

Grain Legume Processing Handbook: Value Addition to Bean, Cowpea, Groundnut and Soybean by Small-Scale African Farmers

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Putting nitrogen fixation to work for smallholder farmers in Africa

Grain legumes and African rural households

The cultivation of grain legumes, particularly common bean, cowpea, groundnut and soybean, has many benefits. These legumes can fix nitrogen from the air and improve soil fertility. They may be dried, bulked and marketed for prices higher than maize or root crops. Most importantly, grain legumes are high in protein and may be processed into a wide range of nutritious foods that greatly complement cereals and tubers.

Grain legumes offer great opportunity to improve the diets in small-scale farming households. Poor diets do not balance the needs for energy, protein, vitamins and minerals. Some diseases result from incomplete diets and seasonal malnutrition. For example, protein deficiency, also known as kwashiorkor, is all too prevalent in populations throughout rural Africa. Poor food quality is further complicated by the so-called hungry harvests. Crop harvests may be rich in starch but contain insufficient amounts of protein, vitamins and minerals that are required by the human body.

A key to dietary improvement is the combination of staple cereals and nitrogen-fixing legumes as intercrops or in rotation. This combination leads to nutritional complementarity of cereal and legume protein. Examples include rice and soybean in Asia, millet and pigeon pea in dryland India, sorghum and cowpea in dryland Africa, and maize, groundnut and beans in East Africa. Cereals and legumes should ideally be consumed in a ratio of 70:30 in order to achieve a desired balance of amino acids. Unfortunately, this goal is not met with households producing and consuming a greater measure of cereal and other starches.

This manual was prepared to help homemakers in Africa to better appreciate and prepare grain legumes, in particular beans, cowpea, groundnut and soybean. It was developed through a project designed to increase grain legume enterprise in Africa so that increased consumer and food industry demand for these legumes will increase profitability of their production and in turn lead to stronger rural economy and wellbeing. It provides information on the nutritional composition of these legumes, how to process them into foods and offers several easy to prepare, nutritious recipes.

Characteristics of grain legumes

Many grain legumes were domesticated throughout the tropical world and are now available to small-scale African farmers. Cowpea is one of the earliest cultivated plants and originates in Africa. Common bean and groundnut originated from South America and were introduced to Africa about 400 years ago. Soybean arrived in Africa more recently, can be processed into numerous products and demand for this crop is increasing rapidly. Other important, but lesser grown grain legumes include pigeon pea, green gram, lima beans, bambara nut, pea and broad bean, but these grain legumes are not considered in this handbook.

Common bean originates from Tropical America and was widely distributed throughout Africa following the earliest European contact. It is a bushy or climbing annual with trifoliate, slightly hairy leaves. It has small, white, yellow or purple flowers bearing long, smooth pods forming large, kidney-shaped seed. It requires moderate rainfall followed by a dry ripening interval but performs poorly in the hot, humid lowlands and is sensitive to extreme soil acidity. Beans are often intercropped with cereals, usually maize and are susceptible to a wide range of pests and disease. The leaves, young pods, young and mature seeds and seed sprouts are edible. The seeds may be black, purple, red, brown, mottled, yellow or white. The number of seeds ranges between 1500 and 4800 per kilogram.



Cowpea is native to Africa and has since been distributed throughout the world. Its growth habit is variable, with erect, trailing or climbing annual forms. It bears smooth trifoliate leaves and white, yellow or violet flowers producing long, smooth pods containing round or cylindrical seeds. Cowpea tolerates heat, drought and soil acidity but is sensitive to waterlogging. It is susceptible to many insects including white fly, aphids and weevils. The leaves, young pods, young and mature seeds are edible and the crop residues are palatable to livestock. It



commonly bears between 8 to 20 seeds per pod and the number of seeds per kilogram ranges from 4500 to 10,000 depending upon variety and growing conditions.

Groundnut originates from Tropical America and is now widely distributed throughout the world. It is an erect (bunch type) or trailing (runner type) annual herb 60 cm in height with fleshy stems. Flowers are yellow, forming at lower nodes and its pods grow into the soil. The pod is rounded, corky and dry.



Groundnut requires about 600 mm of rainfall followed by dry ripening. New varieties are available that resist groundnut rosette virus, a disease that severely limits crop yields. It is best suited to sandy loams, is acid tolerant but requires calcium in the soil for successful pod fill. Seeds are cylindrical, with ends flattened. Groundnuts are eaten raw, boiled or roasted and milled into peanut butter. Seeds are also pressed for vegetable oil and press cake. Leaves and stems are particularly palatable to livestock because foliage remains green through seed ripening. The number of seeds per kilogram is 450-1500.

Soybean originates from East Asia and is a recent introduction to much of Africa. It is a bushy annual up to 120 cm in height with hairy trifoliolate leaves and small flowers forming clusters of short, hairy pods. It is grown from the lowland to upland tropics and tolerates moderately acid soils and short-term drought.



It performs poorly under cool and shaded conditions. Soybean has many industrial uses and is an important source of vegetable oil and protein. It has edible green and mature seeds with seeds ranging in color from cream, yellow, pale green to black. It also is valuable as a source of livestock feed and hay. The protein content and amino acid balance of flour is greatly improved when soya flour is mixed with cereals. Soya is also an important source of B vitamins. Soybean is used in a number of industrial processes, cottage industries and in mixed livestock feeds. Propagation is by seed with about 7000 seed per kg.

Table 1. Nutrient content of the edible portions of four grain legumes.

| legume | edible part | protein | fat | carbohydrate |
|-----------|-------------|---------------|-----|--------------|
| | | ----- % ----- | | |
| common | seed | 25 | 2 | 69 |
| bean | pod | 22 | 2 | 70 |
| | leaf | 27 | 3 | 50 |
| cowpea | seed | 26 | 2 | 69 |
| | pod | 33 | 5 | 55 |
| | leaf | 36 | 3 | 50 |
| groundnut | seed | 25 | 48 | 8 |
| soybean | seed | 39 | 22 | 36 |
| | sprout | 14 | 10 | 43 |

Preparation and nutritional value of grain legumes

Food legumes offer not only excellent sources of protein and starch, but also fat (oil) and carbohydrates (Table 1), with different legumes having higher concentrations of each. They are also rich in minerals (calcium and phosphorus) and vitamins A, B (e.g. thiamin) and C (Table 2), with leaves and green pods having higher concentrations of these essential nutrients. These benefits result from the versatility of legumes as sources of edible leaves, green pods, unripe seed, grain and sprouts. Legumes also contain significant fiber, sodium, potassium, iron and other members of the vitamin B complex.

Table 2. Mineral and vitamin contents of the edible portions of four grain legumes.

| legume | edible part | Ca | P | Vitamin A | Vitamin C | Thiamine |
|-----------|-------------|--------------------------|-----|-----------|-----------|----------|
| | | ----- mg per 100 g ----- | | | | |
| common | seed | 137 | 368 | 11 | 2 | 0.42 |
| bean | pod | 350 | 300 | | | |
| | leaf | 2076 | 568 | 24559 | 834 | 1.36 |
| cowpea | seed | 124 | 432 | 11 | 1 | 0.67 |
| | pod | 478 | 522 | 4027 | 212 | 1.24 |
| | leaf | 664 | 964 | | 327 | 3.18 |
| groundnut | seed | 52 | 438 | 16 | 1 | 0.84 |
| soybean | seed | 245 | 606 | 11 | 0 | 0.73 |
| | sprout | 251 | 580 | 11 | 0 | 0.74 |

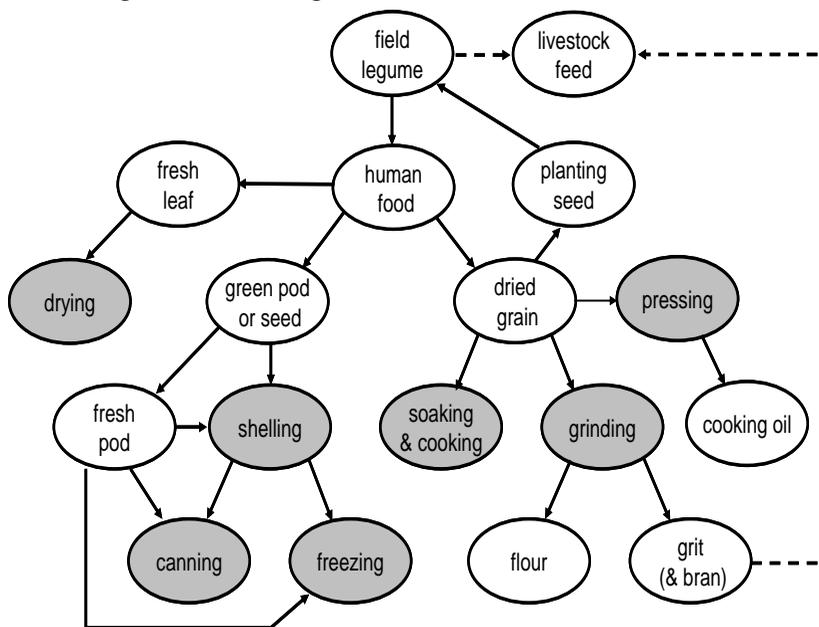


Figure 1. Consumption and processing opportunities for grain legumes.

