Global Journal of Science Frontier Research
Agriculture and Veterinary
Volume 13 Issue 7 Version 1.0 Year 2013
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Utilisation of Soybean in Oniyo Community of Oyo State, Nigeria

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GJSFR-D Classification : *FOR Code: 820405*

Strictly as per the compliance and regulations of :

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Keywords : soy product, malnutrition, food fortification, infant food, diet.

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I. Introduction

Soybean *(Glycine max)* is an herbaceous annual legume with a bushy, erect and leafy plant structure. It originated from China around 1100 to 1700 BC (Sinclair and Backman, 1989). Soybeans were first introduced into Nigeria in 1908 (Fennel, 1966), but the first successful cultivation was in 1937 with the Malayan variety, which was found suitable for commercial production in Benue State in Central Nigeria (Root *et al.*, 1987). Nigeria has been the largest producer of soybeans for food in Sub Saharan Africa (IITA, 2009).

Soybean is valued as a productive and adaptable crop which fits well into the cropping patterns of varying agro-climatic conditions. Soybean is generally considered as a highly versatile grain which has about 365 applications in the formulation of both human and animal foods and other industrial uses (Omotayo *et al.*, 2007). Soybean is a cheap source of quality protein that is superior to all other plant foods because it has good balance of the essential amino acids. Its seed has a close protein content and fairly close amino-acids with cow milk (Belewu and Belewu, 2007). The fat from the soybean is unsaturated type unlike saturated fats from animal origin and hence is good for heart disease patients (Adegoke *et al.*, 2002). Other than the high protein content, it also has good amount of calories and fat. It contains the eight essential amino acids and is a rich source of polyunsaturated fatty acids (including the good fat-omega 3) and is free of cholesterol (Food and Agriculture Organization, 1999). Soybean contains 43 grams of protein per 100gms, which is the highest among the pulses. It also contains 19.5gms of fat, 21gms carbohydrate and provides 432 kcal per 100gms (William and Akiko, 2000). It is one of the best vegetarian food items as far as protein content is concerned, with an average production cycle of 90-110 days from planting to harvesting (Fabiyi, 2006).

Research has it that one kilogram of soybean contained as much protein as 2kg of boneless meat or 45cups of cow's milk or 5dozen of eggs (Dashiell, 1993). Soybean seed contains about 40% protein, 30% carbohydrates, 20% oil and 10% mineral (Osho and Dashiell, 1998). The beans can be utilized in the liquid, powdery and curd forms for human consumption. The oil could be converted to margarine and salad oil. In most cases, soybean has found wide application in the

reduction of malnutrition related problems. Owning to its nutritional value there is a growing demand for soy products such as soymilk, soy oil, soy cake, and soy cheese like soybean curd rich in protein. The medicinal nature of soybean is extremely essential in building body immune system. Soy food has been reported to provide significant, but not total protection against heart disease, high blood pressure, stroke, ulcer, menopause, diabetes and cancer (World Healthiest Foods, 2004; Fabiyi, 2006). Recently, soybean is found to be an industrially important crop used as anti-corrosion agent, core oil, and bio-fuel due to less or no nitrogen element in the oil, and as disinfectant, in pesticides, printing inks, paints, adhesives, antibiotics and cosmetics (Ngalamu *et al.*, 2012).

The most important domestic processing forms are *dadawa*, soy milk, soy *ogi* and soy cheese (*wara*). The soy based products produced by commercial processors are soy oil, soy cake and meal, infant foods, instant foods, soy flour, soy gum and flax. The infant and instant foods industries also utilize the bean in producing soy flour, baby foods, breakfast foods, snacks and other confectioneries. In addition, feed mills utilize between 8.5 - 11 per cent soy for poultry mash and between 18-49 per cent for poultry concentrates; instant food companies utilize between 20 - 80 per cent soy depending on the products while infant food companies utilize 30 per cent soy in their products (Omotayo *et al.*, 2007).

