

68203

c.2



CIAT

68203

225798

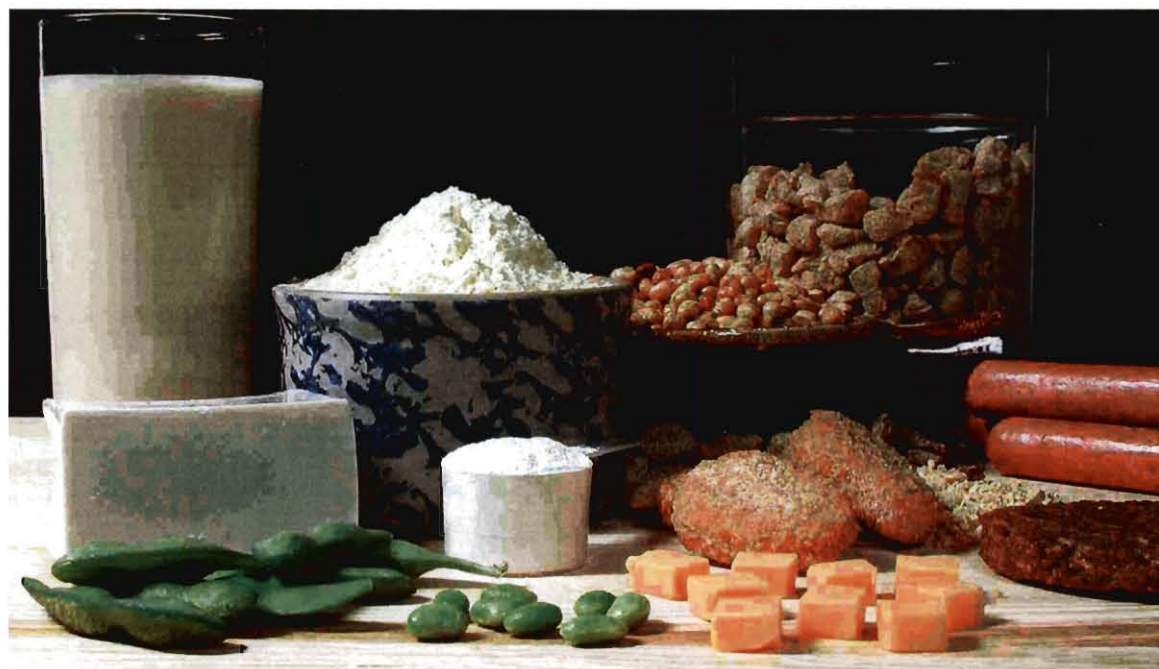


CIAT

Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

COLECCION HISTORICA

TSBF



SOYBEAN PROCESSING AND NUTRITION TRAINING OF TRAINERS:

An Incentive for Soil Health Improvement



CIAT

COLECCION HISTORICA

OMO OHIOKPEHAI (PhD)

(ENGLISH VERSION)

AMPATH • GoK • DOW-USA • MOH • MOA • ROP • MOE Kenya •
MOE Uganda • Kenyatta University • JKUAT • Farmers Associations •
K-Rep • Nakaseke HIV Group-Uganda • Makerere University and Others

CIAT

UNIDAD DE INFORMACION Y
DOCUMENTACION

EA88
4.3

FOR INFORMATION CONTACT:

Dr Omo Ohiokpehai
Tel: +254-20-7224779
Fax: +254-20-7224764/3
E-mail: oohiokpehai@cgiar.org

**TSBF INSTITUTE OF CIAT
C/O ICRAF, UN AVENUE, GIGIRI,
P.O. Box 30677-00100,
NAIROBI, KENYA**

Funded by the Rockefeller Foundation

2008

TABLE OF CONTENTS

INTRODUCTION	5
Soybean processing and utilization: The way to good health!	5
General Information	7
Weight and measures	7
Abbreviation	7
Soybean handling and storage	7
Problems in the processing of soybeans to food	8
Conversions	8
Food Safety for People Living with HIV/AIDS (PLWHA)	11
How to Shop Safely for Perishable Food	12
Food Storage at Home	13
PART II: HYGIENE AND SANITATION	15
TO REDUCE FOODBORNE DISEASES THE FOLLOWING FACTS MUST BE LEARNED:	15
Production of Soy - Flour (Dry Base)	17
EXAMPLES OF PRODUCTS MADE FROM SOYMILK.	19
1. Making Soymilk.....	19
COMMERCIAL SOYMILK MAKING	22
Making Soy Yoghurt	25
Soy Cassava Bites	26
Soy Pancakes	27
Tofu.....	27
Apple Pancakes	28
Pumpkin Pancakes	28
Soy Potato Pancakes	29
Soy Chin – Chin (biscuit)	30
Soy Puff – Puff (soft bread)	30
Soy Mandazi.....	31
Soy Chapatti.....	32
Soya Biscuits	32
Soy Wheat Bread.....	34
Molasses Wheat Bread	35
SPROUTS.....	35
PICKLED VEGETABLES – Source of Vitamins and Minerals	36
Soy Potato Cake	38
Soy mix flours	38
Tofu.....	39
Soy Food Mixes	40
Soy Corn Porridge.....	41
Soy Wimbi Porridge	41
Soy Balls.....	42
Okara Sausages	43
Soy Ugali.....	44
Soy-Wimbi Ugali	44
Soy Nuts	45
PART IV: PACKAGING AND LABELLING.	47

THE FOOD ENEMIES TO COUNTERACT	47
WHY PACKAGING AND WHAT ARE THE PACKAGING REQUIREMENTS?	47
PACKAGING SOLUTIONS	48
PACKAGING MATERIALS	48
1. Rigid.....	48
2. Flexible.....	49

INTRODUCTION

Soybean processing and utilization: The way to good health!

Tropical soil biology and fertility (TSBF) an institute of International Center For Tropical Agriculture (CIAT), was founded in 1984 and its main activity includes research on the role of biological and organic resources in tropical soil biology and fertility and its relationship to the natural and social environment in order to provide farmers with improved soil management practices to sustainably improve their livelihoods. However successful resource management and sustainable agricultural productivity need to go still further addressing socio-cultural realities in the realms of market, health and policies. The central hypothesis is that natural resources management research will have more leverage if the apparent gaps between investment in the natural source base and equitable income generation and distribution can be bridged

Under the new framework investment in soil fertility management represents a key entry point to sustainable agricultural productivity growth, and a necessary condition for obtaining positive net returns to other types of farm investment. Therefore TSBF pursues the following objectives:

- ◆ To improve the livelihoods of people reliant on agriculture by developing sustainable profitable, socially just and resilient agriculture production systems based on integrated soil fertility management
- ◆ To develop sustainable land management practices in tropical areas while reversing land degradation
- ◆ To enhance the human and social capital of all TSBF-CIAT stakeholders for research and management on the sustainable use of tropical soils.

TSBF-CIAT strategy of poverty reduction through science led research has been linked to health (nutrition), food consumption, and markets and it addresses the real needs of the poor; interacting between the components of soil fertility, production yields, markets, processing, nutrition and health. Successful resource management and sustainable agricultural productivity need to be pro poor i.e. it must touch the realms of soil fertility, markets, income generations, food/nutrition security, nutrition and health. It is at the farmer's advantage if a multi purpose crop like promiscuous soybeans was adopted which will improve the soil, thereby increasing the yields of even subsequent crop planted at the same time allowing the farmers to have a good income. Also, the farmer being able to process some of the soybeans for the household thus improving the nutrition of members of

the household especially the children. In particular the zero to three years where the development of the brain is crucial and malnutrition (diseases) is rife.

In an increasingly entwined vicious cycle, food insecurity heightens susceptibility to HIV exposure and infection while HIV/AIDS heightens vulnerability to food insecurity and poverty. Environmental, human and economic health is so intertwined that it is often difficult to distinguish cause from effect.

In above context, a project was approved by the Rockefeller Foundation for an initial period of 2 years (July 2005 – June 2007) aiming at using soybean processing and utilization as an entry point to solving nutrition and health problems of rural and urban households, affected by HIV/AIDS in targeted areas in Kenya. The project which is being implemented by TSBF is in collaboration with AMPATH and in close association with a sister project on 'Exploring the multiple potentials of soybeans in enhancing rural livelihoods and small industry in East Africa', also funded by the Foundation (2004-2007), and focusing on alleviating soybean marketing bottlenecks.

In the current project, processing is being fostered at the household and the community level. The project has carried out baseline surveys, product development (particularly in food fortification), design and testing of processing technologies, follow up surveys of impact assessment, and turning of a wide range of target groups. Utilization research and promotion will stress soybean's advantages in household consumption and will train women associations and groups concerned with social and health welfare. Food fortification and incorporation of soybeans in the traditional foods consumed in rural Kenya is the main strategy of the project. Foods that are locally consumed are identified and thereby fortification or incorporation using soybeans is done. Such food includes:

- ◆ Soy Chin Chin
- ◆ Soy chapatti
- ◆ Soy Cake
- ◆ Soy Corn Porridge
- ◆ Soy Pancakes
- ◆ Soy Food Mixes
- ◆ Soy Puff – Puff
- ◆ Wheat Bread

General Information

Dehull:	Remove bean skin
Part:	Any desired measure
Residue:	That which remains after the extraction of Soymilk from paste.