Soybean is of particular importance because of its high protein content, balanced nutritional composition (Tables 1 and 2) and opportunities for value-added processing. Soybeans are rich in omega fatty acids, iron, magnesium, potassium and contain no cholesterol. Soybeans are particularly important in child nutrition as it prevents stunting due to protein deficiency, supports neurological development, builds stronger bones and strengthens the immune system. Soy dairy products are recommended to those with lactose intolerance. Trypsin is an essential amino acid but trypsin inhibitors are present in raw soybeans and must be deactivated by heat treatment of 105°C for 30 minutes.

The potential for consuming, and processing food legumes is great (Figure 1). Fresh or dried leaves of cowpea may be steamed or boiled and served alone or in combination with other ingredients. Drying picked leaves greatly reduces their perishability as the leaves readily re-hydrate. Slight wilting is not a problem as leaves prepared in this state offer better consistency when cooked. Care must be

Table 3. Nutritional value of raw and boiled cowpea leaves

| preparation | protein | carbohydrate | fat | fibre |
|----------------------|---------------|--------------|-----|-------|
| | ----- % ----- | | | |
| raw cowpea leaves | 36 | 50 | 3 | 4 |
| boiled cowpea leaves | 22 | 46 | 2 | 4 |

taken not to overcook edible leaves as boiling results in a loss of protein and carbohydrates (Table 3).

The immature green pods of many legumes may be cooked and consumed including those of bean and cowpea. Green bean pods fried with a small amount of margarine contain 3% carbohydrates, 2% protein, 4% fat and 3% fiber on a fresh weight basis and are also rich in vitamins A and C. The full sized but immature green seeds of bean, cowpea, groundnut and soybean and other legumes may also be shelled and prepared, greatly reducing their cooking time. Dried grain can be either soaked and cooked, or ground into flour. Legume seeds are typically soaked in water overnight to reduce their cooking time. Once milled, legume flour may be combined with cereal flour to increase its protein content and then baked or fried. Some of the processing option for legume products, particularly canning and freezing, are not widely available to rural households in Africa, but will likely emerge as collective marketing grows in sophistication.

Groundnut and soybean may be screw-pressed into vegetable oil (Figure 1). This process also produces press cake, an important component of animal feeds. In Asia soybean is processed into numerous food products including soy milk, soy sauce, tofu, and

Table 4. Nutritional value of selected soybean products.

| preparation | protein | carbohydrate | fat | fibre |
|-------------------|---------------|--------------|-----|-------|
| | ----- % ----- | | | |
| boiled soybeans | 17 | 5 | 9 | 5 |
| pressed oil | 0 | 0 | 100 | 0 |
| soy sauce | 9 | 8 | 0 | 0 |
| soybean curd | 8 | 0.7 | 5 | 1 |
| soy yoghurt | 5 | 4 | 4 | 0 |
| textured soy meal | 35 | 28 | 7 | 12 |

Table 5. Nutritional composition of soy and cow's milk.

| constituents | soya milk | cow's milk |
|---------------|---------------|------------|
| | ----- % ----- | |
| proteins | 5.7 | 3.5 |
| lipids | 2.4 | 4.0 |
| carbohydrates | 1.4 | 4.2 |
| minerals | 0.8 | 0.7 |
| water | 90 | 88 |

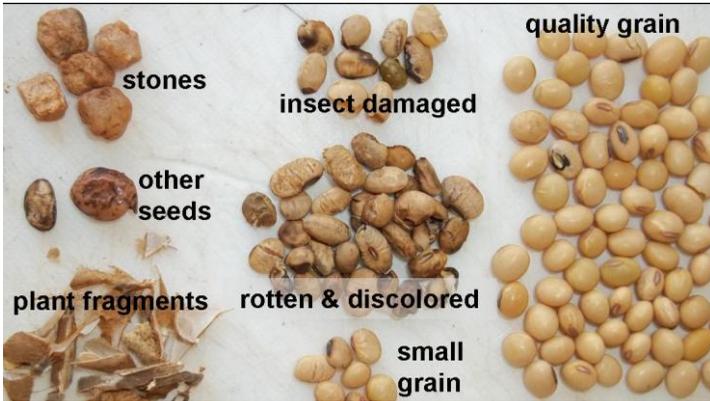
noodles (Table 4). Products from soybean are particularly nutritious, for example soy milk is richer in protein than cow's milk (Table 5). The composition of soya milk when included within diets is particularly well suited to child development and those with health problems.

Soybean forms the basis for several important food industries and non-food products. Soybean oil can be processed into margarine and added as emulsifiers. Soybean flakes may be formed into textured meat substitutes and dietary concentrates. Some non-food soybean products include soap, glues and polishes. These advanced industrial processes are not covered in this handbook.

Post-harvest handling and processing grain legumes

Legumes intended as dried grains are harvested at full maturity, when both the pod and seed are well dried. Keeping beans, cowpeas and soybean for too long in the field is a hazard. Shattering occurs when the dried pod breaks open, spreading the seeds in different directions and is an important seed distribution mechanism of non-cultivated plants but may also be a major source of crop loss. Harvesting a bit early is one means to reduce harvest losses from shattering but care must be taken to dry the grains to acceptable critical threshold, usually from 10 to 12.5% moisture. Groundnuts are best dried to 8% moisture to ensure against fungal contamination.

Post-harvest handling assures that grain legumes provide quality food and meet buyers' standards. For example, grain quality standards for soybean in Kenya consider moisture content, split, off-color, shriveled and pest damaged grains and foreign matter



Photograph 1. Quality soybeans (right), foreign matter (left) and off-grade grain (center).

(Photograph 1). Threshold and target values required by a large-scale buyer in Nairobi appear in Table 6. In addition, soybeans for processing into texture protein must contain at least 40% crude protein and less than 18% oil. The grains must be free from objectionable odors and have no live insects. The techniques necessary to measure these parameters include use of moisture meters, sieves and hand sorting. Farmers’ ability to meet these standards requires a different suite of post-harvest handling skills and equipment.

Experience suggests that drying grain on the ground collects foreign materials and stones that may damage mills. Field and storage pests often destroy untreated grain. Mixed colored grains considerably lower the market value. Each bag is expected to meet a specified weight usually 50 or 90 kg. Wining involves slowly

Table 6. Quality standards for soybeans in Kenya.

| quality parameter | threshold | target | technique |
|---------------------------|-----------|--------|----------------------------|
| moisture | < 13.5% | 10% | multi-grain moisture meter |
| split grain | < 5% | 3% | sieving/hand sorting |
| off-color grain | < 2% | 0.5% | hand sorting |
| rotten & discolored grain | < 1% | 1% | sieving/hand sorting |
| insect damaged grain | < 3% | 1% | hand sorting |
| foreign matter | < 1% | 0.5% | sieving/hand sorting |

Table 7. Nutritional value of selected groundnut products

| preparation | protein | carbohydrate | fat | fibre |
|------------------|---------------|--------------|-----|-------|
| | ----- % ----- | | | |
| peanuts, raw | 25 | 8 | 48 | 9 |
| peanuts, roasted | 26 | 10 | 49 | 8 |
| peanut butter | 24 | 15 | 50 | 6 |
| peanut oil | 0 | 0 | 100 | 0 |

pouring seeds from one surface to a lower one, permitting even slight wind to remove lighter foreign materials. This approach is time consuming and may be replaced using properly sized sieves. Five (5) mm coffee mesh works well for beans, most soybean and groundnut but 3 mm mesh is required for cowpea and smaller soybeans. Tools necessary to meet industry standards include handheld moisture meters, tarpaulins for drying, sieves for removing off-sized materials and weighing scales. Grain quality may be steadily improved from threshold to target values that when achieved command accordingly higher prices (Table 6).