At the household level, soybean serves as a good substitute for locust bean in preparation of *dadawa* (local condiment in soup preparation), when ground it is used in place of melon in soup and is a good source of cheap protein. Soybean has been used to fortify many traditional foods of different ethnic groups in Nigeria. These include soy-*ogi*, soy-vegetable soup, soy-*gari*, soy-*akpu*, soy-*hatsi*, soy-*tuwo*, soy ice cream, soy cheese among many others. Soybean meal is used as a protein supplement in poultry feeds, hog and cattle feed. Soybean meal is the material remaining after solvent extraction of soybean flakes and oil. Soybean oil is an edible oil that can be refined to produce paints, varnishes, soap, lubricants, sealant and in pharmaceutical oil.

In the traditional soybean growing areas of Nigeria, soybean is most commonly intercropped with cereal crops like maize, sorghum and millet to replenish soil nutrients. Soybean entered Nigerian diets in an attempt to improve nutrient intake, especially the protein intake of the low-income populace (Obatolu *et al.,* 2006). Adequate food and proper nutrition are basic requirements for economic development, since an underfed nation is an under productive nation. Poverty and malnutrition often afflict the same groups of people, so rates of malnutrition are used as indicators of poverty (Adewale, 2005). Inadequate protein in diet appears to be the greatest nutritional problem facing Nigerians today. This is because most sources of animal protein are expensive and only few people can afford enough of them in the diet. When needs to alleviate poverty, malnutrition, and to improve the welfare of poor people are considered, issues relating to high quality protein food and greater income opportunities are of paramount importance.

The household use of soy bean is therefore aimed at suiting local dishes for communities all over the country. According to Dugje *et al.* (2009), it is believed that soybean production will increase as more farmers become aware of the potential of the crop, not only for cash/food but also for soil fertility improvement and *Striga* control. The result of a previous study carried out by Olatunji *et al.* (2012) revealed that, although 74 percent of farmers in Abia State were aware of soya bean products, about 27 percent either did not adopt or discontinued adoption. It is, therefore, pertinent to investigate the consistency with which farmers are using and possible constraints to usage of soy bean products among farm families. Oniyo community of Oyo State was purposively selected for this study because it was adopted fifteen years ago by the Institute of Agricultural Research and Training of the Obafemi Awolowo University because the community was recognized to have high soybean production. The adoption was according to the Adoption Village Scheme, an innovation of the National Agricultural Research Project in 1997 to facilitate trial of new research findings and to increase farmers' adoption rate. The institute has since been building resources within the existing social, cultural, environmental and economic context of Oniyo community. It is against this background that this study seeks to answer the following research questions:

1. What is the socioeconomic profile of soybean farmers in Oniyo community?
2. Are these farmers aware of the benefits of soybean?
3. What is their perception of the importance of soybean?
4. What is the socio-cultural significance of soybean in Oniyo community?
5. What is the level of use of soybean in the community?
6. What are the constraints to the use of soybean in the community?

The hypotheses of this study are: that there is no significant relationship between selected socioeconomic characteristics of soybean farmers and their utilization of soybean; and there is no significant relationship between farmers' awareness of soybean benefits and their utilization of soybean.

II. Methodology

The study area is Oniyo community (Lat. 08002"N, Long. 04002"E) in Orire Local Government Area. The community is located in the southern guinea

savanna agro-ecological zone of Oyo State with average annual rainfall of 1100mm to 1250mm and average daily temperature of 250C and 350C. It is about 21 kilometers North West of Ogbomoso town. The Local Government has a total land area of 2,040 square kilometer and 149, 408 inhabitants, out of which 42,242 dwells in Orire community (National Population Commission, 2006). The community is agrarian and the predominant food crops grown are maize, cassava, yam, soybean, cowpea, tomatoes, pepper and sorghum.

The population of the study is all soybean farmers in Orire community. The list of all soybean farmers in Oniyo community was collected from Institute of Agricultural Research and Training to serve as the sampling frame. One hundred and thirty soybean farmers were afterwards selected using simple random sampling. Primary data was collected using interview schedule from the 130 selected farmers, but 123 of the schedules were found to be useable. Data were described and analyzed using frequencies, percentages, means, chart, chi square and Pearson Product Moment Correlation.

