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Development and quality evaluation of products and recipes; and training on household utilization of soybean at Samsam-Odumase and Mimpemihoasem

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DEVELOPMENT AND QUALITY EVALUATION OF PRODUCTS AND RECIPES; AND TRAINING ON HOUSEHOLD UTILIZATION OF SOYBEAN AT *SAMSAM-ODUMASE* AND *MIMPEMIHOASEM*

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ABSTRACT

Soybean products and recipes were developed and evaluated in terms of their nutritional advantages and sensory characteristics, based on the traditional staple foods of the people at the two project villages, *Samsam-Odumase* and *Mimpemihoasem*. Training and demonstration activities were undertaken for participants in the two farming communities on household preparation and use of soy products in traditional dishes to improve the nutritional quality. Village-level techniques developed were quite effective for the production of high quality full-fat soyflour and soybean paste with good nutritional and microbiological characteristics. The techniques were promoted in the project villages as small-scale commercial activities for interested groups of processors. A total of seventeen recipes with desirable nutritional and sensory characteristics were also developed and promoted in the two project villages through training and demonstration activities using the participatory approach. The recipes adequately covered a range of traditional dishes for the three major meals of the people for an effective impact on their nutritional status. During the period of this report, two major and six minor training and demonstration sessions were held for the extension of the products and recipes in the farming communities. The minor training sessions involved mainly small groups of mothers at a time, while the major sessions were held for the whole village. Of the 101 adult participants from the two villages that were trained in household utilization of soybeans, 71% were women and 29% were men. Forty-five children participated mainly to partake in the meals after the demonstration.

1. INTRODUCTION

The FRI/SAFGRAD project was conceived to extend the experiences obtained in earlier projects by a multidisciplinary team of researchers on promoting the production and utilization of soybean in rural communities, to a wider cross-section of the Ghanaian population. The project was initiated to encourage the use of soybean at household and small-scale enterprise levels in two farming villages: *Samsam-Odumase* and *Mimpemihoasem* in the Greater Accra Region of Ghana. The collaborative Institutions in the Ghana team include the Food Research Institute of the Council for Scientific and Industrial Research as the lead institution, the Home Science Dept. of the University of Ghana, and the Crops Services Department of the Ministry of Food and Agriculture.

The general objective of the multi-institutional and multidisciplinary project on soybean utilization is to develop and encourage the adoption of soybean utilization technologies appropriate for household and small-scale enterprises in order to stimulate soybean production, encourage small enterprise development, make available more utilization technologies, improve economic and social benefits to primary producers, processors and, rural communities in Ghana.

The first set of activities undertaken during the first six months of project implementation (June - December 1998) and reported in the first progress report (Plahar *et al.* 1998), involved baseline studies at the two project villages to determine the general socio-economic status of the people, their food consumption patterns and food preparation techniques, the nutritional quality of available weaning foods and staple dishes as well as the general nutritional status of the vulnerable groups of the population. The study was also to document the status of soybean production, processing and utilization in the two villages. While information on the food consumption patterns and food preparation methods was intended to form the basis for product development and recipe formulation activities, the nutritional status studies would serve as baseline information for future impact assessment studies. The study has established the socio-economic characteristics of the two project villages, and determined the traditional food habits of

the people (Plahar *et al*. 1998). Major food crops produced in the area are maize, cassava, yam, plantain and vegetables. The main cash crop is pineapple which is grown mainly for export. Traditional staple foods for adult and pre-school children are based mainly on the cereals and starchy root and tuber crops while weaning foods are prepared with maize with no protein supplementation. Nutritional data obtained from the study indicated that pre-school children in the project area were "at risk" nutritionally and were malnourished. The need for a nutritional intervention was established in the study. The farmers at *Samsam-Odumase* and *Mimpemihoasem* were found to be unaware of the economic and nutritional benefits of soybean production and utilization; and they had very little knowledge on household food uses of the soybean. The willingness was however, expressed to take up production and household utilization of soybean when exposed to the relevant training.

Based on the findings of this first study, the second half of Project Year 1 was devoted to the development and quality evaluation of soy products and recipes as well as training on household utilization of soybeans. This report on the activities within the period is therefore presented in separate sections dealing with the following areas covered:

1. Village-level production and quality characteristics of full-fat soy flour and soybean paste
2. Development and quality evaluation of soy recipes for promotion among the people of *Samsam-Odumase* and *Mimpemihoasem*.
3. Training and demonstration activities on household utilization of soybeans at *Samsam-Odumase* and *Mimpemihoasem*.

SECTION A.

VILLAGE-LEVEL PRODUCTION AND QUALITY CHARACTERISTICS OF FULL-FAT SOY FLOUR AND SOYBEAN PASTE

A.1. INTRODUCTION

Soy flour and soybean paste constitute two main intermediate soy products that have been identified to be the most convenient forms in which soybeans can be utilized as a protein fortifying material for most traditional foods in the study area. In previous studies, techniques were developed at the Food Research Institute for the small-scale commercial production of full-fat soy flour and for household preparation of soybean paste (Plahar et al. 1998). The techniques developed were however, based on motorized equipment run by electricity which is available mainly in the urban centres. In the absence of such facilities in the rural areas, techniques based on available rural facilities must ensure maximum product quality in terms of presence and levels of anti-nutritional factors and microbiological characteristics.

A.2. MATERIALS AND METHODS

2.1. Materials

Samples of soybeans used in this study were the *Salintuya* variety obtained from the FRI/SAFGRAD soybean demonstration farm at *Samsam-Odumase* in the Greater Accra Region of Ghana, and also from the open markets in Accra. All chemicals used for analytical purposes were of Reagent grade obtained from the Sigma Chemical Co., St. Louis, MI.

2.2. Full-fat soy flour production

The procedure developed at the Food Research Institute (Plahar and Annan, 1994) was used in the preparation of standard samples of full-fat soy flour used to compare the samples produced by the village level technology. The procedure involves the use of processing conditions that could adequately eliminate antinutritional factors such as trypsin inhibitors, haemaglutinnins, phytates and oxalates while maintaining maximum protein quality in the finished product. Soybean grains were soaked in potable water for a couple of hours and boiled for about thirty minutes. The boiled grains were then dried in a hot air cabinet drier at 70 - 80 °C to a moisture content of about 8%. The dried grains were dehulled by breaking in a disc attrition mill and winnowing to remove the hulls. The dehulled broken grains were then milled into flour of about 0.2 mm particle size (Fig 1).

The village-level procedure involved basically the same unit operations of cleaning, soaking, boiling, drying, dehulling and milling. The technology was however, based on available facilities and conditions at the village to accomplish each unit operation. Two methods were evaluated here. After boiling, the beans were either spread immediately on trays and dried in the sun, or they were drained and washed with cold water while rubbing in a kitchen strainer (commonly used in the villages in the preparation of palm nut soup or porridge) to dehull. The hulls were removed by floatation which was achieved by immersing the strainer and contents in a bowl of water. The dehulled wet beans were then spread on trays to dry in the sun after which they were milled in an attrition mill (local corn mill - a commercial disc attrition mill used in the villages for milling corn as service). Dried undehulled beans were broken in the corn mill and winnowed to remove hulls. The dehulled beans were then milled to fine flour in the mill. The resulting full-fat soy flour samples were sealed in polyethylene bags for analysis and for demonstration in the project villages.

3. Preparation of soybean paste

The standard method of soybean paste preparation was used to obtain a control sample for comparison with samples prepared by the village-level technique (Fig. 2). Raw soybeans were dry-cleaned, washed and soaked with tap water for one hour. The soaked beans were then boiled for 20 minutes, drained and washed with cold water while rubbing to dehull. The hulls were removed by floatation and the dehulled boiled beans were ground to a smooth paste using a blender. An alternative method for preparing soybean paste by urban standards involves grinding soybeans that have been washed and blanched for 20 min in a blender for 3 min and extracting the milk by filtering through muslin cloth, squeezing to remove as much filtrate as possible (Plahar and Annan,1994). The smooth residue obtained was taken as a second soybean paste control sample. The main modification of the standard method for application at the village level was the use of a grinding stone or a traditional earthenware mashing bowl for grinding dehulled beans into a paste.

