AJFAND ONLINE
Volume 11 No. 1
February 2011
ISSN 1684 5374
Peer Reviewed
AFRICAN JOURNAL OF FOOD AGRICULTURE NUTRITION AND DEVELOPMENT

ADOPTION OF IMPROVED TECHNOLOGIES IN SOYABEAN PROCESSING AND UTILIZATION IN TAFAWA BALEWA LOCAL GOVERNMENT AREA OF BAUCHI STATE, NIGERIA

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ABSTRACT

The study was conducted to assess the adoption of improved technologies (innovations) in soyabean processing and utilization in Tafawa Balewa Local Government Area of Bauchi State, Nigeria. Three villages were selected from the study area and fifteen farmers from each village were selected, using simple random sampling technique. Twenty soyabean innovations in processing and utilization were selected for the study based on the local diet of the farmers and ease of fortification. An interview schedule was used to collect data on socio-economic characteristics, sources of information on soyabean improved technologies and level of adoption of soyabean improved technologies of the respondents. Descriptive and multiple regression statistics were used to analyze the data. The results revealed that some socio-economic characteristics significantly influenced soyabean innovation adoption ($P<0.05$ and $P<0.01$) both positively and negatively. These included: age (+ve), educational level (-ve), farm size (-ve), social participation (-ve) and awareness (-ve) while other four factors were not significant. Among the farmers selected for the study, those who had only primary and secondary education were the majority with 40% and 44%, respectively, 13% had tertiary education, while 2% had only quranic education. The results also showed that many farmers (64%) acquired information from friends/neighbours followed by extension contact (55%) and a few (42%) from radio/television. Out of 20 soyabean innovations, only six were adopted. Soya *daddawa* had the highest adoption of 78% followed by soya cheese (67%), soya *kunu (*29%), soya milk (28%), soya pap (22%) and the least adopted was soya vegetable soup with 4%. The level of adoption in this area seemed to be very low due to lack of adequate information and limited understanding. To increase protein food intake, adoption of soyabean improved technologies should be encouraged. Efforts should be made by extension workers to create more awareness on the importance of these innovations and on methods of processing. This way, consumption of soyabean can be enhanced to help reduce problems of malnutrition in both children and adults.

Key words: Adoption, soyabean, awareness, protein, utilization

INTRODUCTION

Protein-energy malnutrition is widespread and a serious problem in many developing countries including Nigeria. Animal products rich in protein such as eggs, milk, meat and fish are expensive and at times unavailable; recommending them in a diet could be unfruitful [1]. Cereals and tubers such as sorghum, maize and yam regularly consumed in Nigeria, are low in protein. Several attempts have been made to find solutions to nutritional problems in Africa in relation to protein intake. Soyabean is considered to be one of the best options [2]. Soyabean (dried) has a lower purchase cost and contains about 40% protein, 30% carbohydrates, 20% oil and 10% minerals [2,3,4]. While the protein quality of soyabean had previously been under-estimated, research has proved that the quality of soyabean protein is indeed comparable to that of animal protein sources such as milk and beef. Soyabean is able to meet the protein needs of children and adults when consumed as the sole source of protein and at the recommended level of protein intake of 0.6g/kg body weight [5]. Some anti-nutritional factors associated with soyabean can be removed through processing (soaking, boiling and fermenting). Some of these anti-nutritional factors are lipoxygenase, which causes beany flavour and oligosaccharides, which cause flatulence, gastric discomfort, and trypsin inhibitor [4, 6].

Factors that may influence adoption of improved soyabean technologies include socio-economic characteristics such as age, household size, farm size, educational status, social participation and extension contact [7, 8].

In Benue State, lack of adoption of soyabean utilization was related to the lack of awareness on processing methods, lack of processing equipment and tools [9]. This called for introduction of simple and efficient soyabean processing techniques that can be carried out at the village level [3, 10]. Traditionally, the women normally soak soyabean for a few hours (3 to 5 hours) but with no specifications on the amount of soyabean to be added. In this area, women fortify local foods by adding soyabean paste to produce soya *kosai*, soya *moinmoin*, soya vegetable soup and soya *akamu*, without measuring the amount of soyabean added to the local foods (using hands to add the amount of soyabean they want to the local foods). The improved technologies specified that soyabean should be soaked overnight [11] to allow for long-hour soaking in order to remove the anti-nutritional factors [4,12,13]. Also, a specific amount of soyabean (ratio 1:3) should be added to the local food in order to maintain the natural taste of the food [3,4,14]. At village level in the study area (Tafawa Balewa LGA), women process soyabean into various products such as *awara* and *daddawa* for home consumption and sales.

The main objective of the study was to assess the adoption of improved technologies (innovations) in soyabean processing and utilization in Tafawa Balewa L.G.A. in the western agricultural zone of Bauchi State, Nigeria.