Groundnut preparation and processing has several special considerations. Harvesting of groundnut is accomplished by lifting the whole plants from the soil, allowing them to dry for a few days, recovering the pods by threshing and then removing the seeds by breaking the pods open. Care must be taken not to split the groundnuts during preparation because excess broken seeds lower their value. Groundnuts must not be harvested in the rain or placed into heaps that remain damp and encourage mold, including dangerous aflatoxin (see shaded box). Processing groundnut affects its nutrient content to various degrees (Table 7).

Groundnut oil and peanut butter are generally produced on industrial scales but it is possible to press oil and grind butter using cottage industry technologies. Hand operated screw-presses are marketed locally in Kenya by Approtech Ltd. Peanut butter results from simply passing clean groundnuts twice through cereal mills. Roasting groundnuts does not require an oven, but may be performed by placing nuts on a pan or hot sand.

A direct method of measuring the moisture content is available through the use of portable grain moisture meters. Most moisture meters are calibrated to different types of grain. Two basic models are available: probes which are inserted directly into grain bags, and those with chambers where grain is removed from containers (Photograph 2) and samples of about 150 g poured into the device. Within a few seconds, the meter provides users with a moisture reading. In general, grain moisture contents range between 9% and 13%. Grain that is intended for milling is worth more as its moisture content is reduced. Some moisture meters offer other parameters as well including the temperature and weight of the sample. Measuring the sample weight, then removing off-grade grains, such as those with insect damage, discolored or shriveled, and then reweighing the sample permits users to calculate the total off-grade grain content where $\text{offgrade \%} = [1 - ((\text{original sample} - \text{off-grade grains}) / \text{original sample})] \times 100$. If a sensitive scale is available, then the different types of off-grade may be separated and weighed individually where $\text{offgrade type} = (\text{off-grade fraction} / \text{original sample}) \times 100$.



Photograph 2.
Chamber-type LDS
moisture analyzer.

Beware of Aflatoxins!

Aflatoxins are lethal mycotoxins produced by certain types of fungus. They mainly grow on grains and legumes during storage. Groundnut is notorious for growing producing aflatoxins so it is important that it not be harvested during rains, or dried in large piles that encourage the growth of mold. A major concern is that once produced, these poisons are heat stable, so neither cooking nor freezing destroys the toxin. They remain on the food indefinitely, causing liver disease and predisposing humans to cancer. Some precautionary measures include:

- Storing grain under clean, dry conditions
- Consuming fresh rather than dried groundnuts
- Check for signs of discoloration of grains and seed
- Never swallowing foods with the characteristic bitter taste of aflatoxin

Characteristics of some important legume varieties

Legume grains are wholesome, filling and easy to process into a wide variety of foods. Most commonly, beans and cowpeas are cooked as stews, groundnut is roasted, fried or boiled as snacks and soybean is milled or mashed and mixed with other foods. Cooking characteristics of some popular grain legumes in Kenya are presented in Table 8. Some observations on the preparation and use of these legume grains follow.

Rosecoco, Nyayo and Red kidney beans are typically soaked in water overnight, the water discarded and then boiled (6 parts water in 1 part beans), adding additional water as necessary for 1 to 1½ hours depending on the desired texture of the cooked bean. This preparation results in almost 3 cups cooked beans per cup of dried beans containing 8% protein, 14% carbohydrate, 0.4% fat and 7% fiber. They are then cooked as stew with other meat and vegetable ingredients, producing a thick, tasty gravy.

Mwitamenia beans are light brown in color and mottled. These are known as Pinto beans elsewhere and are preferred for mashing. This involves overnight soaking, drained, boiled for 1½ hours (6:1) and then mixed with other foods. This bean has a particularly sweet taste and its mash is stiff rather than watery. In Mexican cooking, mashed Pinto beans provide a base for combining many spices such as cumin and chili.

White beans are also called navy or Mexican beans. These small, white grains soak and cook more rapidly than larger-seeded beans and are best in stews and soups because of their firmness after cooking. This type of bean is also used in recipes for Boston Baked Beans.

Mavuno and Tamu climbing beans. These beans are large and reddish brown with white mottles. Their preparation time is slightly longer than kidney beans and once cooked they swell to a large size and have a distinct nutty taste.

Black-eyed cowpea is cream colored but has a distinctive dark spot around the hilum. Preparation is similar to beans but the seed coat is removed after overnight soaking and they are soft after only 45 minutes of boiling. Cooked beans are very soft and suitable for mashing and mixing with other foods.

Table 8. Cooking characteristics of some popular grain legumes in Kenya.

| grain legume type | dry weight g/cup | soaking uptake ml water | cooking time minutes | cooked weight g/dry cup | cooked volume cups |
|-------------------|------------------|-------------------------|----------------------|-------------------------|--------------------|
| Kidney bean | 198 | 225 | 75 | 440 | 2.8 |
| Nyayo bean | 191 | 188 | 75 | 390 | 2.5 |
| Mwitemenia bean | 183 | 182 | 90 | 393 | 2.3 |
| White bean | 203 | 208 | 75 | 409 | 2.5 |
| Black-eye cowpea | 211 | 229 | 45 | 480 | 3.0 |
| Red cowpea | 198 | 234 | 35 | 460 | 3.0 |
| Soybean 19 | 169 | 217 | 90 | 352 | 2.3 |

Red cowpea has slightly smaller seed, is prepared in the same way as black-eyes, cook slightly faster and are better suited to stews and soups because this cowpea is firmer than black-eye.

Soybeans often require more specialized preparation. They are soaked overnight, drained and then boiled for 1½ hours. Boiled soybeans are not soft after cooking and not well suited to use in stews because they do not produce a rich gravy. Cooked soybean may be chopped and used as a substitute for minced meat or crushed into a variety of nutritious beverages. Simple, value-added soybean products such as soy milk are well suited to cottage industry. Raw soybeans contain trypsin inhibitors and must always be cooked before consumption by humans and livestock.

Red groundnuts are smaller in size and best prepared by frying or roasting. Groundnuts may be eaten raw but taste is improved by cooking. Once cooked, they have a nutty texture and are preferred for snacks. Groundnuts are susceptible to dangerous aflatoxin produced by fungi and care must be taken not to consume those with a bitter taste, either fresh or cooked.

Pink and grey groundnuts are larger in size and have a softer texture. They are boiled for 1 to 2 hours or milled to produce peanut butter and a range of seasoned sauces. Full-sized groundnuts may be harvested early, washed and boiled in their shells using heavily salted water, resulting in an excellent snack.

Selected Grain Legume Recipes

Snacks

Roasted Groundnuts

makes 20 portions

Ingredients

1 kg raw peanuts

2 tsp salt

Preparation: Sort and wash the nuts. Place in sufuria to dry and cook for 30 minutes, stirring frequently. Salt to taste. Groundnuts may then be either eaten or ground into a paste by pounding in a mortar into a fine paste. ***Microwave instructions:*** Microwave 2 cups of groundnuts for two minutes, remove from the microwave oven and stir, then microwave for another 90 seconds. Allow the groundnuts to cool and salt to taste. Note that cooking times vary with the size of the groundnuts.

Soy Crunchies

makes 20 portions

Ingredients

1 kg dry soybean

500 ml cooking oil (2 cups)

4 litres water

1 tbsp salt

Preparation: Remove any dirt or foreign materials from dry soybeans and wash them. Next, boil the nuts for 30 minutes, drain water from the soybeans and pat dry. Heat cooking oil in a frying pan and carefully add boiled soybeans and deep fry until crispy and golden brown. Remove soybeans, drain excess oil and salt to taste. This recipe may be pan fried using less oil but the cooking time is slightly extended.