III. Results and Discussion

a) *Socioeconomic Characteristics*

Soybean is cultivated by male and female, as well as old and young. Yet, more males are more involved in its cultivation than females. Also, majority of the farmers are between ages 41 and 50 years, unlike Adewale (2005) that stated that soybean farmers are in their active years. Almost all of these farmers are married and many of them only have primary education. Result of analysis on table 1 thus implies that soybean is a prominent crop in Oniyo community. First, because men are only interested in cultivating prominent crops; second, its cultivation cut across all age groups; and third, 96.7% of the farmers regards soybean as their primarily cultivated crop. However, the low level of education of the farmers is not satisfactory. On the other hand, most of the soybean farmers have a household size of between four to six people and consequently, most of them have household labor of between one and two people. This indicates that farm families do not have as much household labor as much as they used to have, and therefore have to incur more labor or mechanization expenses or overwork themselves. Rahman (2008) suggested that female headed households tend to be poorer, therefore table 1 show that in this respect, there are fewer poor households among the soybean farmers. Finally, majority of the farmers have had between 11 to 20 years of soybean cultivation and have mean income of between =N=20,000 to =N=40,000 per month. This suggest that these farmers are not novice in the act of soybean cultivation and are not poor because they can well afford to spend more than $1 on each member of their household per day.

Table 1 : Distribution of soybean farmers' socioeconomic characteristics

Variables	Frequency	Percentage
Sex		
Male	80	65.0
Female	43	35.0
Age		
<30	8	6.5
31-40	28	22.7
41-50	43	35.0
51-60	39	31.7
>60	5	4.1
Marital status		
Single	3	2.4
Married	111	90.3
Once married	9	7.3
Education		
Non formal	40	32.5
Adult education	11	8.9
Primary education	60	48.8
Secondary education	12	9.8
Household size/Dependency ratio		
1-3	12	9.8
4-6	77	62.6
7-9	28	22.8
>9	6	4.8
Household labour/Human capital		
None	37	30.1
1-2	79	64.2

3-4	4	3.3
5-6	3	2.4
Household head		
Male	92	74.8
Female	31	25.2
Primary crop grown		
Maize	123	100.0
Soybean	119	96.7
Yam	82	66.7
Cassava	99	80.5
Vegetables	48	39.0
Years of soybean production experience		
<10	21	17.1
11-20	50	40.7
21-30	34	27.6
31-40	18	14.6
Average monthly income		
<20,000	40	32.5
20,000-40,000	65	52.8
>40,000	18	14.7

Source: Field survey, 2012

b) Awareness of soybean benefits

Soybean farmers in Oniyo community generally have high awareness of soybean nutritional benefits, but low awareness of its health benefits. For instance, they do not know that soybean consumption reduces chances of cancer, obesity and ulcer development, and reduces the various discomforts of menopause. Also, because of the popular knowledge that soybean cultivation replenishes soil fertility, these farmers do not know that even soybean grow better with NPK fertilizer application. This indicates that soybean farmers' knowledge of soybean benefits is yet inadequate as also opined by Olatunji *et al.* (2012), because the most uncommon benefits of soybean are its health benefits.

Table 2 : Distribution of farmers' awareness of soybean benefits

S/No	Variables	No Freq	%	Yes Freq	%
1	Soybean products are supplements to meat and fish	3	2.4	120	97.6
2	Cooking oil can be extracted from soybean	4	3.3	119	96.7
3	Soybean by-product can be used to feed livestock	6	4.8	117	95.2
4	Soybean intake reduce side-effects of menopause	116	94.3	7	5.7
5	Inclusion of soybean in diet reduce chances of cancer infection	114	92.7	9	7.3
6	Soybean menu reduce chances of obesity	105	85.4	18	14.6
7	Diabetic patients are advised to increase soybean intake	79	64.2	44	35.8
8	Soybean intake reduce the chances of high blood pressure	12	9.8	111	90.2
9	Soybean cultivation fertilises the soil	0	0.0	123	100.0
10	Milk can be processed from soybean	5	4.1	118	95.9
11	Soybean can be used to flavour food	3	2.4	120	07.6
12	Soybean is a raw material for industries	2	1.6	121	98.4
13	Soybean production still requires the use of NPK	75	61.0	48	39.0
14	Soybean cultivation reduces weed population	2	1.6	121	98.4
15	Soybean intake reduces chances of ulcer development	98	79.7	25	20.3

