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A Community Resource Persons' Training Guide

Banana-based Farming Systems and Foods

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HarvestPlus

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

CGIAR RESEARCH PROGRAM ON Agriculture for Nutrition and Health

A Community Resource Persons' Training Guide: Improving Food and Nutrition Security through Banana-based Farming Systems and Foods

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The **CGIAR Research Program on Agriculture for Nutrition and Health** (A4NH), led by the International Food Policy Research Institute (IFPRI), helps realize the potential of agricultural development to deliver gender-equitable health and nutritional benefits to the poor. www.a4nh.cgiar.org.

The **CGIAR Research Program on Roots, Tubers and Bananas** (RTB), led the International Potato Centre (CIP), is a broad alliance of research-for-development stakeholders and partners. Our shared purpose is to tap the underutilized potential of root, tuber, and banana crops for improving nutrition and food security, increasing incomes and fostering greater gender equity – especially amongst the world's poorest and most vulnerable populations. www.rtb.cgiar.org.

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Acronyms

A4NH	Agriculture for Nutrition and Health
CRPs	CGIAR research programmes
IFPRI	International Food Policy Research Institute
INERA	Institut National pour l'Etude et la Recherche Agronomiques
ISABU	Institut des Sciences Agronomique
Kcal	Kilo calories
Kg	Kilograms
LZARDI	Lake Zone Agricultural Research and Development Institute
Mg	milligrams
µg	micrograms
RTB	Roots Tubers and Bananas
TOT	Trainer of Trainers
UCG	Université Catholique du Graben

Expected outcomes

This *Training Guide* is intended to build capacity of community-level resource persons to transfer knowledge on basic concepts regarding nutrition, appropriate dietary patterns and the use of existing farming systems for better household nutrition, especially for communities dependent on bananas.

In referring to this manual, the community resource persons will be able to draft action plans to transfer the information gained to community members. The expected impact is that enhanced knowledge on the links between agriculture, nutrition and health, formation and/or upgrading of existing home gardens into comprehensive gardens as well as proper dietary and health practices will eventually lead to enhanced nutrition and health status.

Introduction

The production of this guide was an integral part of a collaborative project between Bioversity International and the HarvestPlus Challenge program, under a research project titled 'Addressing micronutrient deficiencies through *Musa*-Based foods in Sub-Saharan Africa. This Guide is designed for use by agriculturalists/ agronomists, home economists, nutritionists and health workers in strengthening capacities of community own resource persons (CORPs). CORPs include: model farmers; community extension workers; community health workers; community leaders; women and youth representatives, and church leaders among others. The overall output is enhancing the nutrition and health status of community members through proper dietary practices and sustainable agricultural practices with special focus on communities within banana-based farming systems.

The information in this manual was selected following gaps identified at community level through focus group discussions and household surveys. The guide first describes what food security implies, it then goes on to give basic concepts on nutrition, i.e., types of nutrients, role in the body and local sources. The Guide goes ahead to describe how to make balanced family meals using locally available resources. The guide gives details on management of banana farms, post-harvest handling of the bananas and appropriate processing and cooking/ combination methods that will enhance nutrient quality and promote better health. Last but not least, information on food safety and hygiene is also given.

This *Training Guide* has been designed to build the capacity of community-level resource persons so that they can transfer basic knowledge regarding nutrition, appropriate dietary patterns and use of existing farming systems for better household nutrition, especially focus on banana dependent communities .

Overview of the *Training Guide*

The guide has six main sections:

1. Principles of Food security
2. Nutrition basics and dietary combinations
3. Management of banana plantations and soybean farms
4. Harvest and storage techniques
5. Appropriate processing/cooking methodologies
6. Food safety and hygiene

Each section includes a time allocation, a pre-test, an overview of the learning objectives, materials needed, notes and facilitator fact sheets pertaining to the section. Also contained is an activity that generates discussion and helps in recapping information while focusing on the key learning objectives.

Training program

Day One	
Time	Session
0830 to 0900	Introductions
0900 to 0930	Entry behaviour evaluation to nutrition, food security and banana production/utilisation
0930 to 1000	Introduction to food security and its components
1000 to 1100	Session I:Factors that affect food security Strategies of enhancing household food security
1100 to 1115	Tea Break
1115 to 1245	Session II: Factors that affect food security Strategies of enhancing household food security
1245 to 1315	Group activity and presentation
1315 to 1400	Lunch
1400 to 1420	Introduction to Nutrition
1420 to 1500	Nutrient functions and sources
1530 to 1630	Making balanced family meals
1630 to 1715	Group activity and presentations meals
Day Two	
0900 to 0930	Re-cap on Day one discussions and activities
0930 to 1045	Production and management of bananas on-farm
1045 to 1100	Tea Break
1100 to 1200	Harvesting and storage of bananas
1200 to 1230	Group activity
1230 to 1330	Nutrition value of bananas and common recipes
1330 to 1400	Lunch
1400 to 1530	Food safety and hygiene
1530 to 1630	Group activity on food safety and hygiene
1630 to 1730	Exit evaluation tool to capture knowledge acquired by participants
1730 to 1800	Certificate issuing and closing remarks

1. Introduction session

Time

30 minutes

Materials

Prepared flip charts
Markers

Learning objectives

1. Get to know fellow participants and the moderators
2. Understand the objectives of the training
3. Understand the scope of the role of a trainer

Welcome and participant introductions

- Welcome participants and thank them for participating in the training.
- Introduce yourself and ask the participants to introduce themselves. Simple games can be used for introductions.
- Enable the participants to feel comfortable in the venue and let them get familiar with the day's schedule.
- Introduce an icebreaker so that participants can meet one another.

Objectives and overview of the training

- Participants should be made aware that the next sessions are designed to build their skills as trainers.
- Using the prepared flip charts, go through the following list of objectives of the training.

By the end of the training, the trainees would have learned and become familiar with the tested and proven best practices with regards to:

1. Food security
2. Nutrition basics and dietary combinations
3. Management of banana plantations
4. Harvest and storage techniques
5. Appropriate processing/cooking methodologies
6. Food safety and hygiene

Roles of the community trainers

Ask the group to brainstorm what they think their roles as community trainers will be. Write responses on the flip chart. Ensure that the list includes:

- Planning for the community trainings sessions.
- Managing the day-to-day details of implementing a training; i.e., facilitation, time management
- Ensuring that learning objectives of each session are met.
- Ensuring active participation and that all questions of participants are answered appropriately.
- Serving as a point of contact for any future questions/ technical support needed by the participants.

Activity

Ask if anyone has any questions or additions to the lists. Add if appropriate.

2. Food security

Time

3 hrs 30 minutes

Materials needed for session

Flip charts
Markers
Block notes

Pre-Test

1. When do we say someone is food secure?
2. What are the components of food security
3. What is nutrition security and how does it differ from food security?
4. What are some factors affecting household food security?
5. What are some major strategies for enhancing household's access to food? (there are at least four)

Learning objectives:

At the end of this session participants are expected to:

1. Have an understanding of household food security
2. State the components of food security
3. Understand the difference between food security and nutrient security
4. Describe factors that affect household food security
5. Describe at least four strategies of enhancing household food security

Food security

Introduction to food security (30 minutes)

(*Ask a few participants to give their understanding of terms; food security, household food security and nutrient security, discuss the responses given and conclude by giving the right answers.*)

Food security and insecurity are terms used to describe whether or not people have access to sufficient quality and quantity of food.

Food security is achieved "when all people at all times have physical, economic access to sufficient, safe and nutritious food for a healthy and active life" (IFPRI, 2002).

The components of food security are:

- Availability of food, or the amount of food that actually exists (local production and other sources);
- People's physical, economic and social access to food (the capacity to produce/buy/acquire food);
- Stability of this access over time;
- Quality or nutritional adequacy of that food;
- People's ability to utilize this food, including the patterns of control over who eats what and the physical ability to absorb and assimilate nutrients.

Household Food Security

- At the household level, food security refers to the ability of the household to secure adequate food that meets the dietary needs of all members of the household, either from its own production, through wild-food foraging, food gifts or through purchases.
- A family is food secure if it has access to sufficient safe and nutritious food throughout the year for all members to meet their nutrient requirements with foods they need and like/prefer for an active and healthy life.
- The nutritional status of each member of the household depends on several conditions being met:
    - The food available to the household must be shared according to individual needs;
    - The food must be of sufficient variety, quality and safety; and
    - Each family member must have good health status in order to benefit from the food consumed.

Factors that Affect Household food security are;

- Poverty
- Food Production
- Health
- Access to markets
- Access to wild foods
- Infrastructure
- Natural hazards
- Political Instability

Group activity (15 minutes)

In groups of 5, let participants discuss the signs of a family that is short of food and one that has little variety in diet (10 minutes). Each group should appoint a leader to present the findings (5 minutes per group)

What are the signs that a family is short of food?