Curried peanuts

makes 6 portions

Ingredients

2 cups salted peanuts

2 tsp curry powder

Preparation: Combine the peanuts and curry powder in a paper bag and shake well. Spread the coated peanuts in a single layer in a cooking sheet and bake for 20 minutes; shake them once or twice during cooking. Alternatively, the groundnuts may be roasted in a microwave oven for 2 minutes, stirred and cooked another 90 seconds.

Soy Crackers

makes 12 portions

Ingredients

1 kg sweet potatoes

¼ cup sugar

½ tsp baking powder

1.5 litres milk or soymilk

½ cup cooking oil

1 cup chopped soybeans

1 cup wheat flour

Preparation: Soak soybeans overnight, boil for 60 minutes, drain, allow to cool and chop. Set chopped soybeans aside. Clean unpeeled sweet potatoes and boil for 45-60 minutes then peel. Mash the peeled sweet potatoes. Add 2 wheat flour and chopped soybeans to the mashed potatoes and mix well, then add baking powder. Add sugar to the above mixture and mix thoroughly. Add milk to the mixture in small portions while kneading. Roll out the dough and cut into thin, wide strips. Deep fry the strips in ½ cup cooking oil for 3-5 minutes, turning once. Remove from frying pan, allowing oil to drain. Salt to taste. Serve with peanut butter or other sauces.

Soya Samosas

makes 8 to 15 portions

Ingredients

1 medium onion

2 tbsp salt

1 tbsp ginger, crushed

1 litre cooking oil

1 cups water

1 cup baking flour

2 fresh chili

1 cup chopped cooked soybean or okara

Preparation: Mix cooked, chopped soybeans with chopped onion and chili and crushed ginger and set aside. Mix flour, water, 2 tbsp cooking oil and salt in a bowl, knead and then roll out into thin sheet. Cut the sheet into large triangles for wrapping the soybean mixture. Place 1 litre of oil into a frying pan and heat. Meanwhile stuff the samosas with 1 heaping spoonful of mix onto each triangle, and fold. To seal the samosas,



mix a small amount of flour with warm water to form thick sticky substance used as “glue” close the folded edges. Slide the uncooked samosas one at a time into hot cooking oil ensuring that the oil covers the samosa. Cook for 1 minute until it becomes reddish-brown. Remove the samosa and place on a clean surface ready to serve. Makes 8 large or 15 small samosas.

Soups and sauces

Mwitemaniamash soup

makes 6 to 8 portions

Ingredients

2 cups dried mwitemaniamash beans

1 tsp salt

1 onion, medium, sliced

2 tbsp lemon juice

½ tsp freshly ground pepper

1½ tsp dry mustard

½ kg fatty meat

Preparation: Sort, wash and soak beans overnight in water. Drain the beans reserving the soaking liquid, and add enough cold water to the soaking liquid. Put the beans and water in a pot and add the onion, celery and ham bone. Bring to a boil, lower heat and simmer, partially covered for 3½ hours or until beans are soft. Add water to replace any that evaporates. Remove the ham bone. Rub through in a blender or beat by hand. Add the cooked ham and reheat, season with mustard, lemon juice, salt and pepper.

Groundnut soup

serves 6 to 8

Ingredients

2 cups crushed groundnuts

2 cups water

½ cup milk or soymilk

½ tsp salt

Preparation

Pound the groundnuts by bringing the thick wooden pestle down into the wooden bowl rhythmically until thoroughly pulverized. Add 2 cups of water to 2 cups of groundnuts and salt. Simmer in an open pot until thick then thin it to a lighter consistency with milk. Serve in bowls. Additional ingredients to the soup may include chopped onions, mushrooms, chilis or strings of cooked chicken, beef or pork.

Groundnut sauce

serves 6 to 8

Ingredients

| | |
|-------------------------|--------------------------|
| 1 small onion, diced | 1 tbsp cooking oil |
| 1 medium tomato, sliced | 2 tsp wheat flour |
| ¼ tsp black pepper | 1 cup of water, boiling |
| 1 large capsicum pepper | 1 cup crushed groundnuts |

Preparation: In a pan, fry onion in cooking oil. Add tomato, capsicum, salt and black pepper, and cook for 10 minutes until soft. In a bowl, stir crushed groundnuts, water and flour into a smooth paste. Add groundnut mixture to the pan and cook for another 20 minutes. The sauce is best served with ugali or cooked arrow root.

Peanut butter

makes 2 cups

Ingredients

| | |
|----------------------------------|--------------------|
| 2 cups unsalted, roasted peanuts | 1 tbsp cooking oil |
|----------------------------------|--------------------|

Preparation: Mix the peanuts with oil and pour crush the mixture using a mortar and pestle until smooth. If available, a food processor results in a smoother blend. For chunky peanut butter, set aside ¼ cups of chopped roasted groundnuts and add to the smooth paste. Peanut butter may be used immediately in recipes requiring groundnut sauce, or stored in a sealed container and eaten over a few days. For a sweeter taste, add 1 tbsp of sugar and ½ tsp salt to the groundnuts while crushing.

Stews

Basic Bean Stew

serves 6 to 8

Ingredients

| | |
|-------------------|------------------|
| 4 litres water | ½ kg beans |
| 2 medium tomatoes | 1 tbsp salt |
| 1 medium onion | 100 g fatty beef |

Preparation: Wash the beans. Put them in the cooking pan containing water and cook for 2 hours. Reserve the bean liquid to be added as needed. Put fat on sufuria, add onions, salt, tomatoes and mix while cooking. Mix at intervals of 5 minutes and cover with the lid. Cook for 25 minutes and remove from heat. Serve with rice, matoke or ugali.

Boston style beans

serves 8

Ingredients

| | |
|----------------------------------|-------------------|
| 2 cups white beans | 1 tsp salt |
| ¼ kg fatty beef or pork, chopped | 2 tsp dry mustard |
| ¼ cup jaggery or unrefined sugar | water |

Preparation: Clean and wash the beans then soak them overnight. Boil the beans for 75 minutes and taste one to see if it is done. Add salt, stir and drain and reserve the bean liquid. Place the chopped meat and beans in a covered cooking pot, add a small amount of water and place over a hot fire. Blend the mustard and jaggery with the reserved bean liquid and pour over the cooking beans. Cover and boil for 1 hour, stirring occasionally and adding water as necessary. Uncover and cook for another 20 minutes to thicken the sauce. Season as desired with salt and pepper then serve.

Red and white cowpeas

serves 8

Ingredients

| | |
|----------------------------|-------------------|
| 1 cup black-eye peas | 1 cup red cowpeas |
| 1 medium onion | ½ tsp salt |
| 1 tbsp butter or margarine | |

Preparation: Clean cowpeas, wash, mix together and soak overnight. Boil cowpeas in 1.5 litres (8 cups) salted water for 40 minutes, drain. Add butter or margarine and salt and pepper to taste. Children particularly enjoy this colorful combination of cowpeas.

Black-eye stew

serves 8

Ingredients

| | |
|-----------------------------------|--------------------|
| 2 cups black-eyed peas | 1 tbsp cooking oil |
| ½ tsp freshly ground black pepper | 1 tsp salt |
| 2 tomatoes, chopped | water |
| 2 onions, medium, chopped | |

Preparation: Sort and wash peas; set aside. Heat oil in a pan, add onion and cook until tender. Stir in peas, salt and pepper. Add 7 cups of water, cover and simmer for 45 minutes or until peas begin to soften. Uncover and cook for 15 minutes or until liquid begins to thicken. Stir in tomatoes, simmer for 10 minutes or until peas are tender, stirring occasionally.

Cowpea and cassava stew

serves 6

Ingredients

1 cup cowpeas

1 onion, medium, ground

1 sweet cassava tuber

½ tsp freshly ground pepper

2 tbsp cooking oil

Preparation: Sort, wash and soak cowpeas overnight. Boil cowpeas, peel and wash cassava, cut it into cubes and boil. Mix the boiled cassava and cowpeas and mash slightly. Fry the onion in cooking oil until it turns golden, add the mixture of boiled cassava and cowpeas, mix together then add pepper and salt to taste.