Source: Field survey, 2012

c) Perception of soybean importance

Majority of the soybean farmers agreed that soybean consumption increases blood quality and quantity, and consequently makes one look healthy. Also, most of the farmers agreed that soy products are palatable and even use it to flavour soup, yet most of them still prefers fish and meat to soy cheese. This implies that soy products are only perceived to be substitutes for fish, meats and other food materials. Moreover, 82.9% of the farmers agreed that soybean cultivation is socially respected; corroborating the statement that soybean is a prominent crop in the area under socioeconomic characteristics. Soybean cultivation will be sustained in the area as suggested by item 20 on table 3 despite that poor pricing is a challenge to this venture contrary to Omotayo *et al.* (2007) which stated that local prices are within international price range. This indicates that reasons for soybean cultivation transcend profit making.

Table 3 : Percentage distribution of farmers' perception of soybean importance

S/No	Perception statements	SD	D	U	A	SA
1	Soybean consumption increases blood quality and quantity	4.9	7.3	-	80.5	7.3
2	Soybean consumption makes one look fresh	-	-	-	85.4	14.6
3	Soybean flavours soup	-	-	-	85.4	14.6
4	Soybean diet enhances children's growth and development	-	-	-	46.3	53.7
5	Soybean products are palatable	4.9	-	2.4	80.5	12.2
6	Soybean products upset my stomach	7.3	75.6	4.9	12.2	-
7	Soybean production is labour intensive	-	75.6	7.3	17.1	-
8	I had rather eat fish than soy-cheese	2.4	7.3	4.9	82.9	2.4
9	I had rather eat meat than soy-cheese	2.4	9.8	4.9	80.5	2.4
10	Soybean processing is labour intensive	-	26.8	4.9	65.9	2.4
11	Soybean products have short shelf life	-	2.4	-	75.6	22.0
12	Soybean activities are socially respected	-	2.4	7.3	82.9	7.3
13	Soybean enterprises is a good source of money	-	-	-	87.8	12.2
14	Livestock enjoy soybean by-products	-	2.4	-	85.4	12.2
15	Low patronage is a challenge of soybean enterprise	4.9	43.9	2.4	46.3	2.4
16	Poor pricing is a challenge in soybean enterprise	-	-	-	87.8	12.2
17	Mixed cropping with soybean maintains soil fertility	-	-	-	87.8	12.2
18	I had rather drink cow milk than soy-milk	41.5	12.2	2.4	29.0	4.9
19	Soybean products are readily available	-	-	4.9	85.4	9.8
20	I will not withdraw from soybean enterprise	2.4	2.4	-	82.9	12.2

Source: Field source, 2012

d) Relative socio-cultural significance of soybean

Soybean compared with other prominent crops like cassava, yam and maize revealed that majority of farmers considers soybean lowest in social relevance and yield. Most also have more years of experience in the other three crops and dedicate the least acres of land to soybean cultivation. However, table 4 reveals that almost all of them acknowledge that soybean has the most diversity of usage, as also suggested by New Nigerian Foundation (2007), among the four crops.

Table 4 : Percentage distribution of relative socio-cultural significance of soybean

Variables	First	Second	Third	Fourth
Acres under cultivation	9.8	-	36.6	46.3
Labour input	12.2	17.1	34.1	29.3
Years of experience	-	-	12.2	80.5
Consumption	-	9.8	56.1	26.8
Income generation	7.3	7.3	61.0	17.1
Social relevance	-	2.4	4.9	85.4
Diversity of usage	92.7	-	-	-
Yield	2.4	-	26.8	58.5

Source: Field survey, 2012

e) Utilisation of soybean

Table 5 shows that usage of soybean for milk, soup, income and cheese purposes rank highest and in agreement with Fabiyi (2006), while its use for flour, feed, cooking oil and flavour is low. This further suggests that other oil, feed and flavour sources were preferable to the farmers. This may be due to soybean palatability, availability, accessibility, affordability compared to other alternatives or they were just used to other alternatives.