MATERIALS AND METHODS

The study was conducted in Tafawa Balewa Local Government Area (L.G.A.) of Bauchi State, Northeastern zone of Nigeria, which falls within the Northern Guinea Savannah. Tafawa Balewa L.G.A. lies within the western agricultural zone of Bauchi State. The western zone stretches from 9^0 30' to 10^0 48' N and 8^0 45' to 10^0 15' E and is one of the leading soyabean growing regions of Bauchi State [15]. There are no separate population figures for each village in the study area. The annual rainfall in Tafawa Balewa L.G.A varies between 1,000-1,200mm per annum. The major crops grown include sorghum, rice, maize, cowpea, groundnut, cotton, soyabean and millet. In 1991, the national census estimates indicated that the population of Tafawa Balewa L.G.A. was 126, 636 while calculations (using the annual growth of 2.8%) at the time of study (2002) showed that the population had increased to 165,640 [16].

Tafawa Balewa L.G.A. is made up of thirteen main villages, which were used as the population for the study. Simple random sampling technique was used to select three villages. Random cluster sampling technique was used to select 45 participants from farmers who were growing or processing soyabean. Data were collected through the use of interview schedule (a type of questionnaire) using a trained enumerator. Information was collected on socio-economic characteristics. Information sources such as: extension contacts, social group, radio/television and friends/neighbours. These are the main sources used by the farmers to seek information on agricultural activities and also on adoption of improved technologies for soyabean processing and utilization. The information sources used by the farmers were the sources available for the farmers in the study area. Other sources of information such as the internet, journals and other literature are being used for the farmers by extension workers. Twenty soyabean-improved technologies (innovations) were selected for this study. These are: soya cheese (*awara)*, soya *daddawa*, soya milk, soya *kunu*, soya yoghurt, soya pap, soya vegetable soup, soya feed, soya baby food, soya *chinchin*, soya *kossai*, soya bread, soya *tuwo*, soya *amala*, soya *moinmoin*, soya *danwake*, soya cake, soya *gari*, soya puff-puff and soya pancake. These improved soyabean technologies (innovations) were selected for the study because most of them were known and processed by the respondents but their methods of processing and utilization were inadequate.

Data analysis

The data collected were analyzed using multiple regression and descriptive statistics to find out the influence of some socio-economic characteristics (such as age, educational status, household size, farm size, processing experience, labour sources and information sources), on adoption of the twenty improved technologies in soyabean processing and utilization.

RESULTS

Table 1 shows that the socio-economic characteristics of the farmers had an influence on the adoption of these technologies.There was a significantly positive ($P<0.05$) correlation between age and the adoption of the improved soyabean technologies. The results also revealed that the elderly respondents adopted the innovations more than the young ones. Educational status, farm size, social participation and awareness were negatively significant ($P<0.01$). Four factors (household size, processing experience, information source and labour source) seemed not to have any influence on the adoption of these innovations, probably due to traditions and conservatism of the farmers.

On respondents' sources of information regarding the improved technologies, four sources including extension contact, social group, friends/neighbours and radio/television were used. Table 2 shows that 64% of the respondents obtained their information from friends/neighbours, 55% from extension contact, 47% from their social group and 42% from radio/television. Percentages on Table 2 were more than 100% because of the multiple responses of the respondents. A respondent obtained information from several sources. This is referred to as multiple responses, and was the reason why the total percentage exceeded 100. Table 3 shows the percentage distributions of the adoption of 20 soyabean improved technologies with soya *daddawa* having the highest adoption of 78%, soya cheese (*awara*) 67%, soya *kunu* 29%, soya milk 28%, soya pap 22%, and soya vegetable soup 4%, while the remaining 14 innovations had zero adoption. Only 6 out of the 20 were adopted.

DISCUSSION

Socio-economic characteristics of the farmers in the study area

The results showed that five socio-economic factors (age, educational level, farm size, awareness and social occupation) have either positive or negative significance on the adoption of improved technologies in soyabean processing and utilization. In this regard, age was positively significant while the other four (educational status, farm size, social participation and awareness) factors were negatively significant (Table 1). Age was probably positively significant because some of the elderly farmers were poor and soyabean *awara* was adopted to replace meat because it was cheaper. This finding is comparable to earlier studies that revealed that age was significantly related to adoption of soyabean technologies [7, 9]. The negative significance of the other four innovations may be due to inadequate extension services and information. Low adoption of soyabean innovations may also be due to low educational levels of respondents and probably due to lack of understanding of the usefulness of soyabean innovations. Moreover, fear of the anti-nutritional factors in soyabean could also be responsible for the low adoption. With regard to those factors that were not significant, it may be probable that the people's traditions were at play. For instance, the head of the family, who could have been non-receptive to new methods of doing things, was solely responsible for family decision making process and hence the low adoption. .