Weight and measures

Cup:	Empty tin of peak milk
Dessert Spoon:	Regular spoon used for eating
Teaspoon:	Small spoon which is half of dessert spoon
5 ½ cups of water:	1 litre of water
7 cups dehulled soybean:	1 dsp. granulated sugar
1 cup whole beans boiled, dehulled and ground with 2 cups of water	3 cups paste

Abbreviation

dsp	Dessert spoon
tsp	Tea spoon

Soybean handling and storage

Soybeans must be harvested when all pods are ripe and/or dry. The moisture content of the grains must be between 12 and 14 percent and stored in a cool dry place. Before storing the grains must be cleaned thoroughly and can keep for more than three years cleaned and the moisture content does not exceed 12 percent. High temperature and relative humidity increases the development of hard to cook phenomenon.

Problems in the processing of soybeans to food

To produce a quality food product at household level the following problems must be overcome:

- ◆ Elimination of the beany flavour – The beany flavour is caused when an enzyme (lipoxygenase) comes in contact with the fat in the soybean cells in the presence of cold water.
- ◆ Removal of flatulence – Flatulence is caused by the presence of oligosaccharides in all beans including soybeans and humans do not have galactosidase activity in the digestive tract. However this effect can be reduced with heat treatment and by alkaline soaking
- ◆ Inactivation of the anti-nutritional factors e.g. trypsin inhibitors can be destroyed with moist heat. When legumes are roasted destruction of trypsin inhibitors are not complete, but roasting previously soaked soybeans can effect complete destruction of anti nutritional factors. Also rapid destruction can take place if the soybeans was briefly boiled (20 – 30 minutes), then soaked and then cooked in water with baking soda or sodium bicarbonate.
- ◆ When the soybeans are cooked these chemicals e.g. sodium bicarbonate the simmering water should be changed to allow the beans to simmer in clean water.
- ◆ Addition of salt at the beginning of cooking soybeans will prolong the cooking time

Conversions

As you have probably noticed by now, Kenya is run on the metric system. This sometimes makes it difficult to figure out measurements and temperatures. Even common food products have different names. Here are a few guidelines to help you out.

Solid measurements

1 cup butter, sugar, or rice = 8 ounces = about 250 grams

1 cup flour = 4 ounces = about 125 grams

1 cup powdered sugar = 5 ounces = about 150 grams

Liquid Measurements

1/8 tsp.	=	0.5ml
1/4 tsp	=	1ml.
1/2tsp.	=	2ml
1 tsp.	=	5ml.
1 tbs.	=	1tbs
1/4cup	=	60 ml.
1/3cup	=	90 ml.
1/2cup	=	120 ml.
/4cup	=	180 ml.
1 cup	=	240 ml.
1 quart	=	1 litre

Oven Temperature

Fahrenheit	Celsius
300	150
325	160
350	180
375	190
400	200
425	220
450	230
Broil	Grill

Product names

Sugar	=	Castor or granulated sugar
Powder Sugar	=	Icing sugar
Light corn Syrup	=	Golden syrup
Cornstarch	=	Corn flour
Baking Soda	=	Bicarbonate soda
Vanilla	=	Vanilla essence
Golden raisins	=	Sultanas
Cream of Tartar	=	Tartaric Acid
Ground Beef	=	Mince

Cooking Equivalents

3 teaspoons	=	1 Tablespoon	1 Tablespoon = HALF fluid ounce
4 Tablespoons	=	1/4 cup	1 cup = 8 fluid ounces
5 1/3 Tablespoons	=	1/3 cup	1 cup = 1/2 pint
8 Tablespoons	=	1/2 cup	2 cups = 1 pint
10 2/3 Tablespoons	=	2/3 cup	4 cup = 1 quart
12 Tablespoons	=	1/2 cup	2 pints = 1 quart
16 Tablespoons	=	1 cup	4 quarts = 1 gallon

Emergency Substitutions

If you don't have:

Baking Powder, 1 tsp.

Buttermilk, 1 cup

Brown Sugar, 1 cup

Chocolate, unsweetened 1 ounce

Cornstarch, 1 Tbs.

Corn Syrup, 1 cup

Egg, 1 whole

Garlic, 1 clove

Ginger root, grated 1 tsp.

Honey, 1 cup

Light Cream (half & half) 1 cup

Lemon Juice, 1 tsp.

Milk, 1 cup

Molasses

Mustard, dry 1 tsp.

Onion, chopped 1 small

Sour Cream

Sugar, 1 cup

Tomato Juice, 1 cup

Tomato Puree,

Tomato Puree, 1 cup

substitute

1 tsp. Cream of tartar 1/4 tsp. Baking soda

1 tbs, lemon juice or vinegar plus enough milk

1 cup. Let stand 5 min before using.

1 cup white sugar plus 1 tbs honey

3 Tbs cocoa powder plus 1 Tbs. oil

2 Tbs flour

1 cup white sugar plus 1/4 cup water

1/4 tsp. baking powder plus 2 Tbs Appropriate liquid milk, water or broth)

1/8 tsp. garlic powder

1/4 tsp. ground powder

1/4 cup white sugar plus 1/4 cup water

1 Tbs melted margarine plus enough whole milk to make 1 cup

1/4 tsp vinegar

1/2 cup evaporated milk plus 1/2 cup water

Honey

1 Tbs prepared mustard

1 tsp. onion powder or 1 Tbs dried minced onion

Plain yogurt or the Chambiko cultured milk Product (in the yellow bag). When strained through Cheese cloth, it's just like sour cream.

1 cup brown sugar or 2 cups sifted powdered sugar

1/2 cup tomato sauce plus 1/2 cup water

1 Tbs 1 Tbs. ketchup

1 Tbs. tomato paste plus enough water to make 1 cup

Food Safety for People Living with HIV/AIDS (PLWHA)

Persons with Acquired Immunodeficiency Syndrome (AIDS) are susceptible to many types of infection including illness from food borne pathogens. They are at higher risk than are otherwise healthy individuals for severe illness or death. Affected persons must be especially vigilant when handling and cooking foods. The recommendations provided here are designed to help prevent bacterial food borne illness.

Why Do Bacteria Endanger People with AIDS?

When the AIDS virus damages or destroys the body's immune system, the person becomes more vulnerable to infection by food borne bacteria and other pathogens. For example, the common pneumonia, which is caused by a bacterial infection of the lungs, can occur in any individual but occurs much more frequently in persons with AIDS. In addition, when pneumonia strikes a person with AIDS, it causes a more severe illness and is thus more dangerous.

What Types of Foodborne Bacteria are of Particular Concern to Persons with AIDS?

Certain types of food borne illness are caused by bacteria which can grow on food. The bacteria can infect humans when the food is improperly handled or inadequately cooked. As with many other types of infections, persons with AIDS are at higher risk for developing severe illness or dying from these illnesses. Three types of bacteria are of particular concern for persons with AIDS: *Salmonella*, *Campylobacter jejuni*, and *Listeria monocytogenes*.

Salmonella bacteria are the most common cause of food borne illness. The bacteria are commonly found on raw or undercooked meats (especially poultry) and can be found in eggs even before they are cracked open. Salmonellosis can affect anyone, but occurs almost 100 times more frequently in persons with AIDS than in otherwise healthy persons. Furthermore, *Salmonella* infections, which occur in persons with AIDS, can be particularly difficult to treat and are more likely to lead to DEATH.

Illness from **Campylobacter jejuni** is also caused by bacteria that can sometimes be found on food, especially raw poultry. This illness occurs about 35 times more frequently in persons with AIDS than in otherwise healthy persons. Many persons contract this form of food poisoning by improperly handling or cooking poultry. Raw milk and contaminated drinking water can also be sources of *Campylobacter* infections.

Listeriosis is caused by *Listeria monocytogenes* which can be found on many different types of food. *Listeria* infections are much more common in persons with AIDS than healthy people. *Listeria* infections in AIDS patients are usually severe and are often fatal. *Listeria monocytogenes* can be acquired from a variety of foods including soft cheeses that are unpasteurized and some ready-to-eat foods such as hot dogs or REARY-TO-EAT meats.

How Can Persons with AIDS Prevent Food borne Illness?

Food must be handled safely at every stage from purchase through consumption. Critical points are transporting perishable foods home from the store immediately; prompt, safe storage; thorough cooking to destroy bacteria and other pathogens; and prompt refrigeration of leftovers.

How to Shop Safely for Perishable Food

When shopping for raw and cooked perishable foods, be sure the food is being stored at a safe temperature in the store. Don't select perishable food from a non-refrigerated aisle display. Never choose packages which are torn or leaking. To guard against cross-contamination, put raw meat and poultry into a plastic bag so meat juices won't drip on other foods, such as lettuce and fruit that will be eaten raw. **Put refrigerated or frozen items in the shopping cart last, and take food home immediately.**

Ready-to-eat Foods

When ordering food from the deli department be sure the clerk washes his hands between handling raw and cooked items, or puts on new plastic gloves. Don't buy cooked ready-to-eat items which are touching raw items or are displayed in the same case. Although the risk associated with foods from deli counters is relatively low, persons at risk may choose to avoid these foods or thoroughly reheat luncheon meats and hot dogs before eating.