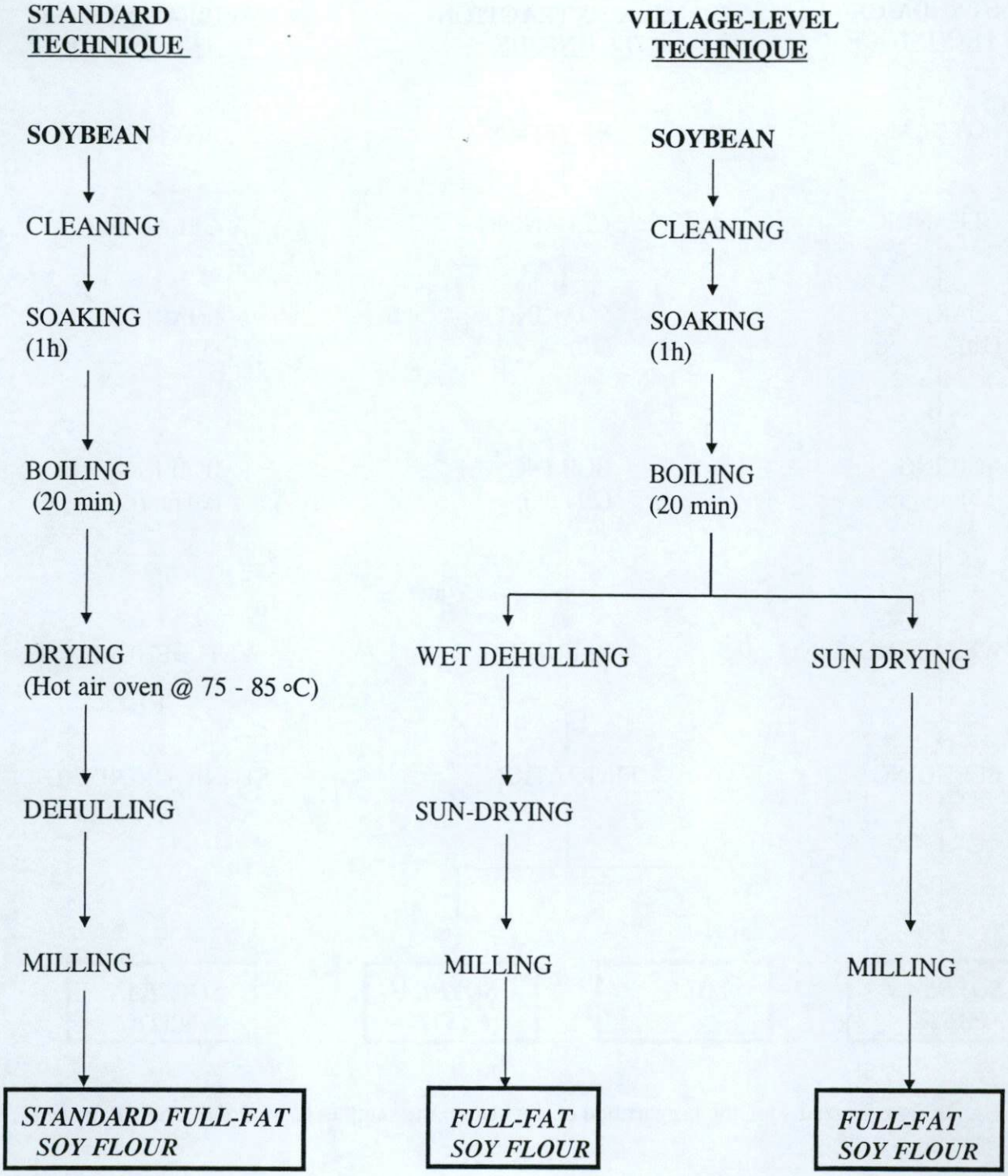


Fig. 1. Flow diagrams for the preparation of Full-fat soy flour samples by standard and village-level techniques.

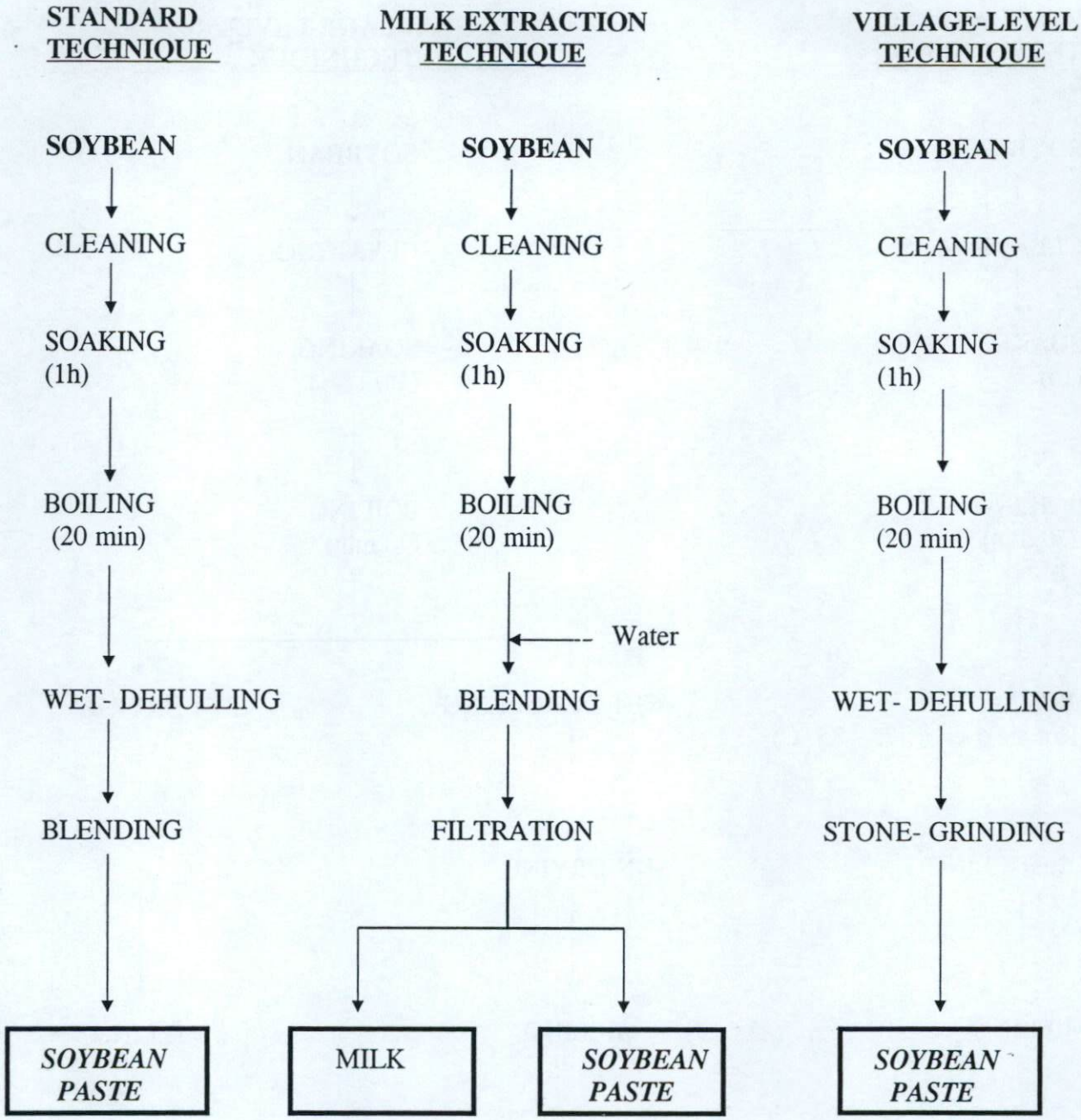


Fig. 2. Flow diagrams for the preparation of soybean paste samples by standard and village-level techniques.

Composition of soy flour and soybean paste products

Samples of the products were analyzed for moisture, protein, fat and ash by standard procedures (AOAC, 1984). Carbohydrate was determined by difference. Selected minerals, calcium and iron were determined using Atomic Absorption Spectrophotometric method (Anon, 1976), while a modification of the high performance liquid chromatography (HPLC) method described by Fellman *et al.* (1982) was used for the determination of vitamins.

