Soybean meal	63	45	45	27	2.7	Disagree
3	Soybean powdered milk	79	63	20	18	3.0	Agree
4	Soybean flour	78	60	20	22	3.1	Agree
5	Soybean liquid milk (soymilk)	72	81	27	-	3.3	Agree

Source: Field Survey, 2010.

soybean products production and processing since these are it dependent on the level of literacy.

In terms of family size, 25% of them had between 0 – 4 and 4 – 6 children respectively, 33.3% had 6 – 8 children while 16.7% of the respondents had family size above 8 persons. All the respondents had family size of at least 4 persons. This implies that majority of the respondents had moderate family size which could be attributed to high level of enlightenment or exposure.

Available soybean products for consumption in the locality

Table 2 above represents the frequency of responses and the mean distribution or score per item on the available soybean products for consumption. From the table, items number 3, 4 and 5 have the mean scores above the cut-off point 3.0. Items number 1 and 2 have mean score below the cut-off point. This implies that items with mean scores above the cut-off point 3 are readily available in the locality while items with mean scores below the cut-off are fairly or not available in the locality. The analysis results showed that soyabean powdered milk, soybean flour and soybean liquid milk (soymilk) are readily available in Orumba South LGA. On the other hand, soybean oil and soybean oil are rarely found or processed in the area.

The knowledge base of the people about processing and utilization of soybean products

Table 3 below represents the frequency of respondents and the mean scores per item on the information on the knowledge base of the people about processing and use of soybean products. Item numbers 3, 4 and 5 have mean scores above the cut-off point of 3.0. Item numbers 1 and 2 have mean score below the cut-off point. Survey results showed that the majority of adult population has been reached mainly with the knowledge and skill in soybean processing and utilization through the mass media, interaction with other people, hospitals and clinics. Extension service delivery on soybean technologies appear to be ineffective since majority of the people did not benefit through this channel. Majority of the respondents got the knowledge on the processing and use of soybean products through interaction with other people, mass media like television, radio, health magazines, cookery books and at the hospitals, maternity and clinics.

Level of acceptability and consumption of soybean products in the locality

Table 4 below represents the frequency of responses and the mean scores per item on the level of acceptability and consumption of soybean products in the study are:

From the table, all the items have mean scores above the cut-off point 3.0. This implies that soybean products are widely accepted and consumed in Orumba South L.G.A of Anambra state. Soybean products are widely accepted and consumed by over 50% of adults, 60% of house wives, and over 90% of growing children.

Survey results showed that 5.6% of the respondents opined that poor transportation system was a critical problem in the processing and use of soybean products in the area. Furthermore, 27.8% and 16.7% of the respondents respectively noted that inadequate financial resources and lack of market information constituted major challenges. Again, lack of processing facilities and methods (38.9%) and non-availability of improved storage facilities (11.0%) were also found to be problems/constraints associated with the processing and utilization of soybean products in Orumba South LGA. Figures in parentheses are percentage respondents table 5 below.

Table 3. Distribution of respondents according to their knowledge base on processing and utilization

S/n	Items	SA	A	D	SD	Mean(X)	Remarks
	Scores:	4	3	2	1		
1	Literate adults have been educated on the processing and utilization of soybean products.	60	63	36	21	2.9	Disagree
2	A good number of adults have been educated by the extension workers on the processing and use of soybean products.	54	70	30	26	2.8	Disagree
3	A good number of adults have been educated on processing and use of soybean products.	72	72	27	9	3.2	Agree
4	Expectant and nursing mothers have been educated on the processing and use of soybean products in hospitals, maternity and clinics	63	108	9	-	3.3	Agree
5	A good number of adults have the knowledge about processing and use of soybean products.	80	81	19	-	3.3	Agree

Source: Field Survey, 2010.

The above findings imply that lack of processing methods and facilities, inadequate financial resources and lack of market information could be the major challenges facing the people in the processing and utilization of soybean products in Orumba South L.G.A of Anambra state.

Discussion of Findings

On the completion of the assessment of the level of soybean acceptability and consumption in Orumba South L.G.A, it was discovered that many people in the locality have knowledge on the processing of soybean. The people of the locality have known the ways of processing the available soybean products through their interaction with fellow human beings. Also some have the knowledge of processing techniques through the mass media like television, radio etc.

Furthermore, some got the knowledge from the briefings they received from clinics, hospitals and maternities. More so, the result of the study revealed that the people have positive attitude towards the consumption of soybean products and its acceptability because of its high nutritive value which has been made known to the people through various educational media.

According to Morrison (1996) and Jacob (1990), the bean contains about 20% of oil by weight and 40% of protein. They also said that soybean have more protein than beef and more calcium than eggs. Therefore, soybean has been used as food for centuries because of the above exceptional nutritive value and the acceptability and consumption of the soybean products are as a result of the awareness or knowledge of the nutritive value of soybean.

Finally, some items of the table showed that some people have not been educated through cookery books and by the extension workers. Also, some soybean products like soybean oil, soybean cake and soybean meal were not yet available in the locality. The reasons for this, according to respondents are lack of proper education on the methods of processing and facilities/equipments used for the processing of these products.

CONCLUSIONS

From the results of the research, it can be concluded

Table 4. Distribution of respondents according to their acceptability and consumption of soybean products

S/n	Items	SA	A	D	SD	Mean(X)	Remarks
	Scores:	4	3	2	1		
1	Soybean products like soybean oil, soybean powdered milk have been widely accepted and consumed by over 70% of adults.	80	72	10	18	3.2	Agree
2	Over 90% of growing children accepted and consumed soybean products like soybean powered milk, soymilk, etc, as it is being added to their daily pap and beverages.	90	53	27	10	3.3	Agree
3	About 70% of nursing mothers have been educated on the rich protein source of soybean and have accepted soybean products like soymilk, soybean powered milk, etc, for conversion into the perfect baby food-breast milk.	80	54	27	19	3.1	Agree
4	About 60% of house wives have accepted and consumed soybean products like soybean flour, soybean oil, hence the paste is added to food such as yam, pap, potatoes, vegetable soups etc.	54	99	18	9	3.1	Agree

Source: Field Survey, 2010.

Table 5. Distribution of Respondents according to their perception of the Problems/Constraints in Soybean Processing and Utilisation

Problems/Constraints (%)	Frequency	Percentage
Poor transportation system	10	5.6
Inadequate financial resources	50	27.8
Lack of market information	30	16.7
Lack of processing facilities and methods	70	38.9
Non-availability of improved storage facilities.	20	11.0

Source: Field Survey, 2010.

that: A great number of people have accepted and consumed soybean products because of its high nutritive value which have been made known to the people. Many people have been educated on the processing and use of soybean products in different ways. There are now available soybean products such as soybean powdered milk, soybean liquid milk (soybean milk) and soybean flour. Some soybean products such as soybean oil, soybean cake and soybean meal are not at all available in the locality due to lack of processing methods and

facilities.

RECOMMENDATIONS

Based on research findings, the following recommendations were made:

1. That food specialist extension workers should be sent to various towns and regions to continue with the education of rural people on how to process other soybean products such as soybean oil, soybean cake and soybean meal.
2. That Government should provide rural people with facilities such as processing machines (like grinding mill, manual bridge press, rain press, decorticators and expellers), at subsidized rates in order to encourage them and to enhance processing of these products that are not available in the locality.
3. That markets should be develop for soybean products seller in
order to enable the people to take advantage in the commercialization of these processed soybean products thereby bring about rural development.
4. That many articles on soybean products processing and used
should be published.
5. Finally, that farmers should be encouraged to cultivate soybean
or to engage in soybean production.

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