Shelf-Stable Foods

Don't purchase cans that are dented, leaking, or bulging; food in cracked glass jars; or food in torn packaging. Tamper-resistant safety seals should be intact. Safety buttons on metal lids should be down and should not move or make a clicking noise when pushed.

Although product dating is not required by Federal regulations, observe any "use-by" dates found on products. **Do not use if beyond expiration date!** Follow carefully the handling and preparation instructions on product labels to ensure top quality and safety.

Food Storage at Home

Immediately refrigerate or freeze perishable foods after transporting them home. Use a refrigerator thermometer to be sure the refrigerator is cooling to 4 °C or below; the freezer should be at -17°C.

Refrigerator

Make sure thawing juices from meat and poultry do not drip on other foods. Leave eggs in their carton for storage and don't place them in the door of the refrigerator. Keep the refrigerator clean. Store ground meat, poultry, and fish up to 1 or 2 days; other red meats, 3 to 5 days. After cooking, use within 3 to 4 days or freeze for longer storage.

Freezer

Food stored constantly at -17°C will always be safe. Only the quality suffers with lengthy storage. It is of no concern if a product date expires while the product is frozen. Freezing keeps food safe by preventing the growth of microorganisms that cause both food spoilage and foodborne illness. Once thawed, however, these microbes can again become active, so handle thawed items as any perishable food.

Pantry (Food Store). Store canned foods and other shelf stable products in a cool, dry place. Never put them above the stove, under the sink, in a damp garage or basement, or any place exposed to high or low temperature extremes. Store high acid foods such as tomatoes and other fruit up to 18 months; low acid foods such as meat and vegetables, 2 to 5 years

Food Handling At Home

Food borne illness can be caused by improper food handling or preparation in the home. Wash, utensils, can openers, cutting boards, and countertops in hot, soapy water before and after coming in contact with raw meat, poultry, or fish. Wash kitchen towels and cloths often in hot water in a washing machine. Wash hands with soap and warm water before and after handling food, and after using the bathroom, changing diapers, or handling pets.

Eating Out

Many cases of food borne illness are caused by restaurant, and take-out foods. People at risk should avoid the same foods when eating out as they would at home. Meat, poultry, and fish should be ordered well done; if the food arrives undercooked, it should be cooked again

Cutting Boards

Research shows that nonporous surfaces, such as plastic, marble, tempered glass, and pyroceramic are easier to clean than wood. Wood surfaces are considered porous. Regardless of the type of cutting board you prefer, wood or a nonporous surface, consider using one for fresh produce and a separate one for raw meat, poultry, and seafood. This will prevent bacteria on a cutting board that is used for raw meat, poultry, or seafood from cross-contaminating a food that requires no further cooking.

Cutting boards need to be maintained and monitored for cleanliness. They should be washed with hot, soapy water. Solid hardwood cutting boards are dishwasher safe; however, wood laminates should not be washed in the dishwasher.

After thoroughly washing your cutting board, you can sanitize it with a solution of 1 teaspoon chlorine bleach in a quart of water. Once cutting boards of any type become excessively worn or develop hard-to-clean grooves, they should be discarded.

Cooking Food Safely

Do not eat raw or undercooked meat, poultry, fish, or eggs. For people with AIDS, **the most important thing is to use a food thermometer** to be sure meat, fish, eggs, and stews reach at least 71°C. Roast whole poultry to 82 °C; poultry breasts to 77 °C. When reheating foods in the microwave, cover and rotate or stir foods once or twice during cooking and check the food in several spots with a food thermometer.

Safe Handling of Leftovers

Bacteria begin to multiply rapidly in the "danger zone" between 4°C (recommended refrigerator temperature) and 60°C. Therefore, bacteria on food left out at room temperature will become unsafe in a matter of hours. Refrigerate leftovers at 4°C or below or freeze (-18°C) as soon as possible. **Never leave perishable food out of refrigeration longer than 2 hours, 1 hour in air temperatures above 32°C.**

Divide leftovers into shallow containers. This encourages rapid, even cooling. Cover with airtight lids or enclose in plastic wraps or aluminum foil. Use leftovers within 3 to 4 days.

Safe Reheating of Leftovers

Even though foods may have been safely cooked, bacteria from the air or people's hands can contaminate the leftovers. Always reheat leftovers thoroughly in a conventional or microwave oven or on the stove top. When reheating foods in the microwave, cover and rotate or stir foods once or twice during cooking. Always test reheated leftovers in several places with a food thermometer to be sure they reach 74°C throughout. The food should be steaming hot.

Traveling Abroad

Persons with AIDS should take additional precautions when traveling abroad. Boil all water. Drink only canned or carbonated bottled drinks or use beverages and ice made with boiled water. Avoid uncooked vegetables and salads. All fruit should be peeled. All foods should be cooked thoroughly and eaten while still hot.

PART II: HYGIENE AND SANITATION

Most cases of food borne illness can be prevented if everyone who handles and prepare food learns about Bacteria and food handling. Bacteria is everywhere but it can be stopped with little as the know how of how to use water and soap.

TO REDUCE FOODBORNE DISEASES THE FOLLOWING FACTS MUST BE LEARNED:

1. Bacteria are a part of all living things and are found on all raw agricultural products;
2. Harmful bacteria can be transferred from food to people, people onto food, or from one food to another;

3. Bacteria can grow rapidly at room temperature;
4. Growth of harmful bacteria in food can be slowed or stopped by refrigerating or freezing (explain alternatives at village level);
5. Food borne illness can produce symptoms from mild to very serious. Illness can occur from 30 minutes to two weeks after eating food containing harmful bacteria;
6. People who are most likely to become sick from food-related illness are infants and young children, senior citizens and people with weakened immune systems.

There are FOUR simple steps to fight bacteria. These are CLEAN, SEPARATE, COOK AND CHILL

- ◆ **Clean** – wash hands, utensils and surfaces in hot soapy water before and after food preparation, and especially after preparing meat etc. Using a disinfectant cleaner or a mixture of bleach and water on surfaces and antibacterial soap on hands can provide some added protection.
- ◆ **Separate** – Keep raw meat etc away from ready-to-eat foods; never place cooked food on a plate that previously holds raw meat, etc.
- ◆ **Cook** – Cook food to the proper temperature and check for doneness with a food thermometer. Cook eggs until both the yolk and white are firm.
- ◆ **Chill** – Refrigerate or freeze perishables, prepared food and leftovers within two hours and make sure that the refrigerator is set at no higher than 4 degrees Centigrade and that the freezer unit is set at -18 Centigrade.

Proper hand-washing

Hand washing should ideally be washed with soap under running water. Rubbing hands vigorously 15-20 seconds until a soapy lather appears and scrubbing between fingers and fingernails.

Where there's no water system running water can be organized by using a water butt with a tap. If there is a shortage of water, using soap with a small quantity of water in a bowl is adequate.

Washing hands should be done

- ◆ Before food preparation
- ◆ During food preparation to avoid cross contamination

- ◆ Before serving food
- ◆ Before eating
- ◆ Before and after handling raw meat, poultry and fish products
- ◆ After changing diapers/nappies
- ◆ After blowing nose/sneezing
- ◆ After using the toilet not just after defaction since the pathogens can also be picked up from previous users of toilets via door handlers taps and drying towels
- ◆ After handling unsanitary object such as waste containers
- ◆ After contact with toxic substances or chemicals
- ◆ After touching/handling livestock or pets

Production of Soy - Flour (Dry Base)

- ◆ While stirring, sprinkle raw soy flour
- ◆ Reduce heat and cook for 25 minutes
- ◆ Add sugar and stir to dissolve
- ◆ Add lemon juice and remove from fire
- ◆ Cool and serve