Amino acid analysis

Amino acid composition of samples was determined by digestion under vacuum with 6N HCl in sealed ampoules at 110°C for 22 h. The hydrolysates were derivatized and analyzed for amino acids on a Waters HPLC system controlled by Millenium 2010 software (Waters Div., Millipore corp., Milford, MA. USA). Cystine was determined as cysteic acid by performic acid oxidation (Hirs 1967). The colorimetric technique of Opienska-Blauth *et al.* (1963) was used for the determination of tryptophan in extracts prepared by the method of Subramanian *et al.* (1970).

Determination of trypsin inhibitor activity

Trypsin inhibitor activity was determined by the method of Hamerstrand *et al.* (1981). One gram portions of the samples were extracted by soaking overnight at 4°C in 50 mL 0.01 NaOH (pH was adjusted to 8.4 - 10.0). The suspensions were diluted so that 2 mL of the sample extract inhibited 40 - 60% of standard trypsin used in the analysis. For the analysis on inhibition of trypsin, synthetic benzoyl DL arginine-p-nitro anilide (BAPNA) was used as substrate. Residual enzyme activities were determined in systems containing 2 mL aliquots of the sample extracts by measuring the absorbance at 410 nm. Trypsin inhibitor activity (TIA) in terms of milligrams pure trypsin per gram sample was calculated as:

$$TIA = \frac{(2.632 \times D \times A_1)}{S} \text{ mg pure trypsin inhibited } g^{-1} \text{ sample}$$

where: A_1 = change in absorbance due to trypsin inhibition mL^{-1} diluted sample extract
D = dilution factor
S = weight of sample (g)

Microbiological Quality Evaluation

For the determination of the aerobic bacteria count (Pour plate technique), ten grams of sample were weighed into sterile stomacher bags. To this 90 ml of Saline Peptone Solution was added and macerated. Serial dilutions of 10^{-1} - 10^{-6} were prepared, pipetted into Plate Count Agar and incubated for 72 h at 30°C (Harrigan and McCance, 1966). Mould and Yeast Counts were determined employing the Pour Plate Technique where 1.0 ml of 10^{-1} dilution of the sample suspension was pipetted into duplicate sterile petri dishes. This was pour-plated with Malt Extract Agar, mixed and incubated at 25°C for 5 days (Anon, 1987). For the enumeration of enterobacteriaceae (Coliforms), one millilitre of 10^{-1} and 10^{-2} dilutions of the sample suspension were pipetted into sterile petri dishes where about 5 ml of Tryptone Soya Agar was added and procedures completed according to Anon (1992a). For direct plating out, streaks were made on MacConkey agar plates using the stock solution prepared from each of the samples. The plates were then incubated at 37°C for 48 h. Pathogenic Organisms were determined as follow: For the detection of Staphylococcus sp. a 5g sample was aseptically weighed and placed in cooked meat medium. A portion of 0.1 ml of the undiluted stock solution was transferred to Baird-Parker's medium. The inoculum was distributed with a sterile angle bent glass rod and incubated at 37°C for 24 - 48 h as per Anon, 1992b. Salmonella bacteria was identified by the method of Anon, 1991. Four separate steps were carried out involving pre-enrichment in buffered peptone water, selective enrichment in Rappaport-Vassiliadis broth, plating out in Xylose-lysine-deoxycholate agar and confirmation by sub-culturing and biochemical tests. In culture identification, smears of growth from the plates were made on clean slides with sterile loop. These were Gram stained and viewed under the microscope to identify the morphology and Gram reaction.

Statistical analysis

Statistical significance of observed differences among means of experimental results were evaluated by analysis of variance (ANOVA) followed by pair-wise comparison of means as described by Larmond (1977).

A.3. RESULTS AND DISCUSSION

a. Composition and trypsin inhibitor activity of soy products

The composition and trypsin inhibitor activities of full-fat soy flour and soybean paste samples produced by standard methods and village-level techniques are given in Table 1. The sun-drying method used in the village-level production of the soy flour could not achieve the same low moisture level in the final product as the oven drying technique used in the standard method. However, the moisture content of 12.8% achieved is considered low enough for stability. In general, both the paste and flour samples, produced by either the village-level or standard technique, possess good nutritional quality for effective fortification of traditional foods.

In terms of the effectiveness of the processing techniques in the inactivation of antinutritional factors, both the village-level method and the standard technique caused over 92% reduction in the trypsin inhibitor activity. Initial trypsin inhibitor activity in raw beans was estimated at 25 mg/g sample, which was reduced to about 1.3 and 1.9 mg/g sample in the standard and the village-level techniques, respectively. The higher moisture content of the paste samples resulted in lower trypsin inhibitor activities recorded when expressed on as-is basis. In earlier studies, Plahar and Annan (1994) observed a reduction in trypsin inhibitor activity from 25 to <1 mg TI/g sample after boiling soaked soybeans for 20 min. Such low levels of trypsin inhibitor activity were considered safe for maximum nutritional benefits.

b. Amino acids composition of soy products

The amino acid composition of the soy products is detailed in Table 2. The full-fat soy flour and paste samples contain lysine in concentrations that can contribute significantly to improving the amino acid pattern when used in fortifying cereal based traditional foods. In addition to their high protein content, legumes are used with cereals in formulations of high quality protein foods mainly because of their high lysine content. The results in this study showed no significant differences in the amino acid patterns that could be attributed to type of product or method of production. Similar patterns were observed for all the products obtained by the different production techniques.

Table 1. Composition and trypsin inhibitor activities of full-fat soy flour and soybean paste samples produced by standard methods and village-level techniques.

Component	Full-fat soy flour samples		Soybean paste samples		
	Control	Village-level	Control 1	Control 2	Village-level
Moisture (%)	8.0	12.8	64.5	70.7	56.7
Protein (%)	39.4	34.7	14.8	11.2	18.8
Fat (%)	19.1	18.9	8.3	5.3	9.8
Ash (%)	5.8	6.0	2.3	1.8	2.6
Carbohydrates (%)	26.7	27.6	10.1	11.1	12.1
Energy (Kcal)	436.3	423.5	174.3	136.9	211.8
Calcium (mg/100g)	353.0	284.0	165.0	140.3	194.9
Iron (mg/100g)	7.5	8.7	6.2	2.8	5.0
Vitamin B1 (mg/100g)	0.82	0.79	0.54	0.03	0.60
Vitamin B2 (mg/100g)	0.27	0.30	0.18	0.01	0.25
Trypsin inhibitor activity (mg/g sample)	1.35	1.90	0.82	0.53	0.82

[1]Values are means of triplicate determinations expressed on as-is basis.

Table 2. Amino acid composition (g/16g N) of full-fat soyflour and soybean paste samples produced by standard methods and village-level techniques.

Component	Full-fat soy flour samples		Soybean paste samples		
	Control	Village-level	Control 1	Control 2	Village-level
Aspartic acid	14.18	13.11	16.19	15.91	16.09
Threonine	4.59	4.47	5.72	4.78	4.76
Serine	5.91	5.49	7.50	7.33	6.84
Glutamic acid	24.54	24.40	25.26	25.01	29.96
Proline	6.67	7.21	8.29	8.51	8.67
Glycine	4.50	4.00	4.96	5.36	5.10
Alanine	5.20	5.00	6.07	5.11	6.50
Cystine/2	0.60	0.75	1.25	1.26	1.30
Cystine	1.32	1.52	1.97	2.08	2.05
Valine	6.62	5.48	6.60	6.38	6.18
Methionine	1.75	1.89	1.88	1.49	1.83
Isoleucine	5.38	5.63	6.65	6.17	5.50
Leucine	9.01	8.46	10.72	9.75	9.12
Tyrosine	4.37	3.97	4.86	4.53	4.25
Phenylalanine	5.72	5.01	6.61	6.57	6.24
Lysine	6.73	6.33	6.47	6.66	6.68
Histidine	2.40	2.31	2.74	2.82	2.80
Arginine	9.98	7.88	9.46	9.78	9.45
Tryptophan	1.22	1.32	1.87	1.90	1.82

c. Microbiological quality of soy products

The microbiological quality of the soy products prepared by the different techniques indicated low total viable counts for all the samples (Table 3). Slightly higher counts observed in the village-level soy samples for total aerobic as well as mould and yeast are due to the sun-drying method which exposed the product to environmental contamination. In both the control and village-level samples, no pathogenic or indicative organisms was found. In the promotion of the village-level technique however, there is the need to stress general hygiene as a means of preventing contamination with faecal coli and pathogenic organisms which are very likely to be contaminants problem under the prevailing village conditions. With proper hygiene, this situation can easily be avoided. Culture examination gave Gm +ve rods, Bacillus and Micrococci as the predominant organisms present in both the flour and paste samples.