- People say they are hungry.
- They eat fewer meals or smaller than usual meals each day.
- There is little food in the home/in storage.
- People eat less preferred foods or foods of lesser quality.
- Children are sent to neighbours for food.

What are the signs that a family has little variety in their diet?:

- The same few foods are eaten daily.
- The family eats few vegetables, fruits and little animal products.
- The diet is dull and monotonous.

Strategies of Enhancing Household Food Security (2 hrs 40 minutes)

(*Ask about 3 participants to describe strategies they normally use to enhance food security. Discuss the strategies mentioned and summarize by outlining the plausible ones.*).

Some of the strategies of enhancing household food security include:

1. Acquiring knowledge related to food security;
2. Improving food production; home gardening and mixed farming;
3. Improving food storage and preservation;
4. Improving food budgeting;
5. Improving incomes;
6. Gathering, trapping and hunting.

1. Acquiring Knowledge related to food security (20 minutes)

Through the use of community resource persons, the community/family members can acquire knowledge on:

- Proper and sustainable agricultural practices
- Food that are nutritious, their selection, preparation, combination
- Proper sanitation and hygiene
- Appropriate health seeking behaviour

This information can be passed on using different fora:

- Community meetings
- At local health facilities
- In churches
- Schools
- Social functions, i.e., weddings, funerals, cultural events etc.

2. Improving food production (20 minutes)

- Family farmers may be able to increase the amount and types of foods they produce by:

  - Improving farming methods (e.g., Mulching, composting, intercropping and fertilizing just to mention a few);

  - Joining cooperatives to buy fertilizer or other agricultural resources;

  - Harvesting water or recycling it for small-scale irrigation, for example reusing water used to wash family dishes to water vegetable or fruit trees in the homestead;

  - Using higher yielding seeds or growing crops that mature early/ late or are drought resistant;

  - Increasing the variety of foods grown, especially vegetables, fruits, and different pulses; those with less land may even grow vegetables on/in containers;

  - Incorporate small livestock raising (e.g., poultry, rabbits), fishermen may increase catches by using better fishing methods (right bait and right net size) and some households may establish fish ponds.

4. Improving food storage and preservation (20 minutes)

(*Let the participants take 10 minutes to list the common food items and describe ways in which they store the food items and preservation techniques used, lead the discussion and finally summarise the key points*)

- Much food is lost through farm storage. Improved secure stores and storage hygiene, and safe use of pesticides increase the amount of food available.

Methods of storing food in ordinary households:

- Sometimes community stores are a good way for farmers to store their crops and seeds. (See examples in figure 1 below)

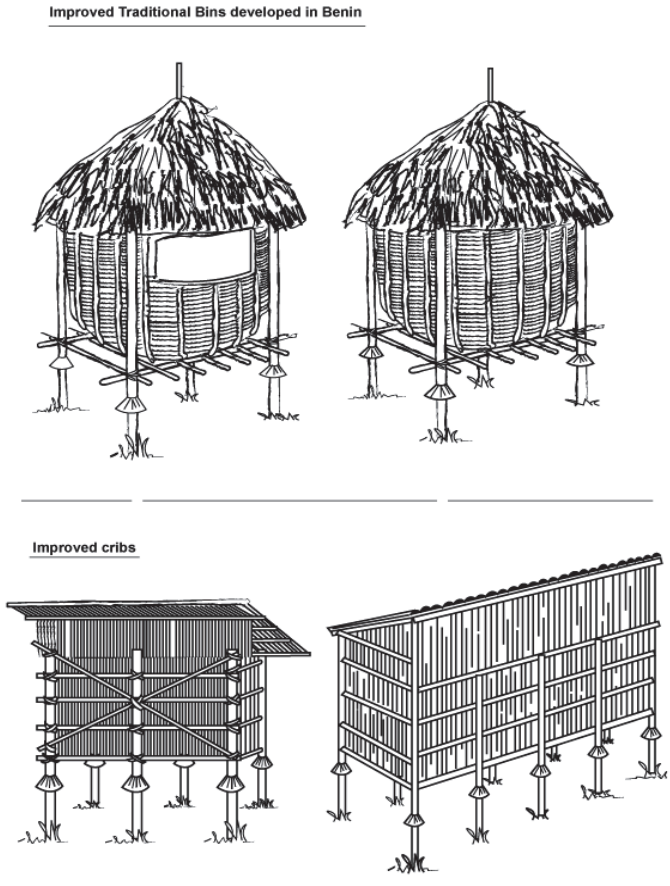

Figure 1. Improved grain cribs with thatch covered walls and rat guards.
(Source: Modified from FAO, 1987)

- Foods are mainly preserved (e.g., dried, smoked, salted) so as to increase shelf life and ensure availability even when the food is not in season.
- Popular methods of food preservation include:

  - Drying: this can be under direct sunlight or under a shade, most grains and cereals are dried for preservation, drying can also be done using solar driers if affordable (link).

  - Use of traditional and modern pesticides on harvested grains/cereals that prevent pest infestation is also a way of preserving food.

  - Smoking is also a popular preservation technique among farmer communities; this is applied to mostly animal products such as meat and fish.

  - Salting also called curing is also a technique that reduces moisture in food items especially meats and fish.

  - Fermentation or souring, this may be good for milk and even cereals and grains, fermented products have better digestibility and increased absorption of iron.

  - Burial in the ground, this is a method that is traditional and most applicable to roots and tubers, the burial can be on dry soils, salty soils or even frozen soils.

  - Cooking increases the shelf life of some food items. Cooking methods such as boiling, frying will increase the shelf life for a short period but methods such as slow-roasting will increase the shelf life of meats and fish for a much longer period.

  Other food preservation methods include: pasteurization, refrigeration/ freezing, canning/bottling, making jams/ chutneys, pickling (in vinegar or alcohol) and soaking in sugar.

5. Improving budgeting for food (40 minutes)

(*Let participants suggest ways of improving budgeting for food at household level. Probe to find out what proportions of participants do any meal planning or calculate amount of food type [e.g., cereals, roots & tubers, vegetables, fruits, fats, milk products, meats, nuts, pulses] required on a weekly/monthly/ quarterly basis*.)

- Some families need advice on how to budget for food and how to use their money in a more efficient way.

- They may need to know which foods give *value for money*.
- This depends on the prices of available foods and this may vary with season, type of shop, etc. To be able to advise families on which foods may be 'good buys' in their area:

    - Remember that different foods have different amounts of waste (skin, bones) and some may be adulterated (e.g. milk diluted with water; spices mixed with ground up bricks or stones).

    - Buying food in large quantities may save money. Most families do not have the money or storage space to do this, but sometimes a group of families can buy in bulk and share the food (e.g., beans, sugar).

    - Some foods are poor value for money because they contain *few nutrients* and are expensive. Examples are sodas (bottled fizzy drinks) and sweets, which are mainly sugar and so are bad for the teeth. These foods should be kept to the minimum.

    - Foods fortified with micronutrients tend to be very expensive for certain smallholder populations, except salt and fortified staple foods (cereal flours). In general, it is best to obtain nutrients by eating a healthy diet. Buying a food fortified with a micronutrient is only justified if there is a serious lack of foods containing that particular micronutrient.

    - Nutrient supplements and 'tonics' are usually poor buys. They are often expensive. It is better to source the nutrients needed by eating a variety of different foods.

      For families mostly dependent on agriculture for food and income, they may need to know how to plan meals and establish what amount of staples, vegetables or protein source foods they may need for different reference periods. This helps in ensuring they do not sell more than needed and they are also able to establish what food items can be bought after selling what proportion of their harvest.

(*For the first 15minutes have the participants into groups of 2-4 people, ensure you have groups of men and women, women only and men only. Let the groups make a monthly budget based on a specific budget, i.e., US$ 100- converted to the local currency. This would show the proportion given to food in relation to other household needs, the type and quantity of food budgeted for and the budgeting differences among men, women and mixed groups.*

For the second 15 minutes, carry out an exercise with the participants to help them make a week menu and calculate the amount of the different food items needed and project that into a month and even several months considering

the seasons. Let the participants suggest how this can be used at household level.)

6. Improving incomes (15 minutes)

Improving incomes among smallholder farmers is crucial because it will facilitate their acquisition of other food items not produced and other basic needs. There are several strategies that can be used to enhance the income level of households.