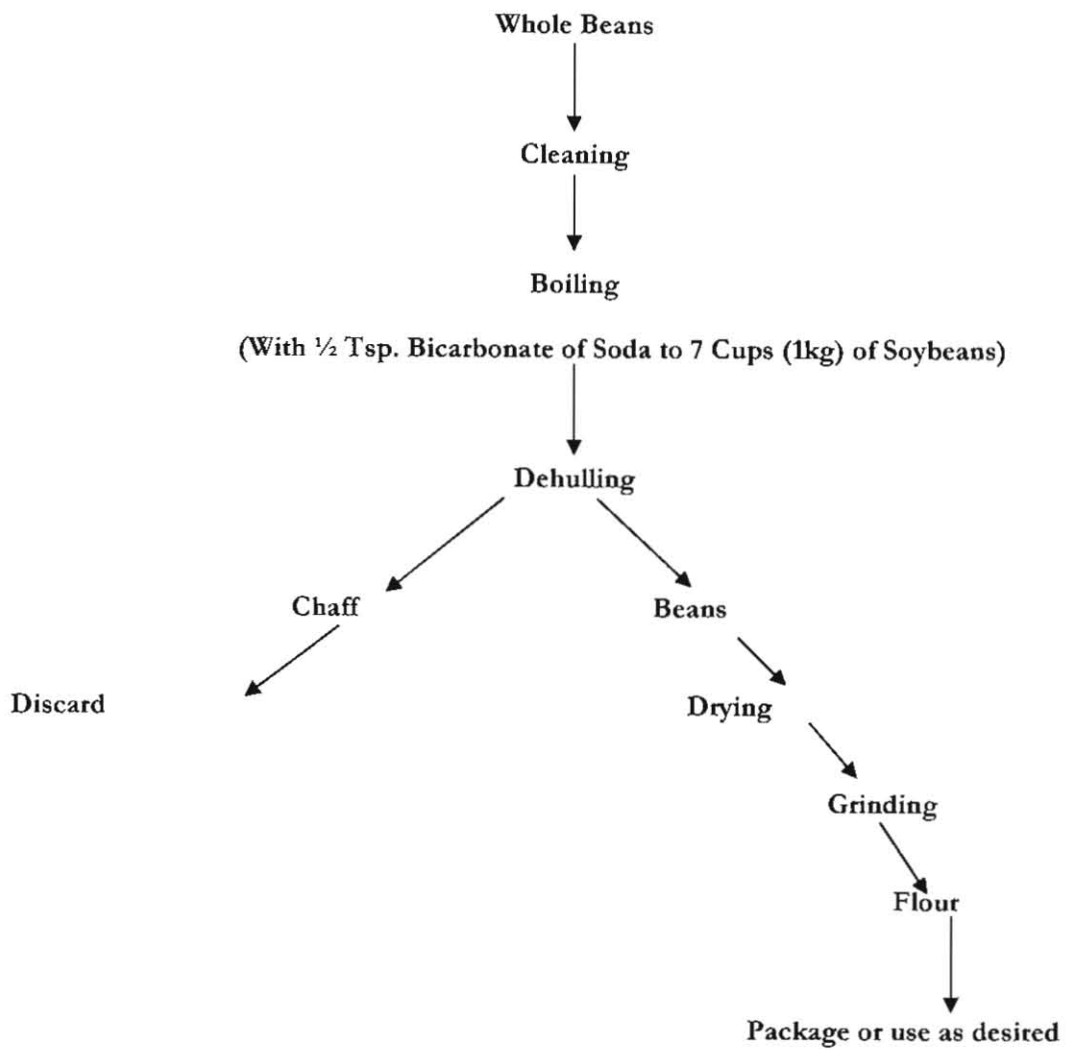
Method

- ◆ Remove stones, damaged beans and any other foreign materials
- ◆ Add soybeans to boiling water to which bicarbonate of soda is added and allow to boil* for 25 – 30 minutes.
- ◆ Dehull beans and drain properly.
- ◆ Dry beans in the sun /oven at low medium setting (where possible first air dry beans under fan)
- ◆ Grind into flour, sieve and package or use as desired.

* Soaking of soybean for 8 – 10 hours, can be done before boiling for the basic methods in which case the boiling time may be reduced by few minutes.

It must be noted that boiling is very essential.

Production of Soy Flour (Dry Base)



EXAMPLES OF PRODUCTS MADE FROM SOYMILK.

1. Making Soymilk

Soaking soybeans, grinding them with water, makes soymilk. The fluid which results after straining is called soymilk. You can make soymilk at home with basic kitchen tools or with a soymilk machine.

Traditionally, soymilk has a beany taste which is well accepted by the users. By using correct processing techniques, this beany taste can be reduced or eliminated. Recently, with many new uses for soymilk having been discovered, the recognition of soymilk's health benefits and with improved flavor and texture, soymilk now has wide and rising acceptance.

Nutritional Values of Soymilk

Plain soymilk is very nutritious: It is an excellent source of high quality proteins, isoflavones and B- Vitamins. Soymilk is free of the milk sugar (lactose) and is a good choice for people who are lactose intolerant. Also, soymilk is a good alternative for those who are allergic to cow's milk.

Instructions before making milk

Inspect Soybeans and sort discarding the bad ones, check foreign matters thoroughly. Wash them at least 4 times or until the water is clean. Soak the beans in water overnight (or at least 8 to 10 hours). They should be soft, swollen and grindable. Again wash and inspect, removing any unswollen ones. Grind in a blender with 2 to 3 cups of water, then sieve through a very thin cloth. Repeat this grinding and sieving process adding 2 to 3 cups water each time until you are through.

Add your flavour i.e. little salt, honey, vanilla, if you wish. Bring it to boil for about 10 minutes. The milk stays good for a few days (3) in the refrigerator.

Many people find the cost of commercial soymilk to be prohibitive and make soymilk at home. Soymilk can be made at home by soaking and crushing Soybeans using traditional stone grindings, traditional blender and electrical blender as the tools.

How do we make soymilk?

Method I

Step 1: Ingredients

You need about 125g Whole soybeans to make 1 litre of soymilk. Therefore approximately 1 kilo of soybeans gives 5 litres of soy milk.

Step 2: Soaking the soybeans

Clean the soybeans and soak them in water for 8 – 10 hours

Step 3: Heating the soybeans (optional)

To remove the beany taste- oil the beans in clean water for about 10 minutes.

Step 4: Grinding the soybeans

Grind the soaked soybeans either using the electrical blender, or traditional stone grinding / traditional blender in warm water. Mix with water in a blender. Sieve the mixture through a clean cloth and recover the soymilk.

The insoluble material which remains on the sieve is called okara, and can be used as an ingredient for cooking ugali by mixing with maize flour, porridge mixing with millet, or

chapattis mixing with wheat flour. (Note: before you mix okara with other flour, allow the okara to boil / cook for about 10 minutes, then mix)

Step 5: Boiling the soymilk

Heat the soymilk till boiling point and continue boiling for about 5 to 10 minutes. After cooling, the soymilk is ready and can be kept in the fridge for 3 days.

Step 6: Flavouring the soymilk (optional)

The soymilk can be drunk as such but taste can be improved by adding some salt (also cow milk contains a lot of salt), some little honey or molasses.

Requirements:

3 ½ cups soybeans (500g)

17 cups of clean drinking water (about 3 litres) -for grinding and sieving (approximately one part soybean to 5 parts of clean drinking water).

¼ tsp. bicarbonate of soda

Pinch of salt

4 ½ dsp Sugar or 13 cubes.

1 tsp. of any desired flavouring.

Method II

1. Clean beans
2. Boil enough water to cover beans, adding half the bicarbonate of soda
3. Wash beans and put into the boiling water and allow to boil for about 10 minutes.
4. Pour off water
5. Put beans into another boiling water into which remaining bicarbonate of soda has been added.
6. Boil for another 10 – 15 minutes.
7. Remove from water.
8. Dehull.
9. Put beans into a blender immediately and grind using part of the drinking water.
10. Mix paste with the remaining water and put in a clean white cloth bag and fold.
11. Using a pair of clean rubber gloves, squeeze out as much filterates as possible leaving a lump cake (residue) inside the cloth (For a large quantity, a simple press may be needed)

12. Cook the filtrate (milk) for about 15 – 20 minutes by steaming, or directly over fire on low heat and stir constantly to avoid sticking to pot: skimming off the scum.
13. Add salt and sugar and stir to dissolve.
14. Remove from fire. Add flavouring and use.

OR

Keep milk in pre-sterilized bottle and seal.

Keep milk in sterilized bottle, put bottle in cold water and allow to boil for about 10 minutes, cool and refrigerate.

Note: The use of clean drinking water for grinding and sieving is essential so as to avoid contamination of milk at source.

Method III

1. Soak beans in cold water for about one hour.
2. Drain off water and dehull beans
3. Put enough water to cover beans on fire, allow to boil and add the bicarbonate of soda
4. Put dehulled beans in the boiling water and allow to boil for 10 – 15 minutes.
5. Blend immediately and continue with the same procedure as in Method I above.

COMMERCIAL SOYMILK MAKING

The VitaGoat system allows villagers to preserve their extra produce without relying on electricity. The device uses a bicycle- powered grinder and wide variety of locally available fuels to prepare protein-rich soymilk, soy yogurt, tofu, and nut butters, as well as fruit and vegetable purees and energy drinks. VitaGoat users first apply pedal-power to grind soybeans, cereals, fruits, or vegetables at a rate that is 10 to 50 times faster than hand-grinding. This process alone produces flours, pastes, nut butters, and even ground coffee. For foods that require cooking, users then feed VitaGoat's steam boiler with wood, coal, gas, or even dung chips. The boiler, which is 10 times more efficient than open-fire cooking, injects steam into a 15-liter vessel, where cooking under pressure saves both time and fuel. A final feature of the VitaGoat is a hand-operated screw-press that can be used to extrude liquid out of cooked proteins for products like tofu and soy yogurt.

The VitaGoat has four main components although one of these, the bicycle grinder, can be used on its own in situations where only dry foods are processed without cooking.