Green vegetables

Cream of cowpea spinach

serves 4 to 6

Ingredients

2 bunches cowpea leaves

1 cup water

1 medium onion, chopped

½ cup cream or fresh milk

2 tbsp vegetable oil

1 tbsp salt

1 medium tomato, chopped



Preparation: Pinch the leaves of nightshade from the main stalk while retaining a very small leaf stem. Wash the leaves, drain off water, boil them for about 25 minutes, remove from fire and drain excess water. Heat vegetable oil in a pan and add the chopped onions stirring occasionally until the onions are soft. Add tomatoes and the boiled nightshade leaves then cook for 2 minutes, stirring occasionally. Add the cream and 1 cup of water, cover and simmer for 5 minutes. Best served while hot with ugali. An alternative recipe involves the addition of 1 to 2 cups of other traditional green vegetables, particularly spider plant or amaranth, with the nightshade.

Kunde western-style

serves 4 to 6

Ingredients

3 onions chopped and sliced

1 tbsp salt

2 tbsp cooking fat

2 bunches cowpea leaves

2 cloves garlic, finely diced ½ litre whole milk
4 tomatoes, chopped

Preparation: Wash kunde in water and add to 1 liter of water and ½ tbsp salt in a pot over medium heat, simmer for 30 minutes, stirring occasionally. Set cooked leaves aside. Heat fat in a pan over medium heat; add onion, tomatoes, garlic and ½ tbsp salt. Fry the mixture for 5 minutes until cooked, stirring often. Add the cooked leaves to fried mixture and stir until it begins to simmer. Add ½ liter whole milk, take to a boil and simmer for 15 minutes. Kunde spinach is best eaten with ugali. The same ingredients and cooking instructions can be used to cook other green vegetables. Add 1 cup mushrooms to the frying mixture for a different taste.

Cowpea leaves in soybean sauce *serves 4-6*

Ingredients

3 medium tomatoes, chopped ½ cup water
2 tsp traditional salt/ local ash 1 medium onion
2 bunches kunde 1 tbsp cooking fat
1 cup soybean paste 1 tsp salt

Preparation: Soak 2 cups of dried soya bean overnight, add to salted water, cook for 60 minutes or until soya beans are soft. Discard the water and mash soya beans with a large spoon until paste forms then set aside. Wash cowpea leaves and shred into small pieces. Melt cooking fat in a pot and add the chopped onion, stir occasionally and fry until golden brown. Add in the tomatoes and continue to stir. Add kunde, stirring constantly, add water and the traditional salt/ local ash, bring to boil and simmer for 10 minutes. Add the soya bean paste, stirring occasionally and bring to a slow boil for 10 minutes. Season with salt and serve with ugali.

Kunde with groundnut *serves 4 to 6*

Ingredients

1 bundle of cowpea leaves (kunde)
1 onion, chopped ½ cup peanut butter
1 chilli pepper, chopped 1 tsp salt
1 tbsp oil 1 cup coconut or cows milk

Preparation: Wash kunde, boil in 1 liter of water and ½ tbsp salt over medium heat, and simmer for 30 minutes stirring occasionally. Set cooked leaves aside. Sauté onions and chili pepper in oil until onion is transparent. Add peanut butter and coconut milk slowly, stirring constantly until it comes to a boil. Add kunde then add salt to taste. Reduce heat and simmer for 15 minutes or until kunde is cooked.

Steamed green beans

serves 4 to 6

Ingredients

½ kg fresh green beans

1 tbsp butter or margarine

½ tsp black pepper

½ tsp salt

Preparation: Wash beans removing ends and strings if any. Cut them in diagonal strips or leave them whole. Place 2 liters of slightly salted water in a covered cooking pot, and steam the green beans in rapidly boiling water for about 10-15 minutes until tender but still crunchy. Drain the beans, add butter, salt and pepper to taste. Young pods of cowpeas may be cooked in the same manner.

Bean sprouts

serves 6 to 8

Preparation and use:

Bean sprouts may be prepared from bean, soybean, green gram and many other smaller grain legumes, *but not butter beans (lima)*. Wash the beans and remove defective grains. Soak 1 cup of seed in water



overnight and place into small tubs with drainage. The tubs are covered with a clean, moist cloth, kept in the dark and sprinkled with clean water 3 or 4 times a day. The sprouts are ready when they are 3 to 6 cm in length after 4 or 5 days. Wash the sprouts in clean water to remove seed coats and eat soon afterwards. Bean sprouts are consumed in salads or cooked as vegetables. Care must be taken not to overcook sprouts as their vitamins may be lost.

Mixed and fried foods

Githeri

serves 8 to 12

Ingredients

½ kg maize

1 tbsp salt

1 kg beans

3 medium tomatoes, chopped

10 liters water

1 large onion, chopped

Preparation: In a large pot, combine washed maize and soaked beans. Add enough cold water to cover. Bring to a boil and simmer in a covered pot for 2 hours or until corn and beans are tender. In the finished dish, most of the



water should be absorbed, and the corn and beans should be tender yet still intact, not mushy. Season with salt. Fry onion in oil and add tomatoes into a paste then pour in the githeri and mix. Serve hot, alone as a main dish or as a side to any other dish.

Fried soybeans

serves 6 to 8

Ingredients

3 cups cooked soybeans or ½ kg okara

3 medium tomatoes

2 large onions, chopped

¼ cup cooking oil

Preparation: Cook soybeans and chop into coarse pieces then set aside. Fry onions in cooking till golden brown, add tomatoes and stir to fine paste. Add chopped soybeans (or okara) and cook for 10 minutes, stirring often.

Refried mwitmania beans

serves 6 to 8

Ingredients

2 cups mwitmania beans

5 tbsp cooking fat

½ teaspoon freshly ground pepper

1½ tsp salt

Preparation: Wash and soak beans overnight in water. Boil and simmer for about 1½ hours or until tender, add salt and pepper. Heat the fat in a pan. Drain 1 cup of beans and put in the pan. Mash thoroughly, adding ½ cup of the reserved liquid then stir and cook for 2 minutes. Add and mash the rest of the beans with more of the reserved liquid gradually until all the beans and the liquid have been

used and the mixture is creamy. For additional taste, add 1 tbsp of cumin or ¼ cup of dhania after mashing. Adding 1 cup of shredded cheese melted into the beans after cooling also improves this dish.

Pilau ya soya

serves 8 to 12

Ingredients

3 medium potatoes

1 medium cabbage

3 medium tomatoes

1 tbsp minced garlic

¼ cup cooking oil

1 tbsp ginger

2 medium onions

1 tbsp pilau masala spice

1 kg cooked soybeans or okara

2 tsp salt

Preparation: Peel the potatoes and cut into quarters. Peel and pound ginger and garlic together. Slice the cabbage. Chop the tomatoes and onions. Blanch the potatoes in boiling water for 8 minutes. Heat oil in a pan and fry the onions until golden brown. Add chopped soybeans, tomatoes and salt and cook for 5 minutes. Add the pounded garlic and ginger then stir. Add pilau masala spice and stir well. Add sliced cabbages and mix well then cook for 10 more minutes. This is a nutritious main dish that is best served with rice.



Mashed grain and meat substitutes

Mashed Beans

serves 6 to 8

Ingredients

3 cups beans

1 tsp salt

Preparation: Clean and soak beans overnight in excess water. Boil beans for 1½ hour in salted water. Drain beans and save water. Mash the beans adding saved water to desired consistency. When mash cools slightly it is ready to serve or to use in other recipes.

Mashed Bean Stew

serves 6 to 8

Ingredients

| | |
|----------------|-------------------|
| 1 kg beans | 2 tbsp salt |
| 4 lts water | ¼ kg tomatoes |
| 2 tsp salt | ½ cup cooking oil |
| 1 medium onion | |

Preparation: Place beans in a dry pot and stir for about 15 minutes. Place on a flat surface and dry under the sun for 15-30 minutes. Grind the beans to a powder using a mortar and pestle. Sieve to remove seed coats and dirt then wash in cold water. Boil bean powder for 30 minutes until firm, stirring frequently. Chop onions and brown them in a frying pan with cooking oil. Chop tomatoes, add to onions and salt to taste. Pour the fried vegetables over the cooked bean powder and serve with ugali, *matoke* or sweet potatoes.