(*Ask the participants to list intervention strategies that could enhance household incomes.*)

Examples of intervention strategies intended to support livelihoods and improve access to food or income

- Market interventions, i.e., group marketing for enhanced farm produce
- Introduction of employment schemes, i.e., food for work/cash for work on local community projects
- Income-generating activities: production of useful local articles (rugs, mats, pottery)
- Exchange of livestock for cash, food or more drought-resistant animals
- Direct cash support
- Industrial projects: food processing (meat from destocking projects, production of weaning food or high-protein biscuits)

7. Gathering/trapping/hunting wild foods (15 minutes)

(*Let the participants indicate how many of them have been involved in gathering/trapping of wild foods. Get a list of food items gathered or trapped, let the participants also describe the usefulness of wild food items and any dangers associated with them. Summarise the discussion with key points.*)

Once upon a time, all people were hunters and gatherers. Their strategies were very diverse, depending greatly upon the local environment. Foraging strategies included hunting or trapping big game, hunting or trapping smaller animals, fishing, gathering shellfish or insects, and gathering wild plant foods such as fruits, vegetables, tubers, seeds, and nuts. At present, most hunters and gatherers combine a variety of these strategies in order to:

- Ensure a balanced diet. Wild foods increase the variety of foods in the diet and make meals tastier, and are great sources of micronutrients and sometimes proteins.
- Provide safety nets in times of food shortage.

Develop a list of wild food gathered, trapped or hunted by the community and determine who within the family/community is involved in gathering, trapping or hunting.

Group Activity (30 minutes)

Discuss strategies of enhancing household food security within this community:

- What do households usually do when food insecure?
- What can be done to ensure they are able to cope next time?

3. Basics in Nutrition and Dietary combinations (3 hrs 20 minutes)

3.1 Basics in Nutrition

Time (1 hour)

Session: 45 minutes
Question/answer: 15 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Block notes

Pre-Test

1. What is good nutrition?
2. What are some of the common nutrient groups?
3. What are some local food sources of the common nutrient groups?
4. What is the function or use of these nutrient groups?

Learning objectives:

At the end of this session participants are expected to:

1. Briefly describe what good nutrition is.
2. List at least six nutrients found in foods and their function.
3. List at least five local sources of carbohydrates, proteins, vitamins and minerals.

Introduction to Nutrition concepts and nutrients (20 minutes)

What is nutrition?

(Ask at least three participants to describe their understanding of nutrition, give the right meaning of nutrition)

- Nutrition is all about the study of food and how our bodies use it as fuel for growth, reproduction and maintenance of health.
- Nutrition comprises the process of providing the nutrients needed for health, growth, development and survival.

Good nutrition is important for:

(*Ask at least three participants to mention something about the importance of good nutrition, then describe the most important functions of good nutrition, remember to also associate good nutrition to better brain development concentration in school and higher productivity.*)

- Physical activity, movement, work, and warmth.
- Physical growth and brain development essential for learning, so good nutrition is especially important for children.
- Body building, replacement and repair of cells and tissues.
- Protection from illnesses, fighting infections and recovery from illnesses.
- For good health to be maintained, a daily diet of foods must accomplish the above four functions.
- The things in food that help us accomplish one or more of the four functions are called nutrients.

Types of nutrients

(*In groups of five let the participants list the types of nutrients they know of and examples of food items available in their community that are rich in each of the nutrients listed, let someone from each group present, comments and corrections will be done after all presentations are made 30 minutes exercise*.)

1. **Macro (big) nutrients**

These are nutrients needed in large amounts. They include:

- Carbohydrates (starches, sugars and dietary fibre).
- Fats – there are several kinds.
- Proteins – there are hundreds of different proteins.
- Water.

2. **Micro (small) nutrients**

These are needed in small amounts. There are many of these but the ones most likely to be lacking in the diet are:

- Minerals – iron, iodine, zinc and calcium.
- Vitamins – vitamin A, B-group vitamins, folate and vitamin C.

Whether or not a food is a good source of a nutrient depends on:

- The amount of nutrient in the food. Foods that contain large amounts of micronutrients compared to their energy content are called 'nutrient-rich' (or sometimes 'nutrient-dense') foods. They are preferred because they help ensure that the diet provides all nutrients needed. The Appendix lists foods that supply useful amounts of different nutrients.
- The amount of the food that is eaten usually.
- How readily is the nutrient in the food we eat available for absorption and use by the body.

Nutrients, functions and sources (40 minutes)

1. Carbohydrates

Carbohydrates provide your body with the fuel it needs to keep running. Depending on how quickly they convert to sugar in the body, they can be simple or complex, carbohydrates are mainly in form of starches, sugars or fibre.

Starch and sugars provide energy needed to keep the body breathing and alive, for movement and warmth, and for growth and repair of tissues. Some starch and sugar is changed to body fat.

The fibre in carbohydrates makes faeces soft and bulky and absorbs harmful chemicals, and so helps to keep the gut healthy. It slows digestion and absorption of nutrients in meals, and helps to prevent obesity.

Sources of carbohydrates

Main sources of carbohydrates are:

Cereals	Starchy roots and tubers
Maize/corn meal	Sweetpotato
Millet	Yam/Taro
Sorghum	Irish potato
Rice	Fresh cassava, Cassava flour
Wheat flour	Plantain, bananas

Figure 2. Example sources of carbohydrates.

Requirements

Requirements vary by age, gender, activity, health status. It is recommended that a person should eat carbohydrate rich foods 3 or more times a day.

Insufficient intake of carbohydrates results into failure to meet body energy requirements hence the rate of growth is reduced as well as body mass (weight) leading to lack of sufficient energy for metabolism and work.

Excessive consumption of carbohydrates beyond what the body requires leads to being overweight hence increases the risk of ailments like heart disease and diabetes.

2. Fats and oils

The fats and oils in foods serve many important functions such as.

- Nutrient: Fat supplies essential fatty acids, which are needed for normal growth of infants and children and for production of hormone-like compounds that regulate a wide range of body functions and keep you healthy.
- Transport: Fat carries fat-soluble vitamins (A, D, E, and K) and assists in their absorption.
- Sensory: Fat contributes to the smell and taste of food.
- Texture: Fat helps make foods tender (especially meats and baked goods).
- Satiety: Fat gives food satiety, so you feel full and satisfied longer after a meal.
- Fat provides a concentrated source of calories. This is good if you are travelling long distances, expending a lot of energy, and carrying your own food.

In the body, fat has the following roles:

- Fats are the body's main form of stored energy (important in times of illness and diminished food intake).
- Fats provide most of the energy to fuel muscular work.
- Fat pads internal organs and insulates our bodies against temperature extremes and damage.
- Fats form the major material of cell membranes (especially brain and nerve cells).
- Fats are converted to many important hormones (including sex hormones).

Fat is a good thing! It's only when there is too much of a good thing that it can become problematic.

Types of Fat: saturated vs. unsaturated

Just like there are two general categories of carbohydrates, there are two general categories of fats based on their chemical structure: *saturated* and *unsaturated* fats. These fats have very different effects on your health.

1. Saturated fats

- Saturated fats are the type of fat that is generally associated with poor health.
- They tend to increase the "bad" cholesterol in your blood and increase your risk of heart disease.
- Saturated fats tend to be solid at room temperature.
- They tend to be most concentrated in animal sources of fat.

Sources of saturated fats

- They tend to be most concentrated in animal sources of fat: butter, cream, beef/pork fat, chicken skin, whole fat milk, cheese, ice cream, ghee, lard/cooking fat, fats from meat, red palm oil and coconuts.
- Exceptions: Tropical oils (including coconut and palm) are very high in saturated fats.

Figure 3. Examples of saturated fat.

There are fats formed when vegetable oils are processed and hardened. These fats eventually end up having the same characteristics as the saturated fats. They should also not be consumed in large quantities. They include: Margarine and lards.

2. Unsaturated fats

- Unsaturated fats are the type of fat that is generally associated with good health.
- They tend to lower blood cholesterol levels and decrease your risk of heart disease.
- Unsaturated fats tend to be liquid at room temperature.
- They tend to be most concentrated in plant sources.

Sources of unsaturated fats

- Vegetable oils, olives, avocados, nuts, peanut butter, soybeans, sunflower seeds, sesame seeds and other oilseeds, oily fishes, oily sea fish, soybean.

Figure 4. Examples of unsaturated fat.

Requirements

Fat needs are expressed as 'percent of total energy needs'. The percent of total energy that should come from fat in a healthy balanced diet is:

- 30-40 percent for children on complementary feeding and up to the age of two years;
- 15-30 percent for older children and most adults; for active adults up to 35 percent is acceptable;
- At least 20 percent up to 30 percent for women of reproductive age (15-45 years).

Consuming more fats beyond what the body needs leads to overweight, and increases the risk of diseases like heart diseases, high blood pressure and diabetes.

3. Proteins

Proteins are the building blocks for muscles, organs and many of the substances that make up our bodies. They provide essential amino acids that the body uses to make muscle tissue. The body needs proteins and calories every day. Proteins also facilitate the production of *enzymes* that govern the body's processes such as growth and digestion.

When you don't get enough of calories and protein everyday your body breaks up its own supplies to make up for the lack of energy. This robs your body of the calories it needs to stay healthy leading to weight loss.

Sources of Proteins

Protein can be found in both animal and plant foods.

1. Animal sources

- Meats, poultry, fish, eggs, cheese, milk and yogurt.
- These foods are considered "complete" or "high quality" proteins because they contain all the "essential" amino acids. "Essential" means that they must be consumed in our diet; our bodies cannot manufacture them.