Table 5 : Percentage distribution of soybean utilization

Variables	Never	Rarely	Sometimes	Often
Milk	-	2.4	-	97.6
Cheese	-	2.4	7.3	90.2
Steamed cake	-	65.9	34.1	-
Fried cake	4.9	63.4	31.7	-
Cooking oil	2.4	14.6	80.5	2.4
Feed	4.9	4.9	80.5	9.8
Flour	-	24.4	73.2	2.4
Flavour	2.4	4.9	68.3	24.4
Income	-	4.9	2.4	92.7
Soup	-	2.4	-	97.6

Source: Field study, 2012

f) Constraints in soybean utilisation

Table 6 suggests that soybean is well accepted as a veritable component of household diet because of its palatability. It also reveals that soybean is readily available and marketable. However, farmers acknowledged that inadequate processing skills and its attendant high processing drudgery are constraints, corroborating the result of New Nigeria Foundation (2007). This may negatively affect the choice of soy products in diet despite their high level of acceptance. On the other hand, the opinion that soybean consumption is for the people that could not afford high priced animal protein was also made bare in the table.

Table 6 : Percentage distribution of constraints to soybean utilisation

Variables	Not a constraint	Not a severe constraint	A severe constraint
Low household acceptance	80.5	19.5	-
Low palatability	90.2	9.8	-
Inadequate processing skills	26.8	68.3	4.9
Low patronage	90.2	9.8	-
High processing drudgery	2.4	87.8	9.8
Low soybean availability	82.9	14.6	2.4
Short shelf life	2.4	4.9	92.7
Consumption is synonymous with poverty	12.2	85.4	2.4

Source: Field study, 2012

g) Level of awareness, perception, constraints and utilization

Fig. 1 shows that the level of farmers' awareness of soybean benefits was neither significantly high nor low and consequently the level of perception as also concluded by Olatunji *et al* (2012). However, it should be noted that more farmers had lower awareness and unfavourable perception of soybean benefits and importance respectively. Nevertheless, the level of constraints to soybean use was remarkably low and thus the level of soybean utilisation was high. The low awareness suggests that farmers need to know more about the uniqueness of soybean in preventing diseases and this will also positively impact on their perception. This will ensure that soybean use will not just be circumstantial, but deliberate.

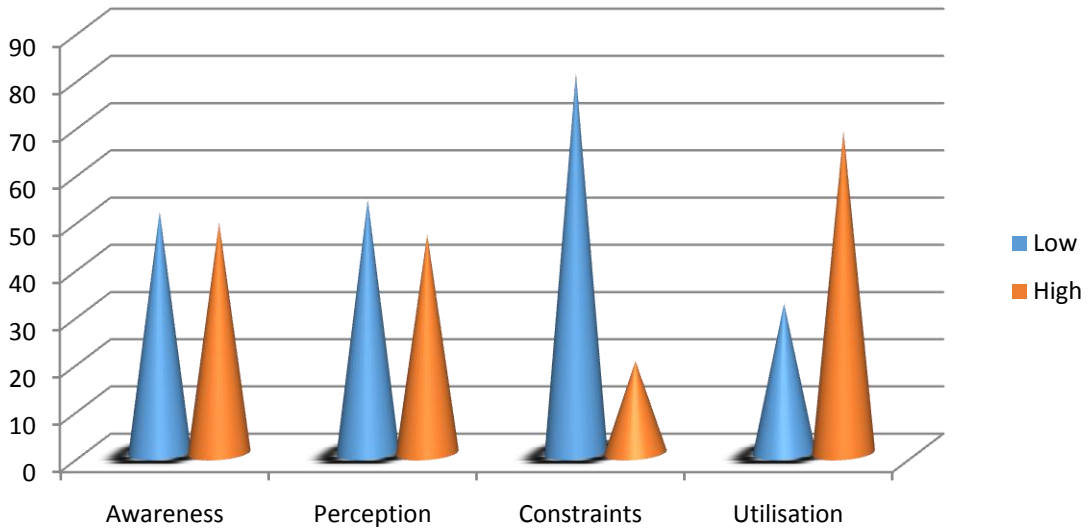

Figure 1 : Chart showing level of awareness, perception, constraints and utilisation