Soybean and mash patties

makes 6-8 patties

Ingredients

| | |
|---------------------------|------------------------------------|
| 3 medium potatoes | 2 cups soybean or ½ kg okara |
| 1 tbsp salt | 1 small onion, chopped |
| 1 tbsp chilies (optional) | ¼ cup dania (or 1 tbsp cumin) |
| ½ cup cooking oil | ¼ cup flour, bread crumbs or ugali |

Preparation: Soak soybeans overnight. Peel potatoes, cut into chunks and boil for about 30 minutes, drain and mash. Boil soaked soybean in 6 cups (1½ litre) of water for 1 hour, then remove the boiled soybeans, drain and chop. Combine the mashed potatoes, soybean, salt, chopped onion, chopped chilies and dania, mix together until a thick mash forms. Form the mash into small patties and powder the outside with flour, bread crumbs or ugali. Fry in hot oil, be sure to thoroughly cook one side before turning to prevent breaking.

Mashed beans and potatoes

serves 8 to 10

Ingredients

| | |
|-------------------|----------------------------------|
| 6 medium potatoes | 2½ cups dried beans (about ½ kg) |
| 6 litres water | ½ tsp salt |

Preparation: Clean beans and soak overnight. Peel and wash potatoes. Rinse beans and place into a pot containing salted water. Boil beans for 1 hour in a covered pot. Add potatoes and continue

boiling for 20 more minutes. Add salt, remove lid and continue to cook until excess water evaporates. Mash bean and potato mixture ready to serve. Ground cumin or chopped dania may be added for additional flavor. Cowpeas may be substituted for beans, and sweet potato or matoke substituted for potato. Best served with stew.

Soy Sausages

makes 6 to 8 portions

Ingredients

½ cup flour or ugali

2 cups cooked soybean

1 tbsp fresh chopped pilipili

¼ cup dania

1 tsp salt

½ litre cooking oil

1 small onion

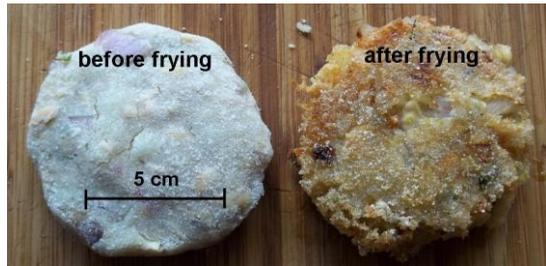
2 tbsp milk

Preparation:

Combine flour, salt and coarsely chopped soybeans in a basin. Add onions, pilipili

and milk and then mix thoroughly. This should produce stiff dough.

Mould flattened patties by hand into desired size and powder with flour or ugali to reduce stickiness. Heat the cooking oil and place the patties into the oil, turning until dark brown to assure that flour is well cooked. The soy mixture may also be shaped into spheres to provide vegetarian meatballs for use in spaghetti and other sauces.



Soyburger

makes 6 to 8 portions

Ingredients

½ cup ugali or bread crumbs

1 cup soybean

1 small onion, chopped

½ tsp salt

1 tbsp cooking oil (to coat pan)

1 egg, beaten

Preparation: Soak soybeans overnight, bring them to a boil in a pot with 6 cups water and simmer for about 2 ½ hours until cooked. Chop soybeans. Mix in other ingredients in a bowl into a uniform, slightly sticky mince. Form the mixture into rounded patties and coat with ugali or bread crumbs to reduce stickiness. Patties should not be too thin or they may break during cooking. Place the patties into a greased frying pan and cook for 20 minutes or until the patties are

brown on the outside and cooked throughout. Serve with bread or a toasted bun.



Soy “meatballs”

makes 20 pieces

Ingredients

- | | |
|-------------------------------------|---------------------------|
| 1kg soy grits or okara | 3medium sized bulb onions |
| 1bunch dhania finely chopped | 1 cup wheat flour |
| 1 clove garlic peeled and crushed | 1 tsp salt |
| 1 ginger peeled and crushed | 1 litre cooking oil |
| 2 tbsp freshly squeezed lemon juice | 2 eggs |

Preparation: mix soy grits with the onions, garlic and ginger. Add 4 table spoons of oil to pan and fry the mixture for 5 minutes. Allow to cool then add the wheat flour, eggs and lemon juice and mix well. Scoop out the mixture with a table spoon and roll them out into small balls using your palms. Heat the cooking oil and carefully deep fry the soy balls to a golden brown colour, drain off excess oil and place in an open dish to avoid sogginess.

Sossi stew

serves 3

Ingredients

- | | |
|--|--------------------|
| 1¾ cups (90 g) textured soybean pieces | ½ tsp salt |
| 1 medium onion, chopped | 1 cup water |
| 2 tomatoes, chopped | 2 tbsp cooking oil |

Preparation: Add oil to cooking pan and fry onion until clear then add tomato and salt. Add soybean pieces and allow softening for 2 minutes while stirring. Add water and simmer for 15 minutes. Other vegetables and seasoning may be added with tomatoes. Note: Sossi is a textured soybean product manufactured in Kenya, but other pieces of textured soy protein may be used in this recipe as well.

Sossi in coconut kunde

serves 3

Ingredients

- 90 g sossi tasty pieces (1 packet)
- 5 cloves garlic, crushed
- 1 piece ginger, grated
- 3 big tomatoes, diced
- 30 g desiccated coconut or coconut milk

- 1 bunch kunde
- 1 big onion
- 3 tbsp cooking oil
- 1 cup water

Preparation: Fry onions till ready. Add garlic and ginger and stir while cooking. Add tomatoes and desiccated coconut. Cover the pan for 2 minutes, stir and crush the tomatoes against the pan. Add sossi and stir for 2 minutes while letting absorb the flavors. Add a cup of water, cover the pot and bring to a boil for 4 minutes under low heat. Add kunde and stir, cover the pot and leave to cook for 5 minutes. If using coconut milk, add it 2 minutes after putting in kunde and let cook for another 3 minutes. Serve with ugali or your favorite starch and vegetables.



Crispy Sossi

serves 3

Ingredients

- 90 g sossi pieces (1 packet)
- 1 large green pepper (hoho)
- 4 tbsp cooking oil

- 2 medium tomatoes
- 1 big onion
- 1 cup of water

Preparation: Heat cooking oil in a pan till hot. Add onions and empty the sossi pieces in the pan. Stir until the onion becomes tender/golden brown. Add tomatoes and stir until sauce forms. Add water to the mixture and let boil for 10 minutes, more water can be added to make the required thickness. Garnish with green pepper and remove from heat. Serve with ugali and vegetables.



Flour and baked foods

Fortified finger-millet porridge *serves 3 to 4*

Ingredients

| | |
|-----------------------------------|---------------------|
| 1 cup finger millet flour (wimbi) | 1 litre water |
| ¼ cup sugar | 1 cup soybean flour |

Preparation: Bring water to boil. Add wimbi and soybean flour, stirring frequently. Boil for 6 minutes while breaking any lumps. Add water or milk until desired consistency is attained then add sugar and stir. This porridge has higher protein, vitamin and mineral content hence more nutritious than wimbi alone.

Soy and maize porridge *serves 4 to 6*

Ingredients

| | |
|---------------------|---------------|
| ¾ cup soybean flour | ¼ cup sugar |
| 1 cup maize flour | 1 litre water |

Preparation: Bring water to boil. Mix maize and soybean flour in a bowl. Add this flour into the boiling water with near constant stirring to avoid lumps. Cook for 20 minutes. Add more water or milk to desired consistency then add sugar and stir.

Fish and groundnut porridge *serves 4 to 6*

Ingredients

| | |
|--------------------------------------|--------------------------|
| ½ cup small dried fish (about 100 g) | |
| 1 litre water | 1 cup crushed groundnuts |
| 4 tbsp sugar | 1 cup maize flour |

Preparation: Boil water, mix the ingredients then pour them into the boiled water and stir. Cook for 10 minutes with constant stirring to avoid lumps Add sugar, stir and cook for 2 more minutes. This porridge has a strong taste because of the fish but is richer in protein and minerals than other porridges.