Figure 5. Example sources of animal protein.

2. Plant sources

- Soy products (tofu, tempeh, soy milk, and other products made from soy), beans, peas, seeds, and nuts.
- There are also small amounts of protein in breads, cereals, and other grains, as well as in vegetables.
- Plant sources of protein are considered “incomplete” because they are missing one or more essential amino acids.
- Soy protein is the one exception--it is considered "complete."
-

Figure 6. Example sources of plant protein.

Requirements

Requirements vary by age, sex, gender and activity (see appendix 1) but the general requirement is approximately 0.75 g per kg of body weight per day.

Not consuming enough protein leads to reduced growth rate, loss of muscle and build-up of fluid in the body as the body breaks down the muscles to obtain the protein and energy needed for daily functions. In children it also leads to retarded growth and protein-energy malnutrition.

It should also be noted that consumption of high amounts of animal protein sources that are accompanied with a lot of fat like meats, milk and eggs leads to excess consumption of fat which has negative effects.

4. Vitamins and Minerals

- Vitamins help the body turn food into energy and tissues.
- There are 13 vitamins in all: vitamin A; the vitamin B complex, which includes thiamine, riboflavin, niacin, vitamin B_6, folic acid, vitamin B_{12} pantothenic acid, and biotin; and vitamins C, D, E, and K.

- Minerals are needed for growth and maintenance of body structures. They also help to maintain digestive juices and the fluids found in and around cells.

- Minerals are not made by plants and animals. Plants get minerals from water or soil, and animals get minerals by eating plants or plant-eating animals.

- Vitamins and Minerals are also known as constructive and protective foods; they help to build the immune system thus reducing the occurrence of infections and if they occur the severity is reduced.

- Micronutrients that are in shortest supply and cause the most micro-nutrient malnutrition worldwide are: Iodine, zinc, vitamin A, iron and folate. Lack of vitamin A leads to night blindness, lack of iron/folate leads to anaemia, lack of iodine leads to goitre, lack of calcium leads to weak bones and teeth and lack of zinc leads to growth retardation and delayed sexual and bone maturation.

Sources

- Orange vegetables, such as orange sweetpotato and carrots, and orange fruits, such as mango and pawpaw and red palm oil are excellent sources of vitamin A.

- Red meat, red offal and liver of all types are a very rich source of iron and vitamin A.

- Most citric fruits and fresh (not overcooked) vegetables provide vitamin C.

- Dark green vegetables supply folate and some vitamin A.

- Many vegetables (e.g., tomatoes, onions) provide additional important micronutrients that may protect against some chronic conditions such as heart disease.

Figure 7. Example sources of vitamins and minerals.

Requirements

Vitamins and minerals are required in small quantities.

- Requirements are based on age, sex and activity level but consumption of a variety of fruits, vegetables and whole grains.

- The best way to make sure we get enough of each micronutrient and enough fibre is to eat a *variety* of vegetables and fruits and whole grains every day.

5. Water

Water just may be the most important nutrient. In fact, the body is more than half water. You can live without food for several weeks, but you can go less than a week without water.

The body needs water to function. It is necessary for

- Maintaining body temperature;
- Transporting nutrients throughout the body;
- Keeping joints moist;
- Digesting food;
- Ridding the body of waste products.

(Think of the use of water when building a house, without the water, the cement, sand and concrete will not be useful.)

Sources

- Water;
- Fruit Juices;
- Soup;
- Milk;
- Porridge;
- Non-caffeinated drinks (caffeinated and alcohol beverages contain diuretic substances that cause the body to lose water).

Requirements

1.5 litres/day or 8 glasses a day

Not drinking enough water leads to constipation, dehydration, dry skin, and build-up of toxins in the body.

Activity

Group common/local foods into their respective food groups.

3.2 Making balanced family meals

Time (90 minutes)

Session: 45 minutes
Activity: 45 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Hand out 1: Food guide pyramid and Food plate
Block notes

Pre-Test

1. What is a balanced diet/meal?
2. Do the different family members (age group and condition) have the same food needs?

Learning objectives:

At the end of this session participants are expected to:

1. Know how to plan for a balanced meal
2. Understand the food pyramid concept when planning and serving meals
3. Briefly describe the main differences between the food needs for the different family members

Balanced meal

A balanced diet provides the correct amounts of food energy and nutrients needed during the day to cover the dietary requirements of the person eating it. A balanced diet must be composed of a variety of different foods from different food groups so that it contains all the many macronutrients and micronutrients the person needs in sufficient quantities.

A good meal should contain:

- A staple food. Look at the list of carbohydrate foods in section 3.1 and see if it contains the local staple foods. Add them if necessary.
- Other foods that may be made into a sauce, stew or relish. These should include:

- Legumes and/or foods from animals
- At least one vegetable
- Some fat or oil (but not too much) to increase the energy and improve taste and facilitate absorption of some nutrients like fat-soluble vitamins. Most of the fat or oil should be from foods containing unsaturated fatty acids (see sources of fats in section 3.1).

- It is good to eat fruits with a meal (or as a snack) and to drink plenty of water during the day. Avoid drinking tea or coffee until 1-2 hours after a meal (when food will have left the stomach) as these reduce the absorption of iron from food.

Encourage families to use:

- Several groups of foods at each meal.
- Different vegetables and fruits at different meals because different vegetables and fruits contain varying amounts of the different micro-nutrients. The more colours consumed the better.
- Serve meat, poultry, offal or fish daily if possible because these foods are the best sources of iron and zinc (which are often lacking in diets, especially the diets of young children and women).

Snacks

- Snacks are foods eaten between meals.
- Below are examples of foods that make good snacks
    - Fresh milk, soured milk, yoghurt, cheese, roasted groundnuts, soybeans, melon seeds, sesame seeds, eggs, fried fish, bread, boiled/roasted maize cob, boiled or roasted cassava, plantain, yam, sweetpotato, bananas, avocado, tomatoes, mangoes, oranges, pawpaw, passion fruits.

Eating snacks like these is a good way of improving a diet which may lack food energy and nutrients. However, frequent eating (snacking) throughout the day increases the risk of tooth decay, particularly where oral hygiene is poor. This is particularly true for artificially sweetened snacks that stick to the teeth. It is better to eat the fruit than make juice as many people discard the fibre in the fruits when making juice.

The Food Pyramid

Although your food intake varies from meal to meal and from day to day, keeping a balanced view of your diet is a good idea. The food pyramid (see figure 8) is meant to be a guideline not rigid set of rules.

Figure 8. The food pyramid.

(Source: Modified from the Food Guide Pyramid; Centre for Nutrition Policy and Promotion CNPP, 2009)

- It is healthy to eat more of the foods from the bottom levels of the pyramid and fewer of those from the top. The top of the pyramid is for foods that should be consumed in small quantities because large amounts are not good for the body.

- The Food Pyramid as a guide helps to promote the 3 basic rules for a healthy diet:

    - Variety
    - Balance
    - Moderation

Variety means that you must include many different foods from each level of the Food Pyramid because no single food can supply all of the nutrients that your body needs on a daily basis. This can help to expand your food choices. It is best to eat foods of all colours. The more colours and textures in your daily meals, the better range of nutrients you'll get. You can choose to vary different foods in a day or aim to vary different foods across a whole week.

Balance means that you must eat the right amounts of foods from all levels of the Food Pyramid each day. This way you will get all the calories and nutrients you need for proper growth and development.

Moderation means that you are careful not to eat too much of any one type of food.

Eating away from home

- Many people buy meals and snacks from vendors or eat in bars, restaurants or hotels; some students receive snacks or a meal at school.

- While eating out can be a special treat, eating outside the home too often can mean getting too many calories, fat and salt and not enough fruits, vegetables and essential nutrients because the nutrient composition of food eaten away is often not of the same quality as food prepared at home.

- Encourage people to choose meals and snacks that provide a mixture of nutrients, especially if they regularly eat away from home.

- Warn them not to eat too many fried street foods as these may contain unhealthy fats and increase the risk of overweight.

- The same guidelines for a balanced meal apply when eating away from home. Eat different food groups, in the right amounts also including fruits and vegetables.

- Encourage people who make and sell meals and snacks to prepare good-quality foods in a hygienic way.

Sharing meals

- Share staple foods and legumes according to energy needs. Children aged 1-3 years need about a third of the amount needed by men. Note that energy needs increase greatly during puberty and adolescence, especially for boys, during pregnancy and breastfeeding, and for men who undertake hard labour.

- Share vegetables and fruits almost equally among all family members but make sure pregnant and lactating women have bigger shares.

- Give bigger shares of iron-rich foods (meat, offal, poultry and fish) to older girls and women, especially when they are pregnant. Young children are often anaemic and need a fair share of these foods too.