Table 3. Microbiological quality of full-fat soyflour and soybean paste samples produced by standard methods and village-level techniques.

Component	Full-fat soy flour samples		Soybean paste samples		
	Control	Village-level	Control 1	Control 2	Village-level
Total aerobic count/g	4.8×10^2	4.3×10^3	6.2×10^1	4.2×10^1	3.8×10^3
Mould count (cfu/g)	2.6×10^3	4.5×10^4	<10	<10	<10
Coliforms (in 0.1g)	Not found	Not found	Not found	Not found	Not found
Feacal coli (in 0.1g)	Not found	Not found	Not found	Not found	Not found
Salmonella (in 25g)	Not found	Not found	Not found	Not found	Not found
Staphylococcus (in 25g)	Not found	Not found	Not found	Not found	Not found
Culture	Micrococci Gm +ve rods Bacillus sp.	Micrococci Gm +ve rods Bacillus sp.	Micrococci Gm +ve rods	Micrococci Gm +ve rods	Micrococci Gm +ve rods

A.4. CONCLUSION

In conclusion, the village-level techniques developed for the production of full-fat soy flour and soybean paste for promotion as a small-scale processing activity in the project villages, are quite effective in producing high quality soy products with good nutritional and microbiological characteristics. While the flour can be produced in large quantities, packaged in small lots in polyethylene and sold over a period of time, the relatively unstable paste can be produced in smaller quantities, moulded into small balls and retailed on daily basis the same way as traditional fermented maize or cassava dough is sold by petty traders in the villages.

SECTION B.

RECIPE DEVELOPMENT AND QUALITY EVALUATION FOR PROMOTION AT SAMSAM-ODUMASE AND MIMPEMIHOASEM

B.1. INTRODUCTION

In the baseline studies conducted earlier in the project villages on soybean production and utilization, food consumption patterns and the nutritional status of the people (Plahar et al. 1998), the major staple foods of the people have been identified to be mainly based on cereals and root crops. These foods were found to be very low in protein and the need for protein supplementation was established in the survey. The food preparation methods were also identified. The recipe development activities subsequently undertaken were aimed at targeting the traditional foods for fortification with soybeans and soy products to help improve the nutritional status of the people, when these recipes are effectively promoted in the household soybean utilization training.

So far, recipes developed using techniques appropriate and specific for the study area include: a. soybeans in the local traditional stews, soups and sauces; and b. soybeans in the local staple foods. This report gives information on the methods of preparation, consumer acceptability and nutritional information on the recipes so far developed for promotion in the project villages.

B.2. MATERIALS AND METHODS

Materials

Materials and ingredients for recipe development activities were obtained from local markets in Accra. As much as possible, ingredients and materials used in the preparation of the recipes for evaluation were similar to what are normally used for food preparation in the project villages.

Recipe formulation

In all the recipe formulation activities, the normal phases involving idea generation, technical development processes for optimization and prototype refining by sensory techniques were applied to arrive at the final formulations and preparation methods. The form, levels, and methods of incorporation of soybeans into the targeted foods were determined through trials to accomplish the desired recipe for each product. The detailed preparation methods are provided for each recipe under Results and Discussion.

Sensory evaluation

Sensory evaluation of the various attributes of the recipes developed in relation to traditional foods was undertaken by a ten member trained panel using a 9-point hedonic scale described by Larmond (1977). Consumer acceptability of the recipes was determined by consumer affective tests.

B.3. RESULTS AND DISCUSSION

The following sections provide information on the recipes developed within the period of this report with the approximate nutritional contribution. These have been grouped under the broad categories of soy recipes for traditional foods, soy recipes for traditional stews and soups and soy beverage recipes.

Soy recipes for traditional staple foods

Soy recipes based on traditional staple foods were developed for the following traditional dishes which were found to be popular in the project villages: *Banku*, *Kokonte*, *Kenkey, Aboloo*, *Aprapransa, Mpotompoto, Koko* and *Tom brown*.

Banku is a staple dish for children and adults prepared with either fermented corn dough or a mixture of fermented corn dough and cassava dough. It is eaten as a main meal with accompaniments such as stews, soups and sauces. *Kokonte* is also a main meal prepared by cooking fermented dried cassava flour into a soft starchy mash. *Kenkey* is a popular maize food prepared with fermented maize dough and taken for any meal of the day with pepper sauce and fried fish or soups and stews. *Aboloo* is similar to *kenkey* but is prepared from unfermented maize dough and is steamed or baked. *Aprapransa* is a semi solid product of roasted maize flour cooked in palm soup with fish and spices. *Mpotompoto* is a cooked porridge of mashed root and tuber crops mixed with spices and fish. Two kinds of *Mpotompoto* are normally prepared by the household. Yam *Mpotompoto* and cocoyam *Mpotompoto* are prepared depending upon availability of the raw material in the home. The preparation involves cutting

peeled yam or cocoyam into small pieces and cooking in boiling water with spices and fish meal. *Koko* and *Tom brown* are cereal porridges prepared from fermented maize dough and roasted maize flour, respectively. These are popular weaning foods in the study area. The ingredient formulae, preparation methods and the approximate nutrition contribution are given below for the various soy recipes developed based on the traditional staple foods.

1. Soy Banku

INGREDIENTS	QUANTITY	HANDY MEASURE
Fermented maize dough	800 grams	4 cups
Soypaste (or **soyflour**)	200 (or 100) grams	1 cup
Fermented cassava dough	200 grams	1 cup
Salt	To taste	To taste

Method

1. Mix corn dough, cassava dough and **soypaste** or **soyflour** together with water to a smooth thin paste.
2. Add salt to taste and stir on fire with a wooden spoon or `banku stick'.
3. Continue stirring and kneading, until a cooked stiff but smooth paste is obtained. Water may be added when necessary to achieve the desired consistency.
4. Mould into small fist size balls and serve with soup or stew.

   **** Number of servings = 6 - 8***

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	193.19
Protein (%)	8.43
Vitamin B1 (mg/100g)	0.14
Vitamin B2 (mg/100g)	0.04
Calcium (mg/100g)	20.39
Iron (mg/100g)	2.00

2. Soy Kenkey

INGREDIENTS	QUANTITY	HANDY MEASURE
Fermented maize dough	800 grams	4 cups
Soypaste (or **soyflour**)	200 (or 100) grams	1 cup
Salt	To taste	To taste
Corn cob sheaths	For wrapping	For wrapping

Method

1. Divide corn dough into three equal parts.
2. To one part of the corn dough, add **soypaste** or **soyflour**, mix with water to a smooth thin paste, add salt and stir briskly on fire to avoid formation of lumps.
3. Half cook the mixture to obtain the *Aflata* - gelatinized dough. Add this to the remaining two parts of the corn dough and mix well.
4. Mould into small fist size balls and wrap in clean corn sheaths (*kenkey leaves*) and cook by boiling in water with a polyethylene covering, for 1½ to 2 h.
5. Serve with soup, stew or hot pepper with fried or grilled fish.

   **** Number of servings = 6 - 8***

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	201.85
Protein (%)	9.90
Vitamin B1 (mg/100g)	0.15
Vitamin B2 (mg/100g)	0.04
Calcium (mg/100g)	18.04
Iron (mg/100g)	2.26

3. Soy Aboloo

INGREDIENTS	QUANTITY	HANDY MEASURE
Gritted corn flour	400 grams	2 cups
Soypaste	100 grams	½ cup
Salt	To taste	To taste
Leaves	For wrapping	For wrapping

Method

1. Divide corn grits into 2 parts.
2. To one part, add soypaste, salt and a little water and cook to make *Aflata*.
3. Add the *aflata* to the remaining uncooked corn grit, add a little water and mix to form a soft meal.
4. Wrap small portions in clean leaves.
5. Arrange in a steamer and steam over boiling water for 1 - 1½ h.
6. Serve with soup, stew or paper and fried fish.