Soya cake *makes 8 to 10 portions*

Ingredients

| | |
|------------------------------|------------------------|
| 1½ cup baking wheat flour | 2 eggs |
| 1 tbsp baking powder | 1 cup milk or soy milk |
| ½ cup soybean flour | ¼ cup sugar |
| ¼ kg margarine or shortening | ½ tsp salt |

Preparation: Combine the dry ingredients: wheat flour, soy flour, baking powder and salt. In a separate bowl, combine milk, eggs, sugar and margarine. Pour the wet ingredients into the dry ones and stir thoroughly to form a loose batter. Place batter into



a greased baking pan and bake in medium oven for 30 minutes or until golden brown. The cake may also be prepared over a fire: prepare 2 liters of clean sand and light a cooking fire. After a bed of coals is formed, place sand on fire and allow to heat for 10 minutes. Place dough in a clean, greased sufuria; sprinkle some additional baking powder on top of the dough. Cover and insert the sufuria into the sand and coals transferring some of the coals to the lid of the sufuria. If necessary, build the fire around the sides of the sufuria. Bake for 30 minutes. Check interior of the cake with a knife to assure that the dough is thoroughly cooked. Allow the cake to cool for 1 hour before serving.

Soy Ugali

serves 4-6

Ingredients

1½ cup composite soy-maize flour 3 cups water

Preparation: Boil water for 10 minutes. Add flour while mixing till it thickens and becomes hard in small portions. Turn the mixture throughout the whole process while leaving for 2 minutes per interval to cook. Cook for 10 minutes and remove from fire. It can be served with *liseveve*.

Soy chapatti

makes 10

Ingredients

1 cup soy flour 3 cups wheat flour
½ tbsp salt 3 cups water
2 tbsp cooking oil

Preparation: Boil water and mix the flours with warm water to obtain dough with desired consistency. Cut the dough into small pieces and roll it as you apply oil. Recoil and roll gain. Cook on flat, dry frying pan for 3 minutes, turning once. As each chapatti is cooked, place on a plate covered with a clean cloth to keep warm.



Okara chapatti

makes 10

Ingredients

1 cup okara

3 cups wheat flour

½ tsp salt

1 cup water

2 tbsp cooking oil

Preparation

Prepare dough using warm water by mixing the ingredients. Roll while adding partially full spoon of cooking oil then recoil. Roll again and start baking. Average time for cooking each chapatti is 3 minutes.

Soy mandazi

makes 12

Ingredients

2 cups wheat flour

½ tsp salt

2 cups soya flour

1 cup water

3 tbsp sugar

1 tsp baking powder

2 cups cooking oil



Preparation: Mix the flours with warm water and baking powder. Add sugar, salt and water and mix thoroughly to make consistent dough. Stand for 15 minutes. Form the dough into small balls. Place cooking oil in pan and heat. Deep fry 6 balls at a time in the hot oil, turning frequently for 2 minutes and remove after they turn golden brown. Place mandazi into covered bowl to keep warm until serving.

Soy pancakes

serves 8

Ingredients

| | |
|-----------------------|------------------------|
| 1 cup soy flour | ½ tsp salt |
| 3 cups wheat flour | 3 cups milk or soymilk |
| 3 tsp baking powder | 6 tbsp cooking oil |
| 3 tbsp honey or sugar | ½ cup butter |

Preparation: Mix all the ingredients starting with the dry ones. Preheat oiled cooking pan and place ½ cup of butter into hot pan, cooking both sides until golden. Serve with syrup or fruit preserves.

Soy puffs

makes 30 portions

Ingredients

| | |
|---------------------|-----------------------|
| 1 cup soy flour | ½ tsp salt |
| 4 cups wheat flour | 1 cup milk or soymilk |
| 1 tbsp baking yeast | 1½ cup warm water |
| 2 tbsp sugar | 6 tbsp cooking oil |

Preparation: Place flour into dry bowl and add salt and half of the sugar. Cream the yeast with remaining sugar and mix with warm milk. Make a well in the centre of the dry ingredients in the bowl and pour in the liquid mixture. Mix together with the warm water and beat very well until smooth. Cover mixture with a clean cloth and put in a warm place to rise (about 2 hrs). Heat the oil and fry the mixture in spoonfuls until golden brown.

Soy dairy products

Fresh Soy Milk

Ingredients

1½ kg soy beans (6 cups)
10 litres water

Materials

2 large trays meat mincer
weighing scale
large spoons



Preparation: Clean and soak the soy beans overnight in 8 litres water. Drain the soaked soybeans, rinse twice and pour them onto a tray. Grind soybeans using a mincer in small portions. Repeat

grinding to obtain finer particles. Add 2 litres of clean water to soybeans (or two cups of clean water per cup of ground soybeans) and mix thoroughly. Pour the soya mix into a clean sack and squeeze over a tray to recover soya milk. The cake remaining in the sack is referred to as okara. Sieve the milk to remove large particles then repeat the above procedures on the remaining okara (press cake) and sieve. Take the soy milk to a rolling boil for 10-15 minutes, stir while boiling. Serve it while hot or cold or prepare for tea. Procedure yields about 3 liters of soy milk.

Soy yoghurt

serves 12

Ingredients

3 litres soy milk
1 cup sugar

1 tbsp vanilla essence
yoghurt starter

Preparation

Cool the recently boiled soy milk to almost body temperature in a water bath to enable the yoghurt to culture. Add yoghurt starter culture to soy milk and mix well with a clean cooking stick. Add hot water in the bath as needed to maintain stable temperature (about 42°C) for yoghurt to culture for 5-6 hours. Add sugar and vanilla essence to the soy milk and stir well. When mixture thickens, transfer to a clean container(s) and place in a cool area until ready for use. Amount of yoghurt produced is 3 litres..

Soybean cheese (tofu)

makes ½ kg

Ingredients

2 ½ litres o soymilk
2½tsp calcium sulphate

Preparation: Soybean cheese, also known as tofu, may be prepared from soy milk. Tofu is prepared by curdling soymilk with salts, usually calcium sulphate. About 2½ liters of soymilk makes ½ kg of tofu. Boil soymilk for 5 minutes and cool to 70°C. Dissolve 2½ teaspoons calcium sulfate in one cup of boiled, warm water. Pour the solution slowly into the soya milk, stir and allow the mixture to stand for 20 minutes. The



soymilk separates into small white curds and an amber liquid. Transfer to a mold lined with cheese cloth. Place a weight on the lid of the mold to put pressure on the curds and drain away excess liquid for 20 minutes. The tofu will set into a single block. Empty it into a tub of clean, cool. The tofu is ready immediately or may be stored for one day without refrigeration. When refrigerating, store tofu in clean water.

Spicy fried tofu

serves 3 to 4

Ingredients

½ kg tofu

1 tsp ginger

1 tsp curry powder

1 clove garlic, minced

1 small onion, chopped

2 tbsp cooking oil

Preparation: Drain tofu, pat dry, and cut into ½ inch cubes. Heat oil and sauté tofu for 5 minutes. Add onion, garlic, ginger and curry powder. Fry until golden brown. Serve with mashed beans, rice or ugali.

Soya beverage

Ingredients

2 kg soya bean

1½ tbsp sugar

Preparation: Clean and roast soybeans in a heated sufuria for 30 to 45 minutes, stirring occasionally until beans darken and have a full aroma. Transfer the roasted beans to a mortar in batches and grind them into powder. Sieve the powder to remove coarser particles and regrind as needed. Add sugar to powder and mix. Pack 3 tablespoons of soy ground into small polythene bags then seal. To prepare beverage, add one packet to 2 cups of boiling water. Serve hot or allow to cool. Note that finely powdered soya beverages are commercially available.



Candies and Desserts

Sweet Mwitemania

makes 10 to 12 portions

Ingredients

½ cup granulated sugar

½ cup butter

1 cup brown sugar

1 unbaked pie shell

1 cup cooked and mashed mwitemania beans

2 eggs, beaten

Preparation: Beat the granulated sugar, brown sugar, eggs and butter until creamy. Add cooked mwitemania beans and blend well. Pour into unbaked pie shell and bake at 375 °C for 20 minutes. Reduce heat and bake for an extra 25 minutes, insert a knife at the centre; if it comes out clean, it is ready. Serve with a scoop of ice cream.