- Make sure young children get plenty of fat-rich foods, such as milk, yoghurt, groundnuts, avocado, oils and fats that give them enough energy even though they eat smaller amounts of foods. Sugar and honey are also ways to increase the energy content, and they can be added to porridge and other foods in small quantities. Honey should not be fed to very young children (below 1 year because of possible botulism).

- Give young children their own bowl or plate. This allows them to get their share of the food if the rest of the family members are all eating from the same bowl. It also makes it easier to monitor their food intake.

Meeting the Food Needs of Different Family Members

Except for young children, who need to be fed four to five times a day, each family member should receive two or three main meals per day, ideally in the morning, at midday and in the evening. In order to help each family member get his or her share of the family food supply, there are some guidelines to follow.

Infants from birth to 6 months of age

- Infants from birth to six months of age should receive breastmilk only, unless advised otherwise by a medical practitioner.

- Breast milk is the best food for a baby and provides all the nutrients most infants need for the first six months of life. It is safe, inexpensive and has the added advantage of boosting the baby's resistance to disease.

- By six months, babies should be introduced to other foods that supplement the energy, protein, vitamins and minerals provided by breast milk. This will also accustom the baby to varieties in food flavours and textures.

Infants from 6 to 12 months of age

- Foods given to the baby in addition to breast milk are called *complementary* or *weaning foods*.

- Preparing safe and nutritious complementary foods can take a lot of time and effort.

- Many mothers and fathers, especially young and first-time parents, need practical advice and assistance to help them provide their babies with the foods they need.

- Foods for babies require special preparation to make sure that they are soft, clean and easy to chew and digest.

- By the time the child reaches one year of age, the complementary foods should be increased to four or five times a day, in addition to breast milk.

- Once a baby is accustomed to liquid and soft foods, and as the teeth appear, semi-solid and then solid foods can gradually be introduced to the diet.

- Staples cooked with water are bulky (i.e., they have little energy or nutrients compared with their volume), so they need to be eaten with nutrient-rich foods. These include mashed beans and pounded groundnuts, mashed green leafy and orange-coloured vegetables (which are rich in vitamin A), and soft fruits such as papaws and pumpkin (which supply plenty of vitamin C).

- An excellent way to enrich porridge is to eat it with small amounts of animal or dairy foods, such as cooked and mashed fish, chicken, meat or eggs, as well as curds or milk.

- To increase the energy content in porridge, make the porridge from fermented or germinated cereal flour, and add a little vegetable or palm oil to it (see appendix 5 on processing germinated cereal flour).

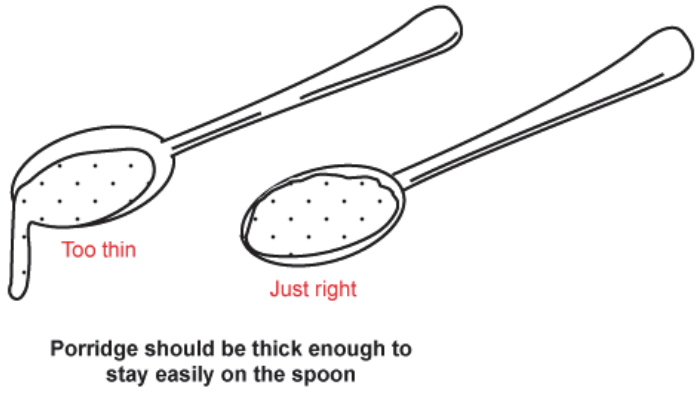

Figure 9. Appropriate consistency or thickness of food for infants is important.

(Source: Modified from WHO, 2000)

Children aged 1 to 5 years

- Young children aged 1–2 years are often the most at risk of malnutrition.
- They have very high energy and nutrient needs for their body size in comparison with adults.
- Proper care and feeding are essential for their normal growth, development and activity.
- Children should be breast-fed regularly every day, until they are at least two years of age unless advised otherwise by a medical practitioner.
- At meal times, they can eat many of the same foods as their parents and they should be encouraged to eat a variety of energy foods, protein foods, fruits and vegetables.
- Children cannot eat the same amount of food in one meal as adults. In addition to breast milk, they should eat four to five times a day.
- A simple way to ensure that children get enough food is to give them nutritious snacks between the main family meals. See Information Sheet 4 and the section on snacks in this Home Garden Technology Leaflet for suggestions.

- Some snacks good for the children include: Fruits (banana, mango, pawpaw, avocado etc.), boiled eggs, boiled/pasteurized/soured milk, chapatti, bread (with groundnut paste/margarine/dipped in milk), small pieces of boiled/fried cassava/plantain/yam/sweetpotatoes-orange fleshed.

- Sick children must be encouraged to eat and drink, even if they have little appetite.

- Lots of fluids – fruit juices, soups and clean water – are especially important when a child has diarrhoea.

- Children recovering from fever or sickness should also be given plenty of energy- and nutrient-rich foods to eat.

- Eating habits are established early, so it is important to teach children at an early age how to get the best value from local foods.

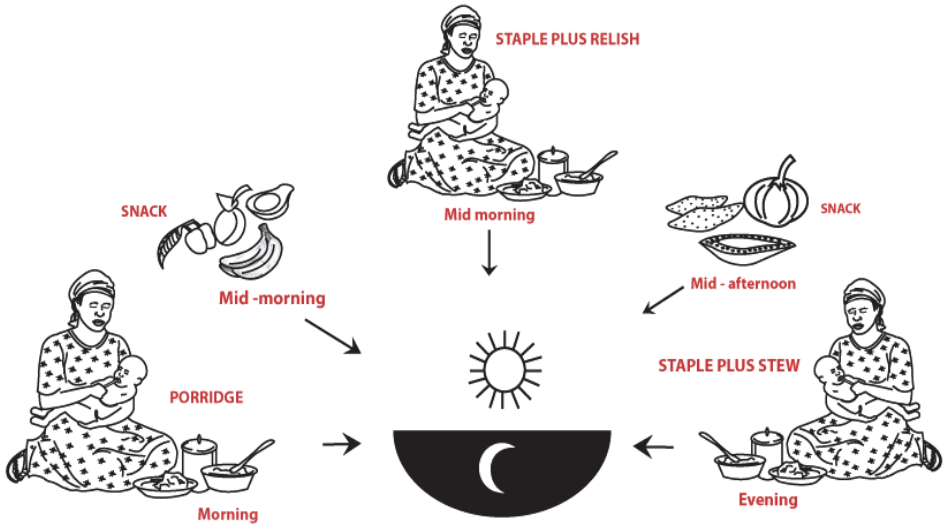

Figure 10. Children have special nutrient needs.

(Source: Modified from FAO, 2001)

School-age children

- Because older children and adolescents grow rapidly, they have very high energy and nutrient needs.

- School-age children need adequate amounts of energy and protein, as well as vitamins and minerals, especially iron, calcium and vitamins A, C and D.

- Children from school age onwards need two to three meals every day, plus snacks between meals.

- Children who do not have a midday meal at home should take a packed lunch to eat at school or have access to snack foods, such as ripe bananas and groundnuts, roasted meats, or roasted or cooked sweetpotatoes, yams or cassava.

- Special attention should be given to adolescent girls. They need to be well nourished both for their immediate development and the future stresses of childbearing.

- Adolescent girls who become pregnant are at particular risk and must have additional nutrients for their baby's growth.

- They should eat plenty of the family staple foods at every meal and generous portions of relishes containing vegetables, legumes, meat, fish or eggs. Foods that are rich in calcium (e.g., milk) should be encouraged.

Pregnant or breastfeeding women

- A woman needs to eat enough before and during her pregnancy to supply the extra energy, protein, vitamins and minerals needed by the growing foetus.

- Requirements for iron are particularly high, and supplements are often needed. Pregnant women should be encouraged to have regular medical checks.

- A woman's nutritional needs are even greater when she is breastfeeding than during her pregnancy, as she also has to meet her growing baby's nutrient needs.

- If the mother does not satisfy the needs of her baby, the baby will draw on, and reduce, the mother's own stores of nutrients. This puts the mother at increased risk of illness and can affect the baby's development.

- A varied and nutritious diet with adequate staple foods, and relishes made from vegetables, legumes, meat and fish, and plenty of fruits should be eaten.

- Breastfeeding women should also drink plenty of water and other fluids (e.g., soup, milk).

The elderly

- Although many elderly people enjoy an active life, illness and the loss of sense of taste can reduce their appetites, while loss of teeth can make chewing difficult.
- If they cannot eat a lot at one time, elderly people need frequent but small meals that can be chewed easily.
- Foods for the elderly should include a wide variety of grains, fruits, vegetables, legumes and, if available, dairy products.
- Consumption of high-energy foods may be particularly important if appetite fails and overall food intake is limited.
- Maintaining adequate fluid intake is also important.
- Elderly people may also need help from family members or neighbours with their agricultural, food processing and food preparation activities.