Steam boiler: Operating on either wood or other hard fuels or liquid gas, the boiler is estimated to be 10 times more fuel efficient than traditional open fire cooking and more efficient than improved stove-design cooking. Water is heated in an inner chamber and the resulting steam is re-heated in a tube, creating a “superheated steam” that is much hotter than regular steam. The boiler is inexpensive to build, safe, and can be taken apart for cleaning. This latter feature is critical since most boilers accumulate scale on their inner shells and eventually fail. Guidelines in operating a boiler are as follows:

- ◆ Keep boiler full of water when not using. (reduces rusting)
- ◆ After filling a cold boiler, release unwanted air pressure by briefly opening steam valves on boiler and cooker.
- ◆ Always blow-down (empty) the hot boiler at the end of the day and refill with water before quitting. Open blow-down valve carefully and slowly.
- ◆ Never leave a hot boiler to cool completely without blowing down and refilling. This can cause a vacuum which can damage the pressure gauge or food or wash water to be sucked into the boiler from cooker.
- ◆ Keep the boiler pressure above 25 Psi and below 80 Psi when normally producing steam for the cooker.
- ◆ Some safety release valves are set to 90 Psi and some are higher. Confirm the setting on your safety valve. Make sure release valve is connected to a pipe and away from operators.
- ◆ If pressure approaches 90 Psi make sure steam valves are open on both boiler and cooker. If that does not reduce the pressure, let some water slowly out of the blow down valve.
- ◆ If the safety release valve opens, do not panic about the extra noise. It will close by itself when it has released enough steam pressure. This is a normal and safe event but should be avoided if possible.
- ◆ Keep at least a medium size fire going all times unless it is close to quitting time.

Keep some water visible in the sight glass. Fill boiler when water drops below the bottom of the glass. Do not fill the boiler above the top of the glass

Cooker: Made from stainless steel, this vessel can cook up to 15 liters of food per batch, under pressure, thus greatly reducing cooking time and saving fuel. It is equipped with temperature and pressure gauges and a safety pressure relief valve. Product is fed through an easily removable top opening and steam enters the vessel through openings located on the bottom of the vessel. Cooked product exits the cooker through a valve controlled bottom opening. Guidelines in operating a cooker are as follows:

- ◆ Maximum capacity is 15 litres. For soymilk = 12 litres of water combined with mashed soybean. Mix before loading cooker.
- ◆ Cook soymilk up to 110 degrees centigrade then close steam valve and release cooked product in one or two minutes
- ◆ Cook fruit and vegetable purees, soups, sauces etc up to 100 degrees centigrade then close steam valve and release cooked product.
- ◆ Never let the cooker pressure rise above 30 Psi. At 40 Psi the safety release valve will open-releasing hot food product.
- ◆ If the pressure gauge shows any pressure when the temperature is below 90 degrees centigrade, gently push the small lift pin button on the top of the cooker (use a spoon or tool). This will let unwanted air pressure out and let steam pressure build
- ◆ For soymilk production: if the pressure gauge reaches 30 psi but the temperature has not reached 110 degrees centigrade, simply close the steam valve and wait a few minutes before releasing the food. This should never happen if the previous rule is followed.
- ◆ When releasing cooked food, open the main valve very slowly at first- then open it enough to allow a continuous flow. Never open the valve fully under pressure until the end (to be sure all the product is out.) Close valve immediately after emptying.
- ◆ Be prepared to partially or fully close the steam valve if the boiler pressure drops below 25 Psi. Resume after boiler rises.
- ◆ For cleaning: Wash underside of lid sideways without turning upside down. Keep the two openings clear of food. Inside of cooker can be soaked with cool water and then washed with a mild detergent and water. Use a long brush through the outlet.
- ◆ Make sure steam valve is closed to prevent wash water being sucked into boiler from possible vacuum in cooling boiler.

Bicycle grinder:

Based on a design originally created in the mid-70s in the US, energy is produced through a pedal-powered system that uses adjustable-speed pulleys, permitting fast and easy grinding of a variety of foods. An inexpensive modified hand mill using metal to metal plates grinds foods 10-50 times faster than with traditional methods. Seating is adjustable depending on the operator's height and the adjustable speeds can be matched to the individual's power. Close up view of the "Corona mill" grinder. Other grinders and implements can easily be adapted to the pedal powered mechanism. The seat position is adjustable according to the person's height and leg length. The first "pass" in the grinder produces coarse cornmeal while the second pass yields very fine corn meal.

Ground coffee can also be produced in one pass from roasted beans and the grind is finer than that produced with North American home type electric mills. Grinding output depends on the operator's pedaling speed and selected grinding gear ratio. These outputs are still almost equivalent to motorized grinding speeds and much faster than hand grinding (10 times faster) and traditional "mortar and pestle" methods (on the order of 50 times faster)..

Press: Made of stainless steel. The pressing occurs by turning a screwed rod that pushes onto a sanitary plastic disc, in turn squeezing out liquid from product held within a filter bag. The liquid pours out the bottom into a pail. The press is very simple to operate and clean.. The end product is the soymilk

Making Soy Yoghurt**How to make soy yoghurt**

It's easy to make soy yoghurt at home. The soy yoghurt is not identical to dairy yoghurt but it works well in cooking. To make 1 liter soy yoghurt you need 140 gram soybeans and a starter. As a starter you can use good quality plain soy yoghurt, or dairy yoghurt (if you don't mind dairy products), or a commercial powdered yoghurt starter (also dairy based).

Culturing the soy yoghurt

Bring the soymilk to 42-45°C (either by cooling the boiled soymilk or by heating the ready soymilk). The culture will only thrive in a narrow temperature range, too cool and it won't be active, too hot and it will die. Measure the temperature with a thermometer. Add 4 tablespoons of starter to the soymilk and mix well with a sterile spoon. Put the yoghurt in

yoghurt maker cups and follow the same directions as for dairy yoghurt. If you don't have a yoghurt machine you can put the yoghurt in an oven at 42 – 450C.

After about 5 – 6 hours, when the yoghurt gets firm, chill the yoghurt.

Making the soy yoghurt thicker

You will notice that home made yoghurt will be a little runnier than dairy yoghurt. To improve the thickness of the soy yoghurt you can add one level teaspoon of agar powder, which is premixed in 50ml water, to the soymilk when it starts boiling.

You can also use corn starch or arrowroot as a thickener. Disperse 2 teaspoon of starch in 30ml cold water and add this mixture to the soymilk just before boiling.

Leading commercial Dairies have very good live culture and is available in super markets. Buy the one indicated 'NATURAL YOGHURT and mix with your milk).

Soy Cassava Bites

Ingredients:

3 cups of Cassava flour

1 cup of soy flour

1 – 1 ½ cups of cold water

1 egg (optional)

Enough soy milk to give soft dough

Sugar to taste

Pinch of salt

Pinch of ground dry pepper (optional)

Vegetable oil for frying

Method

1. Damp the cassava flour with the water.
2. Make soy flour into smooth thick paste using part of the milk and mix with the wet garri.
3. Add salt, sugar and pepper.
4. Beat in the egg (if used)

5. Add soy milk to bring mixture to a soft dough.
6. Using a spoon, put mixture into hot oil little at a time and fry.
7. Serve as snacks.

Soy Pancakes

Ingredients

1 cup	soy flour
¾ cups	wheat flour
3 tbs	baking powder
3 tbs	honey / sugar
½ tsp	salt
3 cups	soymilk
6tbs	soy oil

Method

Mix all the ingredients. Melt some baking oil (olive / sunflower or any good oil) in a pan and preheat. Pour ½ cup of butter in the pan and bake both sides until golden brown.

Tofu

This is the most widely consumed soyfood in the world today. This soft, white, almost cheese like product is favoured for its versatility, mild flavour, and high nutritional value. It is naturally processed from whole soybeans and, as a result, retains a good deal of the soybean's important nutrients.

Method

1. Take fresh soymilk while still hot, at a temperature between 80-85C, and place in a large pot that has a cover.
2. Prepare a coagulant of 0.5 litres of Calcium or magnesium Chloride or Calcium or Magnesium Sulfate at 10% strength (this is based on a soymilk batch of approx. 15 liters). This is equivalent to approx. 4 Tbsp (60mL) or food grade powder. Alternatively, a 9% Acetic acid(vinegar) solution can be used.

3. Stir the soymilk and sprinkle 2/3 of the coagulant on the surface of the soymilk. Stir 2-3 times in the opposite direction to ensure that the coagulant is well dispersed in the soymilk. Cover the vessel; with the lid.
4. Let stand for 5 minutes, then lift the cover and break the upper layer slowly to check curd information.

Apple Pancakes

Ingredients

100g	margarine
4	tablespoon sugar / honey
3	apples, peeled and cut in slices
1 tsp	ground cinnamon
4	eggs, beaten
250ml	soymilk
124g	wheat flour
1 tsp	baking powder
1 tsp	powdered sugar

Recipe Directions

In a pan melt the margarine and add the sugar / honey, cinnamon and apples. Cook over medium heat during 5 minutes, or until the apples are a bit soft (but not too soft).

In a bowl, mix the wheat flour with the baking powder. Add the eggs and soymilk. Beat until you get a smooth butter.