Bean fudge

makes 10 to 12 portions

Ingredients

¼ cup milk

1 block cooking chocolate

2 tbsp powdered sugar

6 tbsp butter or margarine

1 cup cooked, mashed mwitemania beans

Preparation: Stir beans and milk together in a large bowl adding enough milk to resemble mashed potatoes then stir in vanilla. Melt chocolate and butter and stir in the bean mixture. Gradually stir in powdered sugar. Knead with hands to get it well blended. Spread into lightly buttered 9-inch baking dish or form into 1½ inch rolls. Allow to set or chill for 1-2 hours.

Glazed groundnuts

makes 10 to 12 clusters

Ingredients

1 cup raw groundnuts or soybean crunchies

½ cup sugar

2 tbsp butter or margarine

Preparation: In a heavy pan, combine nuts, sugar, and butter or margarine. Cook over medium heat, stirring constantly for 7 minutes or until sugar is melted and golden in color and nuts are roasted. Spread nuts on aluminum foil; separate into clusters. Sprinkle lightly with salt and cool.



Crunchy groundnut banana

makes 8 pieces

Ingredients

1 cup roasted, peeled & chopped groundnuts

½ cup butter or margarine

8 bananas, peeled

Preparation: Steam bananas in a large saucepan for 30 seconds being careful not to overcook. Drain bananas and roll first in melted butter or margarine and then in chopped groundnuts. Arrange them on a serving dish or alternatively bake in the oven for 15 minutes at 190°C, and then serve.

Peanut butter cookies

makes 50 cookies

Ingredients

1 cup shortening

1 teaspoon vanilla

2 cups sugar

2 eggs, beaten

1 cup peanut butter

3 cups flour

¼ teaspoon salt

2 teaspoons baking soda

Preparation: Preheat oven to 190°C and grease a cookie pan. Mix shortening, vanilla and sugar, add eggs and beat thoroughly. Stir in peanut butter. Mix together the dry ingredients, flour, salt and baking soda, and then combine with the moist mixture, again mixing thoroughly. Form the mixture into small balls, place onto the cookie pan, press flat with a fork and bake for 8 to 12 minutes, until firm and brown.

Weights and Measures

pinch = about ¼ teaspoon

3 teaspoons (tsp) = 1 tablespoon (tbsp)

1 tablespoon = ½ ounce = 15 ml

2 tablespoons = 1 ounce = 30 ml (liquid) = 30 g (dry)

4 tablespoons = ¼ cup

16 tablespoons = 1 cup

1 cup = 8 ounces = 240 ml

2 cups = 1 pint

4 cups = 2 pints = 1 quart

1 quart = 950 ml ≈ 1 litre

4 quarts = 1 gallon

Organizing a Grain Legume Cooking Contest

The legume cooking contest is a great way to stimulate interest in grain legumes, popularize new recipes and acknowledge superior cooking skills within the local community. These events are readily incorporated within farmer field days and agricultural shows. Participants are best arranged in advance and asked to submit a recipe for competition. A variety of entries from eight to 15 contestants are then selected. The exact rules of the contest are established by a panel of local experts and explained to the contestants. The recipes submitted and prepared by the contestants may be compiled into a project cook book. Contestants are expected to produce sufficient dishes for both the judges and members of the public and required to start cooking early so that entries are ready at the height of the event. Guidelines for the contest rules follow.

1. Entries must primarily consist of locally-produced grain legumes and vegetables that are boiled, fried or steamed and must be prepared start-to-finish within three hours using no more than two cooking vessels.
2. Grain legumes may be pre-soaked but not pre-cooked.
3. Each contestant is provided similar cooking facilities but must supply their own pot, utensils and ingredients (Photograph 3).
4. Only one entry is allowed per participant in a single contest. Every entry must be accompanied by a list of ingredients and recipe and will be judged shortly after preparation in the presence of the contestant.
5. The following ingredients are strictly forbidden; meat, fish, cheese, canned products, noodles, arrowroot corms and cassava roots (due to the lengthy cooking time necessary to detoxify). Cooking fat from animals may be used at the contestant's discretion. Use of grain legume products such as soymilk or milled flour is encouraged.
6. Entries are permitted the use of non-indigenous plants, herbs and spices, but excess reliance upon non-traditional ingredients may be penalized during judging.



Photograph 3. Contestants are provided identical facilities and time to prepare a dish conforming to contest rules.

7. There are three judges, including a head judge, drawn from the scientific, academic or epicurean communities who evaluate the entries on the basis of taste, texture, presentation and any other criteria they deem important.
8. Contestants may be called upon to sample their own entries before judging, and the judges may ask questions of contestants concerning the preparation of the entry. The decision of the judges is final.
9. Judging takes place during the periods allocated to the cooking contest while the contestant is present and prizes awarded during a public ceremony. The best three dishes are selected based upon taste, presentation, creativity and communication with the judges.

Glossary

- Aflatoxins:** mycotoxins that are produced by *Aspergillus* fungi
- Amino acids:** Organic constituents of proteins containing nitrogen, including essential amino acids
- Carbohydrates:** substances found in plants and animals including cellulose, starch, sugar and carbohydrates that supply energy
- Deficiency:** nutritional problem caused by insufficiency of one or more elements food or diet such as iron or vitamin A deficiency.
- Dehiscence:** natural opening at maturity of legume shells, causing yield loss from seed shatter
- Grain legume:** an annual crop producing edible seeds in the Legume family, N2Africa works with bean, cowpea, groundnut and soybean
- Hungary harvest:** foods that are low nutrition because of poor growing conditions and post-harvest handling
- Industry standards:** critical thresholds in grain characteristics that are acceptable to buyers, includes moisture, split grain, color, pest and disease damage and foreign matter
- Iron deficiency:** a condition resulting from too little iron in the body.
- Kwashiorkor:** another term for protein deficiency, characterized by the development of extended bellies and red, brittle hair
- Malnutrition:** a condition that results from unbalanced diet in which certain nutrients are lacking, in excess or in the wrong proportions
- N2Africa:** a shortened form of the project *Putting Nitrogen Fixation to Work for Smallholder Farmers in Africa* funded by the Bill & Melinda Gates Foundation.
- Okara:** the soy pulp that's left after all the “milk” is strained out from mashed soybeans, useful in human food and livestock feed
- Peanut:** another common name for groundnut
- Protein:** nitrogen-bearing molecules containing amino acids that are essential for building and maintaining muscles and internal organs.
- Protein malnutrition:** a form of malnutrition involving inadequate protein
- Quality control:** the process of ensuring that produce meets industry standards
- Screw Press:** a mechanical devise that crushes grains to exude their oil, use with groundnut and soybean
- Soya:** another term for soybean, often describes products from soybean.
- Sprouts:** edible germinated seeds of grain, including bean and soybean
- Trypsin inhibitor:** a substance that reduces the utilization of an essential amino acid, present in high concentrations in soybean, requiring that it be cooked before consumption

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About this Handbook and the N2Africa Project

One of the objectives of N2 Africa project is to empower women as grain legume entrepreneurs and rural innovators. This goal is being achieved by conducting a project-wide gender analysis in relation to household and farm characteristics, labor tasks and availability and market preferences and then designing incentives that promote household wellbeing and economic opportunities among women farmers. Furthermore, women represent 50% of all participants within the project as farmers, trainers and graduate students. Participating farmers belong to women's groups or women's chapters of farmer associations. All participating farmer organizations nominate a women representative to the project and they are provided opportunity to conduct at least two special events especially relevant to women farmers and homemakers on the role of legumes in household nutrition and value-added processing each year in every country. This booklet emphasizes the use of grain legumes by homemakers as a means to improve household diet and basic food processing cottage industry. It is intended for distribution at farmer field days and cooking contests as a means of stimulating food and nutrition extension services to rural households. During later stages of the N2Africa Project, we plan to facilitate collective marketing of grain legumes and their value-added products.