A previous study reported that the level of a farmer's education is related to the level of innovations he or she adopts. This is because one's level of education affects understanding of new technology and also affects ability to make reliable decisions. Therefore, the more education a person has, the more favourable attitude he or she has towards adoption of new improved technology. [17,18]. This indicates that education has potential to increase adoption of improved technologies. Also, without proper nutrition education, understanding of the benefits of adopting soyabean innovations may not be important to the farmers. Campaign and awareness programmes may be used to encourage the adoption of improved technologies in soyabean processing and utilization.

Information sources of farmers and adoption of soyabean improved technologies in processing and utilization

The findings on information sources revealed that those who got their information from friends and neighbours (64%) were more in number than those who got their information from extension contact (55%) (Table 2). This indicates that inadequate extension services in this area may be responsible for respondents' low adoption of these technologies. Inadequate information from friends regarding methods of processing soyabean may also be a factor for the low adoption. In Bauchi State, and more specifically in the study area, the number of extension agents is too low compared to the number of farmers, which is a ratio of 1:1000 [19]. This may probably limit the number of farmers who can be reached and encouraged to adopt the new improved technologies in soyabean at any given time. Also, lack of good roads prevents rural farmers from getting extension contact as the poor roads minimise rural accessibility by extension officers. Proper information and awareness from extension workers can enhance adoption of soyabean innovations [20]. Awareness is created through extension services; farmers obtain information from extension officers, which guides them towards applications that are effective [21, 22]

Extent of adoption of soyabean improved technologies by farmers

Out of the 20 soyabean innovations studied, only six were adopted. Two of these innovations were above 50% in terms of rate of adoption, with *daddawa* having the highest adoption rate (78%) followed by soya cheese (*awara*) with a 67% adoption rate. High adoption of soya *daddawa* could be attributed to the similarity of the innovation to the local condiment used for soup called locust bean. Four innovations had an adoption rate below 50%, (soya milk, soya *kunu*, soya pap and soya vegetable soap) while 14 had zero adoption rate (Table 3). The reason for the low adoption in this area is not certain, but could probably be due to improper information from friends/neighbours who had low educational status and who were the major source of information in the area of study.

CONCLUSION

Poor communication between users of innovations in agriculture and the extension agents resulting chiefly from low level of education hinders adoption of improved technologies. According to the study findings, poor flow of communication and lack of adequate information was a major problem. Therefore, efforts should be made to help the communities acquire appropriate education. Extension workers should redouble their efforts in reaching considerable numbers of farmers and farmers' associations through campaigns and practical demonstrations on processing and utilization of soyabean.

ACKNOWLEDGEMENTS

We appreciate the contributions of Mr. Adedigba and Mr. Seyi Fashokun of International Institute of Tropical Agriculture (IITA) for their assistance and cooperation during the research work. We also acknowledge the Director of Extension Services (former) Mr. Y. Mammood for his invaluable logistics support and interest in the research.

Table 1: Regression analysis of adoption of soyabean technologies in processing and utilization with farmers' socio-economic characteristics in Tafawa Balewa LGA

Predictor	Coefficient	t-ratio
Constant	6.273	8.87
Age	0.011	2.06*
Educational Level	-0.028	-2.07*
Household size	0.009	0.81^{NS}
Farm size	-0.092	-2.57*
Processing experience	-0.003	-0.17 ^{NS}
Social participation	-0.132	-2.21*
Information source	-0.008	-0.19 ^{NS}
Labour source	0.152	1.85 ^{NS}
Awareness	-0.042	-3.47**

R^2 = 46.6%***

NS = Not Significant

* = Significant at 0.05 level

** = Significant at 0.01 level

Table 2: Sources of information of respondents on adoption of soyabean processing and utilization innovations in Tafawa Balewa LGA

Information sources	Frequency	Percentage
Extension contact	25	55
Social group	22	47
Radio/Television	19	42
Friends/Neighbours	29	64
Multiple response	n = 45	

Table 3: Percentage distribution of soyabean innovation adoption in Tafawa Balewa LGA

Innovations	Frequency	Percentage
1 Soya cheese “awara”	30	67
2 Soya “daddawa”	35	78
3 Soya milk	12	28
4 Soya “kunu”	13	29
5 Soya yoghurt	0	0
6 Soya pap	10	22
7 Soya vegetable soup	2	4
8 Soya feed	0	0
9 Soya baby food	0	0
10 Soya chinchin	0	0
11 Soya “kossai”	0	0
12 Soya bread	0	0
13 Soya “tuwo”	0	0
14 Soya amala	0	0
15 Soya moinmoin	0	0
16 Soya “danwake”	0	0
17 Soya cake	0	0
18 Soya “gari”	0	0
19 Soya puff puff	0	0
20 Soya pancake	0	0

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