** Number of servings = 3*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	316.08
Protein (%)	13.05
Vitamin B1 (mg/100g)	0.41
Vitamin B2 (mg/100g)	0.10
Calcium (mg/100g)	18.04
Iron (mg/100g)	3.12

4. Soy Aprapransa

INGREDIENTS	QUANTITY	HANDY MEASURE
Roasted cornmeal	200 grams	2 cups
Soyflour	50 grams	½ cup
Smoked herrings	150 grams	2 medium
Onion	60 grams	1 medium
Tomatoes	200 grams	3 medium
Palm oil	75 ml	¼ cup
Salt	To taste	To taste
Pepper	To taste	To taste

Method

1. Prepare gravy with the necessary ingredients.
2. Add about a cup of water to gravy and let it boil.
3. Mix **soyflour** and roasted cornmeal together.
4. Add a little to the gravy and stir. Add slowly and stir gradually until finished.
5. Allow to cook for 20 -25 minutes while stirring with a wooden spoon until firm and smooth.
6. Dish out and serve with stew or pepper with cooked crabs.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	217.80
Protein (%)	14.35
Vitamin B1 (mg/100g)	0.06
Vitamin B2 (mg/100g)	0.09
Calcium (mg/100g)	143.27
Iron (mg/100g)	2.50

5. Soy Koko

INGREDIENTS	QUANTITY	HANDY MEASURE
Fermented maize dough	200 grams	1 cup
Soypaste (or **soyflour**)	50 (or 25) grams	¼ cup
Sugar	To taste	To taste
Salt	To taste	To taste

Method

1. Mix corn dough and **soypaste** or **soyflour** with water and strain.
2. Add salt to taste and bring to boil while stirring continuously to avoid formation of lumps.
3. Allow to boil at low heat for additional 20 minutes.
4. Serve with sugar added to taste.

** Number of servings = 2 - 3*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	40.37
Protein (%)	1.98
Vitamin B1 (mg/100g)	0.03
Vitamin B2 (mg/100g)	0.01
Calcium (mg/100g)	3.61
Iron (mg/100g)	0.45

6. Soy Tom brown

INGREDIENTS	QUANTITY	HANDY MEASURE
Roasted maize flour	120 grams	1 cup
Soyflour	25 grams	¼ cup
Sugar	To taste	To taste
Salt	To taste	To taste

Method

1. Mix roasted maize flour and soyflour with water to form a smooth slurry.
2. Add salt to taste and bring to boil while stirring continuously to avoid formation of lumps.
3. Allow to boil at low heat for additional 20 minutes.
4. Serve with sugar added to taste.

** Number of servings = 2 - 3*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	47.58
Protein (%)	1.85
Vitamin B1 (mg/100g)	0.02
Vitamin B2 (mg/100g)	0.02
Calcium (mg/100g)	6.97
Iron (mg/100g)	0.94

7. Soy Mpotompoto

INGREDIENTS	QUANTITY	HANDY MEASURE
Yam or Cocoyam	250 grams	4 medium slices
Soypaste	50 grams	¼ cup
Shrimps (powdered)	15 grams	1 teaspoon
Fish powder	30 grams	2 teaspoons
Tomatoes	210 grams	3 medium
Onion	60 grams	1 medium
Palm oil	75 ml	¼ cup
Salt	To taste	To taste
Pepper	To taste	To taste

Method

1. Peel yam or cocoyam, cut into small pieces and wash well.
2. Put in a saucepan, add water and cook for 5 min.
3. Grind pepper, onion and tomatoes together and add to the yam or cocoyam. Allow to cook for 5 min.
4. Add soypaste and cook for five minutes.
5. Add powdered fish and shrimps and cook until yam or cocoyam is soft.
6. Mash as much yam or cocoyam as possible and add palm oil.
7. Add salt to taste and simmer for 10 - 15 min.

** Number of servings = 2.*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	110.84
Protein (%)	4.01
Vitamin B1 (mg/100g)	0.06
Vitamin B2 (mg/100g)	0.07
Calcium (mg/100g)	89.30
Iron (mg/100g)	0.86

8. Soy Kokonte

INGREDIENTS	QUANTITY	HANDY MEASURE
Cassava flour	400 grams	4 cups
Soyflour	100 grams	1 cup
Water	1.5 L	5 cups

Method

1. Boil water in a pot or pan take 2 cups of the boiling water and put aside.
2. Mix cassava flour and soyflour and add to the boiling water, stirring briskly to prevent lump formation.
3. Add the rest of the hot water in small quantities and continue stirring until the desired consistency is obtained.
4. Shape into fufu shape and serve with palmnut soup, okro soup or groundnut soup.

** Number of servings = 5*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	91.10
Protein (%)	2.10
Vitamin B1 (mg/100g)	0.07
Vitamin B2 (mg/100g)	0.03
Calcium (mg/100g)	23.40
Iron (mg/100g)	0.70

Soy recipes for traditional stews, sauces and soups

Stews are made from a mixture of chopped vegetables and spices fried in oil. Fish or meat is added during the preparation to serve as the protein source and to contribute to flavour. Soups are made by boiling a slurry of vegetables, fish/meat, spices and other thickening base materials such as groundnut paste, chopped okro, or palm nut extract, till cooked. Fish adds to the flavour and serves as the main protein source in soups, sauces and stews which usually serve as a main accompaniment to major staple foods consumed in the project area. The frequency of consumption may range between one to three times a day. The use of soy flour in the formulation of stews, sauces and soups in this project is to contribute to the protein intake, as fish and meat are scarce commodities at *Samsam-Odumase* and *Mimpemihoasem*.

Acceptable formulations were arrived at for the main traditional stews, sauces and soups by a gradual adjustment of the proportion of each ingredient so as to maximize that of the soy flour component, while retaining sensory properties similar to those of the control. The stews were prepared according to the general traditional procedure involving frying of chopped onions, pepper and tomatoes in vegetable oil with occasional stirring until well blended into gravy. Groundnut soup, a typical example of the major soups in the area was also prepared using the traditional method.

The sections that follow give the final ingredient formulas for the main stews and two soups, as well as the preparation methods and the nutritional contribution.

9. Soy Gravy

INGREDIENTS	QUANTITY	HANDY MEASURE
Full-fat Soyflour	50 grams	½ cup
Smoked fish	50 grams	1 medium size
Vegetable oil	75 ml.	¼ cup
Onions	60 grams	1 medium size
Tomatoes	240 grams	4 medium size
Pepper	To taste	To taste
Salt	To taste	To taste

Method

1. Slice onion and grind tomatoes and pepper.
2. Heat the oil and fry onion, pepper and tomatoes.
3. Add a little water to the **soyflour** to prepare a smooth paste, and stir into the frying ingredients and allow to simmer for 20 minutes.
4. Wash and debone fish, break into pieces and add to gravy.
5. Allow to simmer for additional 10 min., season to taste.
6. Serve with ampesi, cooked rice, or kenkey etc.

**** Number of servings = 4***

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	238.37
Protein (%)	12.12
Vitamin B1 (mg/100g)	0.13
Vitamin B2 (mg/100g)	0.09
Calcium (mg/100g)	128.38
Iron (mg/100g)	1.66

10. Soy Stew

INGREDIENTS	QUANTITY	HANDY MEASURE
Soypaste	100 grams	½ cup
Meat	100 grams	4 small pieces
Tomatoes	240 grams	4 medium size
Onion	60 grams	1 medium size
Palm oil	75 ml.	¼ cup
Salt	To taste	To taste
Pepper	To taste	To taste

Method

1. Prepare and cut meat into bite pieces.
2. Season with salt and cook for 15 minutes. Keep the stock for subsequent use.
3. Fry the cooked meat in hot oil, remove and put aside.
4. Slice onions and grind pepper and tomatoes. Fry in oil.
5. Add the meat and cook for 5 min.
6. Mix the stock with the **soypaste** and add to the stew. Cook for 30 minutes and season to taste.
7. Serve with rice, ampesi, kenkey or banku.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	213.98
Protein (%)	8.65
Vitamin B1 (mg/100g)	0.14
Vitamin B2 (mg/100g)	0.09
Calcium (mg/100g)	41.23
Iron (mg/100g)	1.78

11. Soy Garden eggs stew

INGREDIENTS	QUANTITY	HANDY MEASURE
Soypaste	100 grams	½ cup
Garden eggs	230 grams	4 medium size
Smoked fish	50 grams	1 medium size
Vegetable oil	75 ml.	¼ cup
Tomatoes	140 grams	2 medium size
Onion	55 grams	1 medium size
Pepper	To taste	To taste
Salt	To taste	To taste