(See appendix 2 on nutrient needs of different family members)

NB. Growing as wide a variety of foods as possible makes it easier to meet the diverse nutritional needs of all family members. Depending on the size of the home garden and water availability, the home garden can also produce (in addition to roots, tubers, vegetables and fruits) additional amounts of the staple (e.g., maize, cassava, sweetpotato). This augments the stock of the staple and saves families from having to adjust the daily number of meals or the meals' quality (i.e., the variety of food items) as the year goes by.

Group activity (45 minutes)

Plan sample meals for a day specifically for children, pregnant women and the rest of the family.

Make various plate combinations using charts and markers. Apply the food pyramid concept to serving a meal.

4. Production and utilisation of bananas

4.1 Management of banana plantations

Time (1 hour 15 minutes)

Session: 60 minutes
Discussion/question/answer: 15 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Block notes
Handout: management of plantation and diseases
Pictures

Pre-Test

1. What are some of the characteristics of a good banana plantation?
2. What can you do to control or prevent diseases and pests?

Learning objectives:

At the end of this session participants are expected to:

1. Briefly describe how to prepare a field and handle planting material.
2. Know the basics for caring for a plantation.
3. Briefly describe how to handle pests and diseases.

Field preparation

- Banana plantations require deep well-drained fertile loam soil.
- To avoid pests use clean fields (virgin fields, have not been under banana for <2yrs or fallowed 3-5 years).
- Plough twice to provide a good seedbed, leaving 4 weeks between each cultivation to allow germination of weed seeds that are then killed by following cultivation.

- Fields can also be prepared by slashing the field or spraying with herbicides (gramoxone or roundup) to kill weeds as long as rules of using the herbicides are strictly adhered too.
- Do not burn; burning destroys useful organic matter.
- Planting holes should be spaced by 3 m between and 3 m within the row (3 m x 3 m)
- Planting holes can range from 30-60 cm deep and wide depending on the soil conditions and field preparation. Use deep and wide holes in hard soils and field prepared by only slashing or spraying with herbicide.
- While digging the holes, put the top soil separate from the subsoil.
- On flat fields, rows should be straight to allow the plants to receive sunlight while rows on slopping land should follow the contour lines to reduce soil erosion.

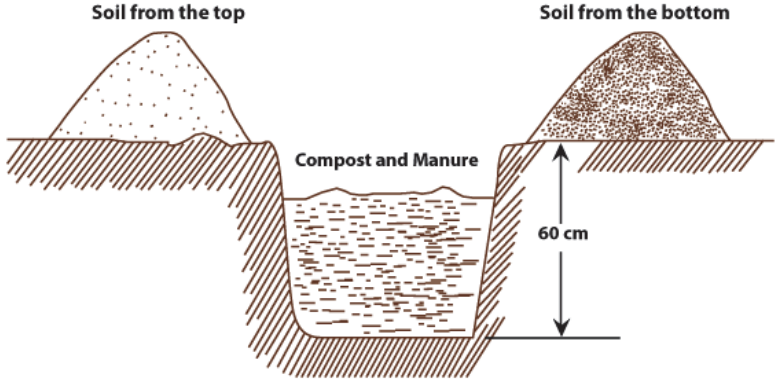

Figure 11. Preparation of planting holes.
(Source: Modified from Tushemereirwe *et al.*, 2003)

Planting material

- Use clean planting material.
- For disease- and pest-free planting material, tissue-culture plantlets or micro-propagated plants are best.

- In absence of tissue-culture plantlets or micro-propagated plants use sword suckers and maiden suckers obtained from plantations that are free of pests and diseases:

    - Use a sharp shovel to uproot the selected sucker to avoid damaging mother plant.

    - Maiden suckers should be cut back just below the crown and 15 cm above the corm.

- Suckers should be cleaned (pared) and treated to remove or kill most pests prior to planting:

    - All old leaf sheaths, roots and the outer layer of the corm should be removed.

    - Cleaning the sucker in the field where the planting material is obtained reduces pest spread to new fields.

    - to disinfect, the pared suckers can also be dipped in hot water at 52-55 °C for 20 minutes or in boiling water for 30 seconds.

- The pared and heat-treated sucker should be planted within one week of uprooting or stored under shade away from an established plantation to prevent weevil re-infestation.

Figure 12. Planting material awaiting preparation before planting.
(Courtesy of William Tinzaara)

Figure 13. Paring (removing of roots) from a sucker.
(Courtesy of William Tinzaara)

Planting

- Banana suckers/plantlets need 4-6 months of growth without water stress. Therefore, planting ought to be done at the onset of the rainy season.
- Place sucker in the hole and cover its corm with top soil mixed with manure followed by the subsoil.
- For sloping land, the sucker should be tilted so that future ratoons emerge against the slope so as to delay development of raised mats.

Field management

Weed control

- Weeds compete with plants for water and nutrients. Keep the field weed-free by weeding: by hand, hoe and/or herbicide.
- Weed before the weeds set seed.
- Hand weeding is less destructive but laborious. It's more applicable under low weed density, e.g., in mulched plantations.
- The hand hoe and herbicide are faster options for weeding. The hand hoe however damages banana feeder roots and could spread banana Xantho-monas wilt (BXW) disease.
- Hand weeding and herbicides are better options in BXW infected fields.

Mulching

- Mulching reduces the amount of weeds, helps water penetrate and returns nutrients to the soil as it rots.
- Sources of mulch include: banana plant residues, annual crop residues, grasses like elephant, swamp and guinea grass.
- Mulches should be placed away from the base of the mat to reduce weevils (about 50 cm away).

Mat management

- It is advised to maintain 3 plants on each mat to reduce competition for water, light, nutrients and space.
- Cut unwanted suckers at ground level and kill their growing points by piercing and twisting with a sharp pointed tool.
- Old dry leaves and sheaths should be removed to improve air movement and light penetration; reduce severity of fungal leaf spots in young leaves; and remove hiding places for weevils.
- Avoid cutting fresh leaves to minimize BXW spread.
- Break the male bud using a forked stick when the fingers on the cluster just turn upwards. This increases bunch size and controls fungal and bacterial diseases.
- Propping should be done for plants with maturing bunches to prevent them from breaking or toppling.
- Plants are generally weak during dry seasons, when the plant needs support using wooden pegs.

Figure 14. Provide support to the plants with maturing bunches.
(Source: Modified from Tushemereirwe et al., 2003)

Fertilization

- Banana has a high demand for nitrogen (N) and potassium (K).
- Organic manure from crop residues and other plant residues like bean hulls, maize and millet stover and elephant grass; as well as animal waste can be applied directly or combined and composited.
- Inorganic (mineral) fertilizers especially high in nitrogen and potassium can also be applied alone or in combination with organic manure.
- Nutrient compositions and application rates depend on the soil-type, the type of inorganic fertilizers and the nutrient deficiencies of the soil.
- Apply the recommended rate of fertilizer in a ring 30 cm from the mat and at 4-5 cm of depth, then mulch.

Intercropping

- Bananas can be intercropped with crops like beans, green vegetables, Robusta coffee, provided the right spacing is given.
- Intercropping bananas with Arabica negatively affects the bananas.
- Do not intercrop with green manures such as *tephrosia*, *mucuna* and *canavalia* because they compete with banana for nutrients and water.

- Intercropping with annual crops when canopy has closed destroys roots and can spread BBW and should be discouraged.

Soil and water conservation

- Banana has a high demand for water.
- Dig water trenches or retention ditches to increase water retention and absorption in to the soil. Trenches also reduce soil erosion, especially on slopes.

Grass can be planted as a band to conserve soil and water.

- Old leaves and sheaths should be removed and used as mulch. Their removal reduces weevils and improves hygiene, light penetration and air movement.
- Break the male bud using a forked stick when the fingers on the cluster just turn upwards.
- Propping should be done for plants with maturing bunches to prevent them from breaking or toppling.
- Plants are generally weak during dry seasons support the plant using wooden pegs

Diseases

- Bananas and plantain are affected by a number of diseases that can be fungal, viral and bacterial.
- The most effective control is growing resistant cultivars.
- Infection and spread can however be reduced or prevented by:
    - Identification and removal of diseased plants
    - Correct spacing/plant density
    - Use of clean planting materials
    - Use of clean farming tools
    - Removal of male buds
    - Good field sanitation
    - Weed control, mulching
    - Good drainage
    - Good fertilisation/manuring

See symptoms and what to do for leaf spots, weevils, nematodes, fungal diseases, and banana streak disease in management practices handout.

Activity

Discuss whether the above information differs from what is in practice and ways to implement the recommended practices.