Put the apple mixture in an oven pan. Pour the butter evenly over the apples. Place uncovered in a preheated oven to 22 degrees centigrade (425 degrees Fahrenheit). Bake during about 15 minutes until the apple pancake is golden.

Decorate the apple pancake with sifted powdered sugar and serve it immediately.

Pumpkin Pancakes

Ingredients

250g	wheat flour
3 tsp	baking powder
¼ tsp	groundnut
1 tsp	ground cinnamon
150g	sugar / honey
250g	cooked pumpkin, mashed

3	eggs
250ml	soy milk
100ml	soybean oil
1 tsp	vanilla extract

Method

In a bowl, combine the wheat flour, baking powder, sugar, nutmeg and cinnamon. Make sure that there are no clumps.

In another bowl, combine the pumpkin, eggs, soy milk, oil and vanilla extract. Beat well. Add the dry ingredients from the other bowl and beat well.

Pre-heat a greased pancake pan over a medium heat. Pour two or three tablespoons of butter in the pan to form a pancake. Bake each side about one minute or until slightly browned. Serve the pumpkin pancake with brown sugar or with honey.

Soy Potato Pancakes

Ingredients

8	medium potatoes, peeled and shredded
150g	wheat flour
2	teaspoon baking powder
¼ tsp	salt
4	eggs
2 tsp	soybean oil
100ml	soymilk

Method

Mix the wheat flour with the baking powder and salt. Add the potato, soymilk, soybean oil, eggs and mix all together to form the batter. Put three tablespoon of the batter in a greased pan, form pancakes and bake on medium heat until the pancakes are golden brown and slightly firm. Serve the potato pancakes immediately.

Soy Chin – Chin (biscuit)

Ingredients

1 cup soy flour

$\frac{3}{4}$ cup soy milk

3 cups wheat flour

$\frac{1}{2}$ tsp. nutmeg

Pinch of salt

1 egg

3 dsp Sugar

Vegetable oil for frying

Method

1. Sift wheat flour and soy flour together in a bowl.
2. Add sugar, salt and nutmeg
3. Beat in the egg with the milk
4. Mix together to a non – sticky texture
5. Roll out thinly. Cut into desired shapes
6. Fry in hot oil and drain
7. Serve or store in an air-tight container

Soy Puff – Puff (soft bread)

Ingredients

2 cups soy flour

8 cups wheat flour

$1\frac{1}{2}$ cups warm soy milk

3 cups warm water

$1\frac{1}{2}$ dsp. Baking yeast

6dsp. Sugar or 18 cubes

Pinch of salt

Vegetable oil for deep frying

Method

1. Sieve flour into dry bowl
2. Add salt and part of sugar
3. Cream the yeast with little of the sugar and mix with warm milk.
4. Make a well in the centre of the dry ingredients in the bowl and pour in the liquid mixture.
5. Mix together with the warm water and beat very well until smooth and free from lumps.
6. Cover mixture with a clean cloth and put in a warm place to rise (about 2 hrs)
7. Heat the oil and fry mixture in spoonfuls until golden brown.
8. Drain and serve.

Soy Mandazi

Mandazi resembles a doughnut. Mandazi are made from dough of a mixture of flour and baking powder. The dough is rolled out, cut into shapes and deep fried

Ingredients

- 1 Cup raw soy flour
- 3 cups wheat flour
- ½ cup sugar
- 4 teaspoons baking powder
- 1½ cup water
- Oil for deep drying

Method

1. Bring the water to boil and dissolve the sugar in it
2. While stirring, sprinkle soy flour into the water and stir to mix thoroughly
3. Simmer for five minutes stirring all the time
4. Remove from fire and cool to room temperature
5. Sift flour and baking powder together and add to the soy sugar mixture. Mix everything in pliable dough
6. Knead the dough well
7. Roll the dough out to about 1 cm thickness

8. Cut into desired shapes (circles or squares or triangles)
9. Deep fry the rounds/squares or triangles in hot fat for about 10 minutes
10. Serve hot or cold

Accompaniments: Tea coffee cocoa or any other beverage

Soy Chapatti

Ingredients

1 cup soy flour
3 cups wheat flour
Pinch of salt
Water
Oil for cooking

Method

1. Sieve the wheat flour and the soy flour together in a clean bowl
2. Add water to the flour and knead the dough well.
3. Roll the dough out to about 1 cm thickness
4. Cook for 5-10 minutes until brown.
5. Serve warm.

Accompaniments: Sauce, tea,

Soya Biscuits

Ingredients

½	cup soy pulp
½	cup wheat flour
½	cup oat flakes
2 tsp	baking powder
3 tbs	sugar / honey
2 tbs	margarine
½ cup	soy milk
1	egg

Method

Mix the sugar / honey with the margarine until creamy. Add the soy pulp, salt, soy milk and the egg. Mix very well. Finally add the flour, oat flakes and baking powder. Put small heaps of the dough on an greased plate and bake about 12 minutes in an oven (180°C)

Soy Wheat Bread

Ingredients

1 level dessert spoon

2 1/2 cup warm water

2 teaspoons sugar

1 tablet ascorbic acid

1-1 1/2 level teaspoon salt

1 cup soy flour

2 tablespoons fat

To glaze: 1 egg 1 level teaspoon 1 table spoon sugar 1 tablespoon water

Method

1. Blend one tea spoon sugar with warm water
2. Sprinkle the yeast on top and leave for ten minutes or until the yeast froths then whisk or stir. If using ascorbic acid tablet dissolve it in the warm yeast liquid
3. Mix the salt, remaining sugar and flour in a large warm mixing bowl
4. Rub in the fat. Make a well in the centre of the flour mixture
5. Add the yeast liquid and into the well and blend with a wooden spoon or fork. Work to a firm dough. (The dough is the right consistency when it does not stick to the bowl)
6. Turn onto a floured board and knead until well pressed with a lightly floured finger, it springs back and the impression disappears. Do not over knead the dough.
7. Shape the dough into a ball, put in a bowl and cover with a cloth or put into a large oiled polythene bag
8. If using ascorbic acid leave for 5 minutes only if not leave until the dough is nearly double in size (about 1-1 1/2 hours at room temperature)
9. Knead again (knock back) then shape
10. Put in a warm greased bread tin
11. Brush with a glaze made by mixing 1 egg 1 level tablespoon 1 sugar and 1 table spoon water
12. Cover the dough loosely with oiled polythene and allow to "prove" (rise) again- about 40-45 minutes
13. Bake at the centre of the oven at 230 degrees Celsius gas mark 8 for 30-35 minutes
14. Remove from the oven turn out the tin and cool.

Molasses Wheat Bread

Ingredients

1 cup	Fresh ground whole wheat flour
1	Batch Okara from soy milk maker
2 tsp.	Yeast
2 tsp.	Vital wheat gluten
1 tbs.	Sorghum molasses
1 tbs.	Buttermilk powder
1 tsp.	Soybean oil (optional)
	Soy milk

Method

Combine all of the ingredients to create thick slurry about like pancake batter. If the soymilk is cold, warm it before adding for faster yeast action. Let rise in the bowl until it's like a sponge and bubbly and light when stirred. (a source of heat will help) Put the bowl on a skillet to avoid overheating the bowl, and cover it with a damp towel)

When the sponge is ready, stir in unbleached white flour until the dough can be kneaded for several minutes to create a good feel.

Let rise in the bowl until about doubled, punch down and add just enough flour so you knead the dough again without it being too sticky.

This kneading can be a little longer than the first to create a good spring to the bread. Form the dough into a block about the size of your bread plan.

SPROUTS

What Are Soy Sprouts?

Although they are not as popular as mung bean or alfalfa sprouts, soy sprouts (also called soybean sprouts) are an excellent source of proteins, vitamins and isoflavones. During sprouting most of the undesirable carbohydrates are metabolized, the protein digestibility improves and the trypsin inhibitors are inactivated. Unique is the formation of ascorbic acid (vitamin C) during sprouting.

Soy sprouts are available in health food stores and even supermarkets. But the best way to get soy sprouts is by growing sprouts at home.

How to make your own soy sprouts?

Soybeans can be sprouted in the same manner as other beans and seeds.

Put ½ cup of soy beans into a glass jar (a mason jar is fine) and add 2-4 times as much cool water. Allow soy beans to soak for 8 – 12 hours. Do not cover the jar because the sprouts need air.

Drain off the soak water. Rinse thoroughly with cool water. The soak water is a starchier than most other seeds so rinse until the water you drain off runs clear. Set soy sprouts aside out of sunlight and at room temperature between rinses. Rinse and drain again in 8-12 hours and repeat this for 5-7 days.

Store the soy sprouts in a refrigerator.

1. Lower heat and cook for about 5 minutes. Add more water if necessary to get soft consistency
2. Add chopped vegetables and allow cooking for about 5 more minutes
3. Serve

PICKLED VEGETABLES – Source of Vitamins and Minerals

Atchar

Atchar is a hot vegetable pickle eaten by many in Southern Africa. It is usually eaten with bread or rice. Atchar from vegetables, is made from carrots, onions and cabbage (sometimes sweet peppers and green beans) stored in vinegar and oil. The main flavour of atchar is usually cayenne pepper (chill), with salt and other spices being added.