Source : Field study, 2012

h) Chi-square tests of hypotheses

Result of analysis in table 7 shows that soybean use is irrespective of individual sex and the sex of household heads. This implies that soy products are acceptable to both male and female, and also in both male and female headed households. The table also show that there is significant relationship between marital status and education, and soybean utilisation. This indicates that the use of soybean in nurturing children to ensure proper growth and development. Also, as stated by Ajao *et al.* (2012), the more educated farmers are the higher there utilisation of soybean. This infers that more educated farmers understand and

appreciate the uniqueness of soybean for nutrition and health. The contingency of coefficient reveals that a unit increase in farmers' educational status leads to 0.34 increase in their utilisation of soybean.

Table 7 : Chi-square result of hypotheses

Variables	df	Chi-square value	p-value	Decision
Sex versus soybean use	1	0.473	0.492	Not significant
Marital status versus soybean use	4	10.667	0.031	Significant
Education versus soybean use	3	16.321	0.001	Significant
Sex of household head versus soybean use	1	0.053	0.817	Not significant

Source: Field study, 2012

i) Correlation test of hypotheses

Table 8 reveals that the higher the age and monthly income of a farmer, the lower his/her utilisation of soybean. This agrees with the assumption that income increases with age and years of working experience. This corroborates the earlier assertion that soybean use is associated with low income by Obatolu *et al.* (2006) and disagreed with Haddad and Alderman (2000) that stated that more income leads to better nutrition over time. In addition, there is no significant relationship between awareness and use of soybean, contrary to the assertion of Dugje *et al.* (2009). This could be due to the level of awareness that is neither low nor high in the figure above.

Table 8 : Pearson Product Moment Correlation test of hypotheses

Variables	r-value	p-value	Decision
Age versus soybean utilisation	-0.043	0.640	Not significant
Monthly income versus soybean utilisation	-0.084	0.358	Not significant
Years of experience versus soybean use	-0.153	0.091	Not significan
Awareness versus soybean utilisation	0.079	0.383	Not significant

Source: Field survey, 2012

IV. Conclusion

This study inferred that soybean was cultivated by male and female, as well as old and young. Majority of the farmers are between ages 41 and 50 years. Almost all of these farmers were married and many of them only have primary education. Soybean was a socially prominent crop in the community, especially because of its diversity of usage. Most of the soybean farmers had a household size of between four to six people and consequently, most of them had household labor of between one and two people. Majority of the farmers have had between 11 to 20 years of soybean cultivation and had mean income of between =N=20,000 to =N=40,000 per month. Soybean farmers had low awareness and perception of soybean benefits and importance respectively, but had high level of utilisation of soybean, with low level of constraints to its uses. Individual sex, sex of household heads and awareness do not influence soybean utilisation, but marital status and education do. However, the higher the age, monthly income and years of experience of farmers, the lower their utilisation of soybean.

V. Recommendations

In order to upgrade farmers' awareness and change their negative perception, extension service needs to re-package and dynamically disseminate information, educate and re-educate farmers on several health benefits of soya bean use. Emphasis should be made on nutrition and health consciousness for adults and aged, irrespective of more income. Research and extension must come up with programs to build farmers capacity in simple processing of soybean into diverse products efficiently. Diverse soy products will ensure that farmers have various alternatives to choose from, while simple processing skills will facilitate soybean adoption in diets. Periodic monitoring and assessment of nutrition status of farm families should be done by extension workers to maintain or promote rural heath in order to keep them productive. Public and nongovernmental organizations should promote publicity on importance of adequate nutrition in relation to soybean potentials.

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