4.2. Harvest and Storage

Time (60 minutes)

Session: 45 minutes
Discussion/question/answer: 15 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Block notes
Pictures

Pre-Test

1. How do you tell it is time to harvest bananas/plantain?
2. What is the best way to store bananas?

Learning objectives:

At the end of this session participants are expected to:

1. Estimate time of harvest for quality fruit
2. Briefly describe the best way to harvest fruit
3. Know how to store bananas

Harvesting

- Time taken from flowering to harvesting varies with cultivars and climate.
- It generally takes 3 to 5 months for bunches to mature.
- Hybrids and exotic bananas take slightly longer than local cultivars.
- Aim at harvesting fruit of acceptable eating quality and long shelf life.
- Several indices are used:
    - Peel colour
    - Fruit size
    - Shape
    - Length
    - Volume
- Appearance is more critical in dessert cultivars than those for cooking.

- Using the grades: thin, light three quarters, three quarters, heavy quarters and round full, fruits are usually harvested at three quarters as these can tolerate transportation and storage before ripening (4-6 days before ripening starts).

- Bruised fruit has a shorter post-harvest life, ripens more quickly and affects the eating quality.

- At harvest, a cut should be made in the pseudostem to allow the bunch to descend slowly.

- For local market, the upper end of the stalk is cut while holding the lower end up so that the bunch lands on the ground balanced on the thick end with no damage to the fruit.

- For the export market, the bunch is not allowed to fall to the ground.

    - While holding the bunch at head level, each hand is cut off the stalk with a sharp knife.
    - The hands are placed on banana leaves laid on the ground for the latex to run and dry up.
    - The hands are sorted and graded according to the buyers' require-ments and packaged.

- Ensure that the banana residues are chopped and spread in the field. Weevils multiply in the old corms and pseudostem after harvest.

Storage

- Bananas should be stored in a place as cool as possible that is well ventilated.
- Avoid keeping them exposed to direct to sunlight, in heaps, where there is smoke or exhaust fumes from trucks as these quicken ripening and reduce the quality.

Group activity (30 minutes)

Find out how participants normally estimate harvest time as well as how they harvest and store bananas

4.3. Nutrient value of bananas and plantain

Time

30 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Block notes

Pre-Test

1. What is the benefit of eating bananas and plantain?

Learning objectives:

At the end of this session participants are expected to:

1. Know the nutrient benefits of eating bananas.

Nutrient value of bananas and plantain

- Because of their impressive potassium content, bananas are highly recommended by doctors for patients whose potassium is low.
- One large banana, about 9 inches in length, has 544 mg of potassium, 135 kilo calories, 35 gm carbohydrates, 2 g of protein, 4 g of fibre, 2 mg sodium, 8 mg Calcium and 41 mg Magnesium.
- One large banana also contains a full range of B vitamins with 0.047 mg of Thiamine, 0.111 mg of Riboflavin, 1.011 mg Niacin, and 0.558 mg vitamin B6 plus 13.2 mg of Vitamin C.
- No wonder the banana was considered an important food to boost the health of malnourished children!
- Some local varieties of banana and plantain in the Eastern Africa region have been found to have substantial levels of Provitamin A with consumption of only 100 g fruit capable of meeting at least 14% of the daily dietary requirements of children below five years. Plantains having a higher content than the cooking varieties. However the vitamin A in cooking cultivars is more accessible for use by the body than that in plantain.

- The plantain, when cooked, rates slightly higher on the nutritional scale in vitamins and minerals but similar to the banana in protein and fibre content.

4.4. Appropriate processing/cooking methodologies

Time

Session: 30 minutes
Activity: 45 minutes

Materials needed for training

Flip chart board
Flip chart
Marker pens
Hand out 1: Food guide pyramid
Block notes

Pre-Test

1. What are some of the processing/cooking methods we use?
2. How is the method of processing important with regards to nutrition?
3. What are some of the things that can be done to ensure processing/ cooking enhances nutrition?

Learning objectives:

At the end of this session participants are expected to:

1. Briefly describe why the way food is processed/cooked could influence its nutrition content.
2. Identify ways in which the local foods can be processed/cooked to ensure nutrients are retained or enhanced.

Processing & Cooking methods-banana/plantain based foods

Bananas and plantain can be prepared in a variety of ways and served as part of the main meal or as a snack. The importance of processing is to improve and vary taste and texture; and improve digestibility. Cooking with and/or eating bananas with other foods rich in proteins, minerals, vitamins and fats does not just enhance the quality of the diet, it also increases the absorption, transport and utilisation of nutrients (presence of some nutrients helps others) For example, Presence of protein is important for fat absorption and transport;

presence of fat, vitamin A and protein and their absorption and transport are also linked.

Bananas and plantains are prepared and consumed in forms such as:

Raw

- For ripe dessert cultivars that can be eaten as a snack; mashed (pureed) for young children; used for juice production.

Boiled/ Steamed

- For ripe or unripe cooking bananas and/or plantain;
- Can be boiled or steamed with or without the peel;
- Can be served whole or mashed and served with a variety of sauces like beef, vegetables, legumes and nuts;
- They can be peeled and be boiled with other ingredients like legumes, vegetables, and other condiments.

Fried

- Deep or shallow fried;
- Ripe plantain can be sliced or left whole then fried;
- For crisps: ripe plantain is thinly sliced and fried;
- For chips: unripe banana is fried and salted;
- Dessert bananas can be coated in a batter (flour, water and other ingredients) and fried to make banana fritters.

Roasted

- Mainly plantain;
- With or without the peel.

Dried

- Unripe banana and plantain is sliced, dried and ground into flour for storage. Can be fermented prior to drying.
- Banana flour can be used to make porridge; a stiff paste that is served with a sauce; and/or used to make a variety of confectionaries like cakes, donuts.

Activity

Let the participants come up with the local recipes.

Discuss recipes in the appendix 1 and how bananas can be incorporated into the family diet.

5. Food safety and hygiene

Time

Session: 60 minutes
Discussion/question/answer: 30 minutes

Materials needed

- Flip chart
- Flip chart board
- Marker pens
- Block notes

Pre-test

1. List any 5 practices related to good personal hygiene.
2. What do you understand by safe storage of food (raw) and water?
3. Name three important practices in preparing, cooking and storing food safely.

Learning objectives

By the end of the chapter, learners should be able to:

1. List at least four practices importance in good personal hygiene;
2. Practice good hygienic during food preparation, cooking and storage

Why foods and drinks must be safe and clean

It is important that the food we eat and the water we drink is clean and safe. So it is essential to prepare meals in a safe, hygienic way. If germs get into our foods and drinks, they may give us food poisoning (resulting, for example, in diarrhoea or vomiting). The people most likely to become sick are young children and people who are already ill, particularly people living with HIV/ AIDS.

Basic rules of hygiene aim to:

- Prevent germs from reaching foods and drinks. Many germs come from human or animal faeces. Germs can reach food via:
    - Dirty hands, flies and other insects, mice and other animals and dirty utensils;
    - Water supplies if they are not protected from faeces.

- Prevent germs from multiplying in foods and reaching dangerous levels. Germs breed fastest in food that is warm and wet (e.g., Porridge), especially if it contains sugar or animal protein, such as milk.

To help families have clean, safe foods and drinks:

- Find out about disposal of faeces, hand washing practices, the source and storage of water and ways in which food is prepared. This helps you identify ways in which germs may be reaching food and water, and foods in which germs may be breeding.

- Suggest practical ways to improve water and food hygiene. Some of the suggestions listed below may be relevant and useful. But remember not to overburden families with too much advice.

Personal hygiene

Advise people to:

- Wash hands with clean water and soap (or ashes):
    - After going to the toilet, cleaning a baby's bottom or cleaning clothes, dirty bed linen or surfaces contaminated with faeces. It is most important to wash hands after contact with faeces;
    - Before and after preparing food and eating;
    - Before feeding a child or sick person (make sure they wash their hands too).
- Dry hands by:
    - Shaking and rubbing them together;
    - Using a clean cloth that is kept only for this purpose.
- Keep fingernails short and clean.
- Avoid coughing or spitting near food or water.
- Cover any wounds on hands to prevent contamination of food during its preparation.
- Use a latrine and keep it clean and free of flies.
- Teach small children to use a potty. Put children's faeces in the latrine.
- Clean up faeces from animals.

Clean and safe water

Advise families to:

- Use safe water, such as treated pipe water, or water from a protected source, such as a borehole or protected well. If the water is not safe, it should be boiled (rapidly for one minute) before it is drunk or used in uncooked foods (e.g., fruit juices).
- Use clean, covered containers to collect and store water.
- Use clean materials to filter your water in need be.
- Use clean utensils to serve and drink water.

Buying and storing food

Advise families to:

- Buy fresh foods, such as meat or fish, on the day they will eat them. Look for the signs of poor-quality food.
- Cover raw and cooked foods to protect them from insects, rodents and dust.
- Store fresh food (especially foods from animals) and cooked foods in a cool place, or a refrigerator if available.
- Keep dry foods such as flours and legumes in a dry, cool place protected from insects, rodents and other pests.
- Avoid storing leftovers for more than a few hours (unless in a refrigerator). Always store them covered and reheat them thoroughly until hot and steaming (bring liquid food to a rolling boil).