Method

1. Slice onion and grind tomatoes and pepper.
2. Chop garden eggs and blanch for 15 minutes.
3. Debone fish and break into bite pieces.
4. Heat the oil and fry onion, pepper and tomatoes. Add the garden eggs.
5. Cook for 5 minutes and add the fish.
6. Mix the **soypaste** with a little water and stir into the stew.
7. Allow to simmer for 30 minutes in a partially covered pan, while stirring occasionally. Season to taste.
8. Serve with ampesi, kenkey or banku.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	162.17
Protein (%)	10.38
Vitamin B1 (mg/100g)	0.07
Vitamin B2 (mg/100g)	0.07
Calcium (mg/100g)	84.72
Iron (mg/100g)	0.91

12. Soy Palaver sauce

INGREDIENTS	QUANTITY	HANDY MEASURE
Soypaste	100 grams	½ cup
Kontonmire	100 grams	6 medium leaves
Smoked fish	50 grams	1 medium
Palm oil	75 ml.	¼ cup
Tomatoes	120 grams	2 medium size
Onion	60 grams	1 medium size
Pepper	To taste	To taste
Salt	To taste	To taste

Method

1. Slice onion and grind tomatoes and pepper.
2. Wash and debone fish and break into small pieces. Wash and shred the kontonmire (Kontonmire may be cooked and mashed, if desired).
3. Heat the palm oil and fry the onion, pepper and tomatoes; add the pieces of fish and cook for 5 minutes.
4. Mix the **soypaste** with a little water and add to the gravy. Cook for 10 minutes.
5. Add the shredded (or cooked and mashed)kontonmire pieces and allow to simmer for 15 to 20 minutes. Season to taste.
6. Serve with ampesi, kenkey or boiled rice.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	203.93
Protein (%)	13.43
Vitamin B1 (mg/100g)	0.08
Vitamin B2 (mg/100g)	0.10
Calcium (mg/100g)	124.33
Iron (mg/100g)	1.54

13. Soy Vegetable soup

INGREDIENTS	QUANTITY	HANDY MEASURE
Soypaste	100 grams	½ cup
Smoked fish	100 grams	2 medium size
Meat	100 grams	4 small pieces
Garden eggs	190 grams	3 medium size
Tomatoes	180 grams	3 medium size
Onion	60 grams	1 medium size
Pepper	To taste	To taste
Salt	To taste	To taste

Method

1. Wash and cut meat and fish into bite pieces.
2. Season with sliced onion and ground tomatoes, salt and pepper and cook for 10 minutes.
3. Meanwhile, wash and cook garden eggs with a little water, blend and strain.
4. Add enough water to the soup on fire, and cook for 5 min.
5. Mix the **soypaste** with a little water and add to the soup.
6. Add the strained garden eggs to the soup and allow to simmer for 35 to 40 minutes with seasons added to taste.
7. Serve with fufu, banku or boiled rice.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	44.86
Protein (%)	7.09
Vitamin B1 (mg/100g)	0.03
Vitamin B2 (mg/100g)	0.04
Calcium (mg/100g)	57.33
Iron (mg/100g)	0.63

14. Soy Groundnut Soup

INGREDIENTS	QUANTITY	HANDY MEASURE
Soypaste	100 grams	½ cup
Groundnut paste	200 grams	1 cup
Smoked fish	100 grams	2 medium size
Meat	100 grams	4 small pieces
Tomatoes	210 grams	3 medium size
Onion	55 grams	1 medium size
Pepper	To taste	To taste
Salt	To taste	To taste

Method

1. Wash and cut meat and fish into bite pieces.
2. Season with sliced onion and ground tomatoes, salt and pepper and cook for 10 minutes.
3. Mix **soypaste** with a little water and stir into soup. Cook for 10 minutes.
4. Add enough water to the groundnut paste, mix to a smooth running consistency, and add to the soup.
5. Allow soup to cook for 45 to 60 minutes with seasons added to taste. Serve with fufu, Omo tuo or kenkey.

** Number of servings = 4*

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	107.38
Protein (%)	9.99
Vitamin B1 (mg/100g)	0.04
Vitamin B2 (mg/100g)	0.05
Calcium (mg/100g)	62.19
Iron (mg/100g)	0.8I

Soy beverage recipes

Soy beverages developed include plain soymilk and chocolate flavoured soymilk as nutritious and refreshing drinks for the village communities. The recipes were not based on any traditional dishes available in the project villages. The sections that follow provide information on the method of preparation and the nutrition information on the beverages.

15. Soymilk (Method I)

INGREDIENTS	QUANTITY	HANDY MEASURE
Soybeans	250 grams	1 cup
Water	1.8 litres	6 cups
Salt	To taste	To taste
Sugar	To taste	To taste

Method

1. Dry-clean soybeans by removing stones, chaff, dirt and other foreign matter.
2. Wash and soak for one hour. Bring to boil and allow to boil for 20 minutes.
3. Drain, and wash with cold water while rubbing to dehull.
4. Grind beans into a smooth paste, add 6 cups of hot water and mix thoroughly.
5. Strain the mixture through a muslin cloth or clean white cloth and squeeze to extract milk.*
6. Cook the milk by boiling for 10 minutes with salt and sugar added to taste.
7. Cool and serve or store refrigerated.

* The resulting residue may be used in other recipes.

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	50.49
Protein (%)	4.89
Vitamin B1 (mg/100g)	0.10
Vitamin B2 (mg/100g)	0.04
Calcium (mg/100g)	32.68
Iron (mg/100g)	1.02

16. Soymilk (Method II)

INGREDIENTS	QUANTITY	HANDY MEASURE
Soybeans	125 grams	½ cup
Water	1.2 litre	4 cups
Salt	To taste	To taste
Sugar	To taste	To taste

Method

1. Dry-clean soybeans by removing stones, chaff, dirt and other foreign matter.
2. Wash and soak beans in 500 mL potable water for 30 minutes.
3. Drain the water and drop the soaked beans into 1 litre boiling water and boil for 10 minutes.
4. Pour the beans and hot water in a blender and grind for 3 minutes.
5. Stir the slurry well and filter through a clean muslin cloth, squeezing to extract as much filtrate as possible.*
6. Boil the extracted milk for 20 minutes and add salt and sugar to taste.
7. Cool and serve, or keep refrigerated.

* The resulting residue may be used in other recipes.

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	39.06
Protein (%)	3.77
Vitamin B1 (mg/100g)	0.08
Vitamin B2 (mg/100g)	0.03
Calcium (mg/100g)	25.28
Iron (mg/100g)	0.79

17. Choco-Soymilk

INGREDIENTS	QUANTITY	HANDY MEASURE
Soybeans	500 grams	2 cups
Cocoa powder	45 grams	1 Tablespoon
Water	1.8 litre	6 cups
Salt	To taste	To taste
Sugar	50 grams	2 Tablespoon

Method

1. Dry-clean soybeans by removing stones, chaff, dirt and other foreign matter.
2. Wash and soak beans in 500 ml potable water for 30 minutes and dehull by rubbing.
3. Drop the dehulled beans into 1 litre boiling water and boil for 10 minutes.
4. Pour the beans and hot water in a blender and grind for 3 minutes.
5. Stir the slurry well and filter through a clean muslin cloth, squeezing to extract as much filtrate as possible.
6. Add the cocoa powder and blend for 3 minutes.
7. Boil the resulting choco-soymilk for 20 minutes and add the sugar and salt to taste.
8. Cool and serve, or keep refrigerated.