Ingredients

Ingredients needed for 7-8 jars of mild vegetable atchar (400g jars/glass bottles like those used for peanut butter)

750g Carrots

600g Cabbage

450g Onions

750ml Sunflower oil

300ml Vinegar

72g Cayenne pepper

15g Ginger powder

40g Salt

30g Curry powder

Method

1. Wash all vegetables in cold water. Remove all rotten parts, skin, tops and tails, and discard them.
2. Grate the carrots using the large round holes on the grater.
3. Cut the onions and cabbage into thin pieces, approximately 5cm long. Do not use the core of the cabbage.
4. Wash the jars and lids and put them into a large saucepan. Fill the saucepan with water so that the jars and lids are covered and heat until the water boils. Let the water boil for about 5 minutes.
5. Put a little of the oil in a saucepan and add to this, the dry foods (cayenne pepper, salt, ginger powder and curry powder). Stir well and make sure that the oil does not burn. Keep stirring. If more oil is needed, add only from the amount you have measured out for the recipe.
6. Add the onions and heat quickly until they become soft (approximately 5 minutes).
7. Add the rest of the oil and vinegar. Stir well. You must have enough vinegar or the atchar will spoil.
8. Add the cabbage. Stir well. Heat for a further 5 minutes. Stir from time to time. Make sure the atchar does not burn.
9. Finally add the carrots and heat for a few minutes so that the carrots are slightly softened (about 5 minutes).
10. Fill the jars to 2cm from the top. Make sure that there is a layer of liquid from the atchar covering the vegetables, otherwise when the jar is opened, it will spoil.

11. Clean the outside of the rim of the jar and put on the lid. Close as tightly as possible. (Pickled Vegetables Intermediate Technology Development Group 2)
12. Slowly turn the jar upside down, so that any bacteria on the lid or in the space at the top of the jar are killed. Leave the jar upside down until it is cold.
13. When the jars are cold, test each lid to make sure it has a good seal.

Soy Potato Cake

Ingredients

- 1 big or 2 medium sized sweet potatoes (about 1kg)
- 1 ½ cups soy milk
- 1 dsp. Sugar or 3 lumps of sugar (optional)
- 1 dsp. Margarine
- Pinch of salt

Method

1. Wash and boil potatoes
2. When cooked, peel and rub through a sieve, add salt
3. Mix with soy milk, sugar (if used) and margarine
4. Bake in a moderate oven for about 30 minutes

Soy mix flours

Ingredients

- 1 cup steamed soy paste
- 3 cups cooked mashed rice/ cooked mashed irio or sweet potatoes
- 4dsp vegetable oil
- 2½ cups of water
- 2 finely chopped tomatoes
- 2 dsp chopped onions
- 2 dsp finely ground deboned dry fish
- 1 dsp finely chopped vegetables
- Salt to taste

Method

4. Add steamed soy paste to any of the above chosen food and mix with water
5. Warm the oil and fry slightly the chopped tomatoes and onions
6. Add the oil to the soy mixture and put on the fire
7. Cook for about five minutes
8. Add the ground crayfish or ground fish together with fried ingredients. Add salt to taste

Tofu

This is the most widely consumed soyfood in the world today. This soft, white, almost cheese like product is favoured for its versatility, mild flavour, and high nutritional value. It is naturally processed from whole soybeans and, as a result, retains a good deal of the soybean's important nutrients.

Method

1. Take fresh soymilk while still hot, at a temperature between 80-85C, and place in a large pot that has a cover.
2. Prepare a coagulant of 0.5 litres of Calcium or magnesium Chloride or Calcium or Magnesium Sulfate at 10% strength (this is based on a soymilk batch of approx. 15 liters). This is equivalent to approx. 4 Tbsp (60mL) or food grade powder. Alternatively, a 9% Acetic acid(vinegar) solution can be used.
3. Stir the soymilk and sprinkle 2/3 of the coagulant on the surface of the soymilk. Stir 2-3 times in the opposite direction to ensure that the coagulant is well dispersed in the soymilk. Cover the vessel; with the lid.
4. Let stand for 5 minutes, then lift the cover and break the upper layer slowly to check curd information.
 - If the curd is of good quality (clear curd clumps have formed with a yellowish-greenish liquid between them), then cover the vessel and allow to stand for 10 minutes.
 - If the curd formation is weak, add the remaining coagulant solution and stir 2-3 times very gently. Cover the vessel and allow to stand for 10 minutes.

5. The coagulation process is complete when large curd pieces or flakes float in a light yellow transparent whey.
6. Remove most of the whey by using a colander and a ladle (the whey can be kept as an excellent cleaner for the system) and transfer the remaining curd to a cheese-clothed lined pressing box.
7. For soft tofu, press for 30-60 minutes with a 5 kg load; For firm tofu, press for 60-90 minutes with a 10 kg load. Note though that the relative firmness of the tofu also depends on type of coagulant used, coagulation temperature and the protein level of the soymilk base.
8. Cut the pressed tofu into 6-8 blocks and cool in water for 60-90 minutes, preferably with water circulation. This carries away most of the coagulant flavours that remain in the tofu. It also improves the shelf life.
9. Refrigerate any portions that will remain unused for more than 4 hours.

Soy Food Mixes

Ingredients:

- 1 Cup steamed soy paste
- 3 cups cooked mashed rice / cooked mashed yam / cooked mashed irish or sweet potatoes.
- 4 ml vegetable oil
- 2 ½ cups of water
- 2 finely chopped tomatoes
- 2 dsp. chopped onion
- 2 dsp. finely ground deboned dry fish
- 1 dsp. Finely chopped vegetables
- Salt to taste
- soymilk

Method

1. Add steamed soy paste to any of the above chosen foods and mix with the water.
2. Warm the oil and fry slightly the chopped tomatoes and onion.
3. Add the oil to the soy mixture and put on the fire.
4. Cook for about 5 minutes

5. Add the ground crayfish or ground fish together with fried ingredients. Add salt to taste.
6. Lower heat and cook for about 5 minutes. Add more water if necessary to get soft consistency.
7. Add chopped vegetables and allow to cook for about 5 more minutes.
8. Serve.

Soy Corn Porridge

Ingredients:

- 1 cup of soy flour
- 1 ½ cups of guinea corn flour
- 1 ½ cups of corn flour
- 8 cups of cold water
- 3 cups of soymilk
- 1 cup of hot water
- Sugar to taste
- Pinch of salt

Method

1. Add flour together in a clean pot
2. Make into a smooth paste by adding the cold water gradually while mixing. Add salt.
3. Put on the fire and allow to cook for about 5 – 10 minutes, stirring continuously.
4. Add sugar and the salt, continue stirring until sugar dissolves. Add the hot water if mixture is too thick.
5. Mix in the soymilk

Soy Wimbi Porridge

Wimbi is finger millet. Wimbi porridge is more nutritious than plain maize meal porridge because wimbi contains vitamin B and Iron. Adding soy flour makes the porridge even more nutritious

Ingredients

3 cups water

2 cups soymilk

½ cup maize meal

¼ cup wimbi flour 3 table spoons sugar

Juice from 2 lemons (optional)

Method

1. Bring 3 cups of water to the boil
2. Blend maize meal and wimbi flour into a paste with remaining 2 cups of water
3. While stirring, add the paste to the boiling water. Continue to stir until the mixture starts to thicken
4. While stirring, sprinkle raw soy flour
5. Reduce heat and cook for 25 minutes
6. Add sugar and stir to dissolve
7. Add lemon juice and remove from fire
8. Cool and serve

Accompaniments: Nil

Variation: Replace wimbi flour with sorghum or bulrush millet flour. The dish is suitable for breakfast snack or for weaning (supplementary feeding)

Omit lemon juice if porridge is for a child

Okara is what is left in the filter cup after the soymilk is made. Okara is very rich in natural fiber and other nutrition.

Soy Balls

2 cups cooked Soy grits or okara

4 table spoons wheat flour

2-4 table spoons soymilk

1 lightly beaten egg

1 level tea spoon salt

1 table spoon chopped tumeric

1 medium sized onion- finely chopped 2 cloves garlic crashed

Oil for deep frying

Method

1. Combine soy grits or okara with flour
2. Add milk, a table spoon at a time, stirring well to avoid formation of lumps
3. Stir in beaten egg
4. Add salt, tumeric, onion and garlic. Mix well
5. Heat frying oil
6. Form mixture into small balls or drop it into the hot oil in dessert spoonfuls
7. Fry the balls for 15-20 minutes ensuring they are evenly brown on all sides
8. Serve with chili sauce (optional)

Okara Sausages

Ingredients

¼ minced meat

1 egg

1 cup okara

2 table spoons wheat flour

Spices (Dhania cumin mint etc)

Salt to taste

Method

1. Mix all ingredients together in a bowl
2. Form into sausages shapes, if possible with artificial casing
3. Steam or fry for about 15 minutes
4. Serve hot

Accompaniment: Potato chips or serve hot for breakfast

Variation: Use chicken instead of beef. Omit meat and increase Okara to 2 cups

Use fine soy mash instead of Okara

Soy Ugali

Ugali is the most widely eaten dish in Kenya. It is stiff cooked mixture (something like dough) of water and maize meal or maize meal and millet/sorghum flour.