APPROXIMATE NUTRITIONAL CONTRIBUTION	
Energy (kCals/100g)	100.24
Protein (%)	8.40
Vitamin B1 (mg/100g)	0.18
Vitamin B2 (mg/100g)	0.07
Calcium (mg/100g)	56.29
Iron (mg/100g)	1.83

Consumer acceptability of soy recipes

The mean scores for the various sensory attributes of the different soy recipes developed are shown in Table 4. For the staple-based recipes, mean score ranges obtained were 7.6 - 8.0 (*like very much*) for taste, 6.9 - 8.4 (*like moderately* to *like very much*) for aroma, 7.3 - 7.9 (*like moderately* to *like very much*) for mouthfeel, 7.3 - 8.6 (*like moderately* to *like very much*) for texture, and 7.6 - 8.4 (*like very much*) for appearance and for overall acceptability. The recipes for stews, sauces and soups had mean scores ranging between *like moderately* and *like very much* for all the sensory attributes and overall acceptability (7.3 - 7.9 for taste, 7.1 - 8.0 for aroma, 7.4 - 7.9 for mouthfeel, 7.3 - 7.8 for texture, 7.1 - 7.7 for appearance and 7.0 - 8.0 for overall acceptability). Because of novelty, the soy beverages had slightly lower acceptability scores than the recipes that were based on existing traditional foods. Mean scores ranged between 6.4 - 7.9 (*like slightly* to *like very much*) for taste, 6.4 - 6.8 (*like slightly* to *like moderately*) for aroma, 6.3 - 7.4 (*like slightly* to *like moderately*) for mouthfeel, texture and appearance, and 6.6 - 6.8 (*like moderately*) for overall acceptability. In all cases, the chocolate flavoured samples were more acceptable than the plain soymilk samples.

The high sensory scores recorded for the recipes is indicative of the possibility of their being effectively promoted in the project villages.

Table 4. Mean sensory scores for soy recipes based on traditional staples, soups, stews, sauces and beverages developed

Recipes	Mean sensory scores					
	Taste	Aroma	Mouthfeel	Texture	Appearance	Overall acceptability
Staples-based						
Soy banku	7.60 ± 1.39	8.00 ± 0.90	7.33 ± 0.94	7.30 ± 1.00	7.82 ± 1.14	7.80 ± 1.20
Soy kokonte	7.80 ± 1.41	7.80 ± 1.01	7.70 ± 1.00	7.74 ± 1.25	7.60 ± 1.20	7.61 ± 0.53
Soy kenkey	7.70 ± 1.25	8.20 ± 1.22	7.60 ± 1.07	7.40 ± 0.87	7.96 ± 1.46	7.64 ± 1.17
Soy aboloo	7.81 ± 1.68	6.90 ± 1.51	7.90 ± 0.99	7.80 ± 0.90	7.60 ± 1.10	7.90 ± 0.90
Soy aprapransa	7.60 ± 1.39	8.00 ± 0.90	7.30 ± 1.94	7.60 ± 0.96	7.90 ± 0.73	7.82 ± 1.15
Soy koko	8.00 ± 1.41	7.80 ± 1.01	7.70 ± 1.25	7.80 ± 1.13	7.70 ± 1.19	7.84 ± 1.34
Soy Tom brown	7.70 ± 1.25	8.40 ± 1.22	7.60 ± 1.07	7.30 ± 1.15	7.70 ± 1.94	7.60 ± 1.45
Soy mpotompoto	7.81 ± 1.68	7.41 ± 1.51	7.90 ± 0.99	8.60 ± 1.19	8.40 ± 1.17	8.43 ± 1.08
Stews, soups etc.						
Soy gravy	7.75 ± 1.91	7.75 ± 1.16	7.87 ± 1.95	7.25 ± 1.83	7.25 ± 0.88	7.00 ± 1.85
Soy stew	7.37 ± 1.51	7.12 ± 1.24	7.50 ± 1.50	7.75 ± 1.38	7.62 ± 0.74	7.75 ± 1.16
Soy G-eggs stew	7.50 ± 1.31	7.25 ± 1.48	7.37 ± 1.40	7.50 ± 1.85	7.47 ± 1.06	7.37 ± 1.59
Soy palava sauce	7.87 ± 1.24	8.00 ± 1.06	7.62 ± 1.41	7.82 ± 1.41	7.37 ± 0.91	7.60 ± 1.19
Soy vegetable soup	7.75 ± 1.83	7.50 ± 1.30	7.50 ± 1.41	7.50 ± 1.13	7.12 ± 1.45	7.62 ± 1.59
Soy Groundnut soup	7.25 ± 1.11	7.75 ± 1.91	7.45 ± 0.94	7.70 ± 1.00	7.65 ± 0.90	7.80 ± 1.41
Soy beverages						
Soy milk 1	6.37 ± 1.51	6.71 ± 1.00	7.38 ± 0.51	6.37 ± 1.22	6.42 ± 1.50	6.67 ± 1.30
Soymilk 2	6.50 ± 1.31	6.35 ± 0.80	6.28 ± 1.20	7.41 ± 1.05	7.00 ± 0.82	6.55 ± 0.76
Choko soy milk	7.87 ± 1.24	6.80 ± 1.20	6.84 ± 1.14	6.88 ± 0.84	6.81 ± 0.84	6.78 ± 1.06

Interpretation of scores: 9 = *like extremely*, 8 = *like very much*, 7 = *like moderately*, 6 = *like slightly*, 5 = *neither like nor dislike*, 4 = *dislike slightly*, 3 = *dislike moderately*, 2 = *dislike very much*, 1 = *dislike extremely*.

B.4. CONCLUSION

A total of seventeen recipes with desirable nutritional and sensory characteristics have been successfully developed for promotion at the two project villages. The recipes adequately cover a range of traditional dishes to cater for the three major meals of the people for effective impact on their nutritional status.

SECTION C.

TRAINING AND DEMONSTRATION ACTIVITIES ON HOUSEHOLD UTILIZATION OF SOYBEANS AT *SAMSAM-ODUMASE* AND *MIMPEMIHOASEM*.

C.1. INTRODUCTION

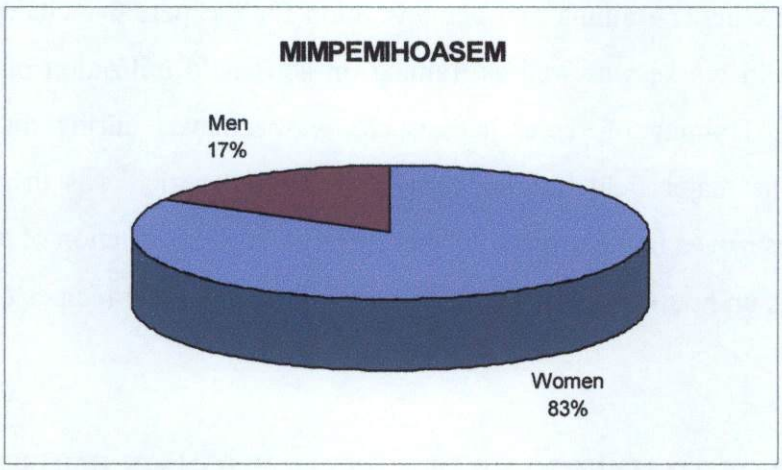
The training and demonstration activities within the period of this report formed part of a major objective of the project. Planned training activities under the project include: (a) project staff training, (b) training of farmers and housewives on household level utilization of soybean based on recipes developed, (c) training of village entrepreneurs and individuals on small-scale processing for commercial production of soy-based high protein foods, and (d) training of farmers in project villages on soybean cultivation.

The achievements under training and demonstration for the period include training of research assistants and field workers as well as training on household utilization of soybeans in the two project villages. Training of research assistants was achieved during the product and recipe development. The major field training activity within the period was therefore the training of farmers and housewives in the project villages on small scale production of soy flour and soybean paste, as well as on household utilization of soybeans based on the recipes developed.

C.2. RESULTS OF TRAINING AND DEMONSTRATION ON HOUSEHOLD UTILIZATION OF SOYBEANS

A total of six minor and two major training sessions were held in the two project sites on household utilization of soybeans where some of the recipes developed under the project were extended. The minor training sessions involved a group of mothers at a time. In the minor training sessions a total of twenty women were involved during the period. The major training sessions on the other hand involved the whole village including mothers, fathers and children. At *Samsam-Odumasi*, participation in the training sessions include 33 women, 21 men and 24 children. In the other project village, *Mimpemihoasem*, 39 women, 8 men and 23 children participated in the training and demonstration.

The gender distribution of participants trained in the villages is given in Fig 3 separately for the two project sites, and Fig 4 for overall gender distribution. For the adult participation at *Samsam-Odumase*, 39% were men, and 61% were women. In *Mimpemihoasem*, 83% women participation was recorded with only 17% male participation. In terms of overall gender distribution, 71% of participants so far trained in the two project villages were women, with 29% being men.



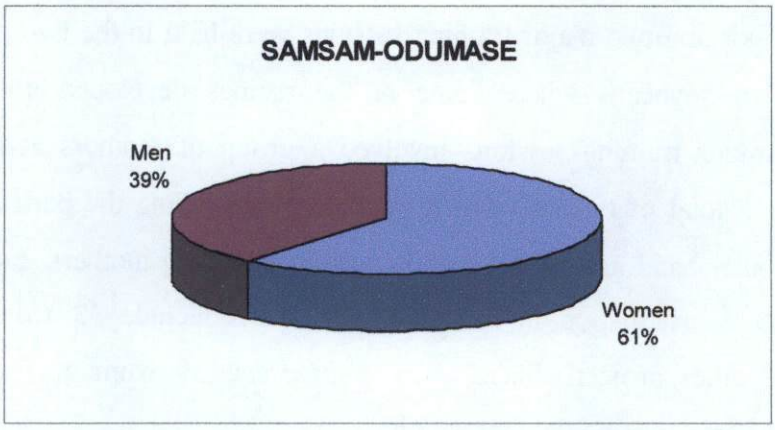


Fig 3. Gender distribution of participants trained in household utilization of soybeans in the two project villages

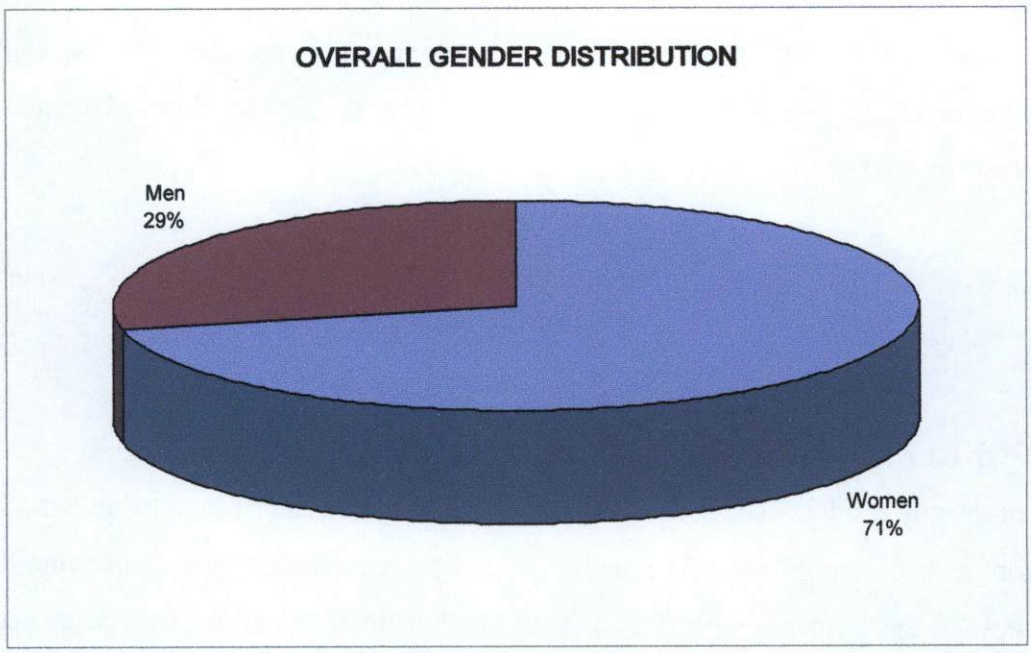


Fig 4. Overall gender distribution of participants in the household soybean utilization training in the two project villages.

Areas covered in the training and demonstration include:

a. Lectures and discussions on protein-energy malnutrition and the inadequacy of traditional weaning foods used in the villages to support proper child growth and development.

b. Village level techniques for the preparation of full-fat soy flour.

c. Techniques for the preparation and uses of soybean paste in traditional foods.

d. Household preparation of soybased soups, stews, sauces and staple foods.

e. Field evaluation of soymilk.

In all the training and demonstrations, the participatory approach was adopted, and the participants actively took part in the preparation of the dishes, the way they normally did at home, with instructions from the resource people only on the aspects concerning the incorporation of soy product. The field sessions were highly successful and generated a great deal of interest for the use of soybeans among the villagers.

Figures 5 to 10) show pictures of scenes at the training and demonstration sessions in the two project villages.

C.3. CONCLUSION

Most of the soy products and recipes developed were successfully promoted at Samsam-Odumase and Mimpemihoasem villages. The method of extension used succeeded in creating the necessary awareness of the farmers and housewives on the nutritional benefits of soybeans and the simple techniques of household processing and utilization of soybeans in traditional dishes for improved nutrition. In general more women participants (71%) were trained in the two major demonstration sessions held in the villages than men (29%).

Fig 5. Development of soy products and recipes

Fig 6. Soybean utilization training and demonstration at *Samsam-Odumase* - A participatory approach

Fig 6. Soybean utilization training and demonstration at *Samsam-Odumase* - A participatory approach

Fig 7. Soybean utilization training and demonstration at Mimpemihoasem - A participatory approach.

Fig 8. One-on-one training sessions for mothers in project villages

Fig 9. Soy dishes prepared by women trainees on display during soy utilization demonstration

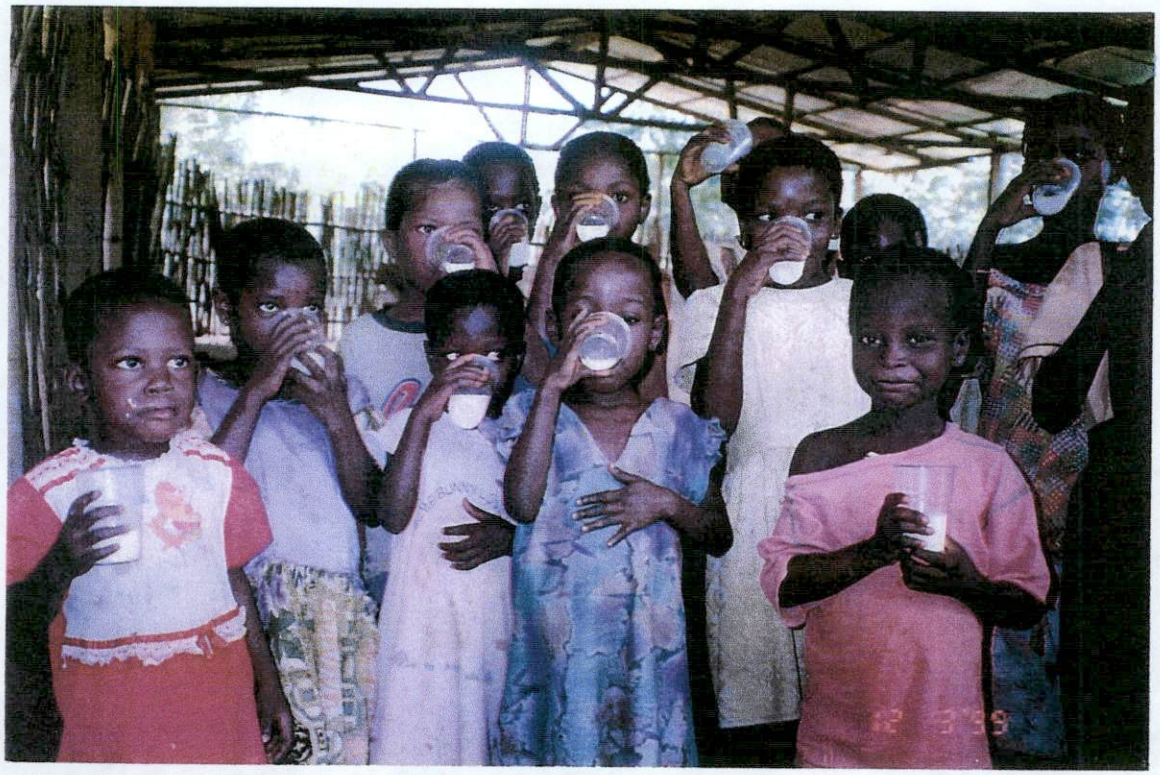


Fig 10. Children of Samsam-Odumase (Top) and Mimpemihoasem (Bottom) villages enjoying soymilk during demonstration

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1999-06

Development and quality evaluation of products and recipes; and training on household utilization of soybean at Samsam Odumase and Mimpemihoasem

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