However maize meal is the most commonly used.

Ugali is generally bland and is served with vegetable relish and/or stew. Roasted meat with Ugali and tossed salad is a delicacy. The dish is quick to prepare..

Ingredients

1 cup of water

2 cups maize meal (or mixture of maize meal with wimbi or sorghum or cassava flour

½ cup raw soy flour

Method

1. Bring the water to boil
2. While stirring, sprinkle the raw soy flour into the boiling water and simmer for 2 minutes
3. Increase heat and add maize meal
4. Using a wooden spoon, stir vigorously until a smooth stiff mixture is achieved
5. Reduce heat and cook for 10-25 minutes stirring occasionally
6. Mould Ugali into cake-like shape by drawing the mixture together
7. Turn out on to a plate and shape as desired
8. Serve hot

Accompaniments: Vegetable, sauce

Variation: Maize meal can be mixed with wimbi or sorghum or cassava flour: the rate of 1 part flour to 2 parts maize meal

Soy-Wimbi Ugali

Maize meal ugali was discussed earlier. In wimbi ugali, finger millet flour is mixed with maize meal ugali. Otherwise the preparation and the procedure is the same as that of maize meal ugali. Ugali is popular in Western Kenya.

Ingredients

2 cups wimbi flour

½ soy flour

4 cups water

Method

1. Bring water to boil
2. While stirring, sprinkle soy flour into the boiling water. Cook for about 2 minutes
3. Increase heat and add wimbi flour. Stir vigorously until a smooth stiff mixture free of lumps is attained.
4. Reduce heat and cook for 10-25 minutes stirring occasionally
5. Mould Ugali into cake-like shape by drawing the mixture together
6. Turn on to a plate and shape as desired
7. Serve hot

Soy Nuts

Soy nuts are made from whole soybeans which have been soaked in water and then baked until crisp and brown. Soy nuts are similar in texture and flavour to peanuts. Soy nuts can be found in different flavours, such as salt or paprika.

Soy nuts are easily made at home by soaking dry soybeans in enough water to cover for three hours. Then drain and spread the soy nuts in one layer on a well-oiled cookie sheet. Roast at 350°F (190°C), stirring often, until well-browned. Salt to taste and store the soy nuts in an airtight container.

Nutritional values of soy nuts (per 100g salted soy nuts):

Water	2.0	g
Energy	471	kcal
Energy	1972	Kj
Protein	35.2	g
Fat (total lipid)	25.4	g
Fatty acids, saturated	3.7	g

Fatty acids, mono-unsaturated	5.6	g
Fatty acids, poly-unsaturated	14.3	g
Carbohydrates	33.6	g
Fiber	17.7	g
Ash	3.9	g
Isoflavones	200	mg
Calcium, Ca	138	mg
Iron, Fe	3.9	mg
Magnesium, mg	145	mg
Phosphorous, P	363	mg
Potassium, K	1470	mg
Sodium, Na	163	mg
Zinc, Zn	3.14	mg
Copper, Cu	0.8	mg
Manganese, Mn	2.2	mg
Selenium, Se	19.1	µg
Vitamin C (ascorbic acid)	2.2	mg
Thiamin (Vitamin B1)	0.1	mg
Riboflavin (Vitamin B2)	0.145	mg
Niacin (Vitamin B3)	1.41	mg
Panhotenic acid (Vitamin B5)	0.45	mg
Vitamin B6	0.21	mg
Folic Acid B9	211	µg
Vitamin B12	0.0	µg
Vitamin A	200	IU
Vitamin E	0.91	mg

PART IV: PACKAGING AND LABELLING.

All foods are easily spoiled by a number of causes, for instance:

1. flour
 - become wet because of moisture in air
 - may be infested by insect/worms
2. vegetables
 - withered because of the loss of water
3. milk
 - quickly damaged by bacteria making it sour
4. poultry, meat
 - spoiled by bacteria covering them with slimes and generating rotten odors

THE FOOD ENEMIES TO COUNTERACT

1. Undesired modifications of the content of moisture the oxygen in the air that can:
 - ♦ oxidise pigments, flavors, vitamins
 - ♦ promote growth of microorganisms insects
2. living organisms that love to “eat” foods exactly like humans. They can be visible (insects and worms)
3. invisible/hardly visible (microorganisms such as bacteria, yeasts, moulds)

WHY PACKAGING AND WHAT ARE THE PACKAGING REQUIREMENTS?

Packaging is a form of protection of food:

- i) against changes of water content
- ii) against air (i.e. oxygen)
- iii) against contamination of insects and small organisms (and foreign materials, stones, as well)

In addition it supplies:

- i) mechanical protection against damages from handling shipping

- ii) a mean of distributing food already in the final unit for the consumer and attracting the purchaser

PACKAGING SOLUTIONS

To package a food three components are necessary:

- i) packaging material(s)
- ii) packaging equipment (one or more tools or machines)
- iii) people to do the packaging operations !

PACKAGING MATERIALS

The packaging materials can be:

- rigid

- ◆ wood
- ◆ paperboard
- ◆ metallic (tinplate, aluminum)
- ◆ glass (jars, bottles)
- ◆ plastic(trays, bottles, cups)
- ◆ Pottery

- flexible

- ◆ plastic
- ◆ paper
- ◆ metallic (aluminum foil)

1. Rigid

i) Bottles

- ◆ Rigid bottles for liquid/fluid products

- ◆ rigid bottles of 250-1000 cc capacity with various capping solutions
- ◆ may be made of glass or of different plastics
- ◆ glass and some plastics are heat resistant
- ◆ glass provides very good protection to the product inside
- ◆ plastics ones are used for water, drinks, milk, oil

ii) Jars

- ◆ glass jars of 250-1000 cc capacity with different capping solutions (crown, screw-on, twist-on and twist-off)
- ◆ screw-on and twist-on/twist-off closing can be applied by hand
- ◆ glass ensure heat resistance and provides very good protection to the product inside
- ◆ used for jams, fruit puree, tomato paste, spreads, pickles

iii) Pots & Cups

Rigid plastic pots and cups with lid: for solid/paste/fluid products

- ◆ rigid containers of 125-1000 cc capacity; usually closed with a sealed film cap (sometimes aluminium based). May have click on rigid lid
- ◆ used for yogurts, spreads, wet salads and meals combinations
- ◆ some types (polypropylene based) are heat resistant
- ◆ unless proper heat sealing machine is available the pack is not hermetic; to make them hermetic a film has to be sealed onto the pot/cup rim

2. Flexible

i) Simple Plastic pouch without specific gas barrier

- ◆ bags of variable thickness (40-100 microns generally); good protection from moisture but no protection to oxygen
- ◆ normally one layer material (polyethylene or polypropylene)
- ◆ to be filled and closed with clip or thermal sealing
- ◆ suitable for liquids provided closure is made hermetically;

ii) Plastic casings with barrier to gas and moisture; suitable for hot fill

- 110 microns plastic PACKAGING OF SOYBEAN PRODUCTS: REQUIREMENTS made in one side clipped casing with gas & moisture barrier properties
 - ◆ to be filled and closed with clips
 - ◆ suitable for hot filling and reheating in the pack prior consumption
 - ◆ pack a range of products from liquid to powder
 - ◆ obtain small to medium size packs (200-1000g)
 - ◆ ensure storage life from a few weeks to a few months at environmental storage conditions
 - ◆ allow local distribution on a limited geographical area by simple transportation means
 - ◆ be used in small artesanal premises (potentially without electric power)

SOYBEAN DERIVATIVES APPLICATION SUMMARY

PRODUCT	FILLING T°	DESIRED LIFE	POTENTIAL SOLUTIONS:	CHANCE OF SUCCESS	ISSUES:
Dry Flour	C	3-6 months	Clipping + Plastic Pouch	High	
			Sealing + Plastic Pouch		
			Glass Jar	Moderate	Storage life depending upon aw and possible preservatives
Flour based paste	C	1-3 months	Clipping Vertical + Barrier Bag		
			Sealing + Barrier Bag		
Milk	H	15 - 30 days	Rigid plastic bottle with cap	Low	Storage life and safety
					Hot filling / Prompt distribution option
Paste	H	30 days	Glass Jar	Moderate	Storage life may be an issue depending upon aw & dry matter percentage
			Clipping Vertical + Casing		
			Rigid pot plus lid		
Spreads	C	30 days	Glass Jar	Moderate	
			Rigid pot plus lid		
Yogurt	C	15 days	Glass Jar	Low	Storage conditions
			Rigid pot plus lid		Might not be feasible



For further information please contact Tropical Soil Biology and fertility (TSBF) Institute of
International Center for Tropical Agriculture (CIAT) %o World Agro Forestry Centre (ICRAF)
United Nations Avenue P.O.Box 30677, 00100 Nairobi, Kenya Phone: 254-20-7224779
Fax: 254-207224763/4 Email: o.ohiokpehai@cgiar.org Website: www.ciat.cgiar.org