Preparing food

Advise people preparing food to:

- Keep food preparation surfaces clean. Use clean, carefully washed dishes and utensils to store, prepare, serve and eat food.
- Prepare food on a clean table where there is less dust.
- Wash vegetables and fruits with clean/safe water. Peel if possible.

- Prevent raw meat, offal, poultry and fish from touching other foods, as these animal foods often contain germs. Wash surfaces touched by these raw foods with hot water and soap.

- Cook meat, offal, poultry and fish well. Meat should have no red juices.

- Boil eggs so they are hard. Do not eat raw or cracked eggs.

- Boil milk unless it is from a safe source. Soured milk may be safer than fresh milk.

Hygiene around the home

Advise families to:

- Keep the surroundings of the home free from animal faeces and other rubbish.
- Keep rubbish in a covered bin and empty it regularly in appropriate places (pits, compost) so as not to attract flies.
- For easy waste management separate the waste such as plastic, glass, paper and food/plant remains.
- Make compost for the garden with suitable waste food, garden rubbish and animal faeces. Composting destroys germs in faeces. The compost pit should be at least partially shaded and at least 2 feet from a structure like your house or a fence. It should be at a place convenient for you to add materials, access to water and good drainage. In addition you should take into consideration the direction of the wind so that the smell or odors doesn't come to the house.

Toxins and chemicals

Food and water is unsafe if it contains toxins or dangerous chemicals. A toxin called "aflatoxin" is produced by a mould that grows on cereals and legumes. Eating aflatoxin can make someone seriously ill. Moulds should be prevented from growing on any food items and this can be done by drying crops thoroughly and storing them in a dry place. People should desist from eating mouldy foods or giving them to animals but these can be added to compost.

Pesticides and other harmful agricultural chemicals may get into food or water and cause poisoning if:

- The chemical is not used in the recommended way;
- The empty containers are used for food or water.

Advise people to:

- Follow carefully the instructions for using chemicals;
- Be strict about keeping chemicals away from children;
- Never put food or water into containers that have been used for chemicals;
- Wash hands after using chemicals, and wash any foods (e.g., Fruit) that have been sprayed with them.

Activity

Discuss steps that can be taken to put these recommendations into practice.

6. Planning the community outreach training

Time

Session: 30 minutes

Materials needed

- Flip chart
- Flip chart board
- Marker pens
- Copies of action plan template

Learning objectives

- Develop action plans.
- Understand details concerning logistics for the community trainings.

Activity

- Participants are separated depending on their residence locations. From these large groups, teams of 2/3 are then formed. These teams will plan for and also carry out the community training together.
- Each team selects a leader and fills in the template below (1 action plan per team).
- The team then decides on a target group to train. It is recommended that the team chooses one of the community groups that they or any team member is affiliated to, such as saving groups, women groups, youth groups, farmer groups, religious groups, etc.
- The team then sets the date for the first training. The subsequent dates will be agreed upon by the trainers and the community members they are training.
- Facilitators aid the discussion and give details on timing, logistics, follow up of the trainings and the relevant contact persons.
- The facilitator and the team group leader each retain a copy of the action plan.

Community Training Action Plan

Date:
Site:
Village:
Target group:
Group ID:
Group Leader:

	Group members	Organization/ Affiliation	Telephone
1			
2			
3			
4			

Meeting date	Venue	Main topic to be covered	Resources needed

Appendices

Appendix 1. Nutrient needs of different family members

Daily requirement of Energy, carbohydrates, protein, fat, vitamins A, vitamin A, iron and zinc for different sex and age groups.

Family member	Age *(yrs)*	Energy *(kcals/d)*	Carbohydrates *(g/d)*	Protein *(g/d)*	Total Fats *(g/d)*[c]	Vitamin A *(µg RE/d)*[d]	Vitamin C *(mg/d)*	Iron *(mg/d)*[e]	Zinc *(mg/d)*[h]
Man (active)	19-70	3067[a]	130	56	20-35	600	45	27	14
Woman	19-50	2403 [a]	130	46	20-35	500	45	59	9.8
Pregnant Woman	18-50	2240	175	71	20-35	800	55	[g]	15
Lactating Woman	18-50	2640	210	71	20-35	850	70	30	17
Child	0.5-1	743	95	11	30	400	30	19[f]	8.3
	1-3	1046	130	13	25-40	400	30	13	8.4
	4-8	1742	130	19	25-30	450	35	18	11.3
Child (Male)	9-13	2279	130	34	25-35	600	40	29	19.3
	14-18	3152	130	52	25-35	600	40	38	19.3
Child (Female)	9-13	2071	130	34	25-35	600	40	65 (28*)	15.3
	14-18	2368	130	46	25-35	600	40	62	15.3

Note: 1 g protein or 1 g carbohydrates = 4 kcal; 1 g fat = 9 kcal; 1 g alcohol = 7 kcal.
Fat requirements were calculated to provide 25% of average energy requirements.
[a] Subtract 10 kcal/d for males and 7 kcal/d for females for each year of age above 19 years.
[b] Protein requirements based on 1.5 g/kg/day for infants, 1.1 g/kg/day for 1-3 y, 0.95 g/kg/day for 4-13 y, 0.85 g/kg/day for 14-18 y, 0.8 g /kg/day for adults, and 1.1 g/kg/day for pregnant (using pre-pregnancy weight) and lactating women.
[c] based on Acceptable Macronutrient Distribution Range (AMDR)
[d] Recommended safe Intakes of vitamin A
[e] The requirements are based on a low iron availability diet (i.e. 5% of iron absorbed).
[f] Bioavailability of iron during this period varies greatly.
[g] It is recommended that iron supplements be given to all pregnant women because of the difficulties in correctly evaluating iron status in pregnancy.
[h] Assumed bio-availability of dietary zinc is low-15 percent.
*A female child aged between 9-13years but non-menstruating
Sources: Dietary Reference Intakes for Energy, Carbohydrate. Fibre, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005). This report may be accessed via www.nap.edu
FAO/WHO (2004). Vitamin and mineral requirements in human nutrition: Report of a joint FAO/WHO expert consultation

Appendix 2. Recipes for Banana and Plantain

Katogo

Ingredients

- Eight to ten green bananas or plantains
- Juice of one lemon (optional)
- Oil for frying
- One onion, chopped
- Two or three tomatoes, chopped
- One sweet green pepper (or bell pepper), chopped
- Salt, coriander, cayenne pepper or red pepper (to taste)
- One pound beef: ground beef or stew meat cut in bite-sized pieces (optional)
- Two cups beef broth or beef stock

Procedure

- Peel the bananas/plantains, cut into cubes, sprinkle with lemon juice, and set aside.
- Heat oil in a large pan. Fry the onion, tomatoes and green pepper together. Add spices to taste. Add meat or broth. Continue frying and stirring until the meat is nearly done or until the broth is starting to boil.
- Reduce heat. Add bananas/plantains. Cover and simmer over low heat until plantains are tender and meat is done. Serve hot.
- The beef can be replaced with beans or peas or soybeans (previously boiled with salt); offal (intestines previously boiled with salt); silver fish (previously lightly fried in a little oil); or groundnut flour (made into a paste with water); or vegetables such as eggplant, bitter tomatoes, or amaranth leaves etc.

Plantain in Palm Oil

This dish makes use of two of the most common ingredients in Central African cookery: plantains and palm oil. Other oil can be substituted, but palm oil (or at least a mix of palm oil and some other cooking oil) gives the most authentic taste and colour.

Ingredients

- One cup of palm oil, or any cooking oil, or a mix of the two

- Four or more plantains (they don't have to be completely ripe)
- One or two hot chili peppers, cleaned and chopped (for a mild taste, use one hot pepper, left whole, so it can be removed before serving)
- One onion, chopped
- Salt to taste

Procedure

- Heat most of the oil in a large pan. Peel plantains. Cut plantains into disks of equal thickness. Fry the plantains in the hot oil for several minutes, until they are golden brown. Remove them from the oil and place them on absorbent paper.

- Heat the rest of the oil in a deep pot. Fry the peppers and onion over high heat for a few minutes, stirring often.

- Add the fried plantains to the peppers and onion. Add a spoonful of water, cover and simmer at a low heat for a few minutes. Salt to taste.

- Serve hot, alone or as a side dish.

Fried Plantains

Ingredients

- Oil
- Plantains, one per serving (plantains can be cooked when green or half-ripe or fully ripe, as desired)
- Salt or African hot sauce

Procedure

- Peel and cut plantains, either into thin slices, or slice each plantain in half and cut each half lengthwise. Heat the oil in a pan on the stove top. Add plantains (in a single layer) and fry until golden.

- Serve with *African Hot Sauce* or salt as a snack, an appetizer, or a side dish. Can also be served sprinkled with sugar as a snack or dessert.

Ndizi na Nyama (Plantains with Meat)

Ndizi is the Swahili word for *plantains*. *Nyama* is the Swahili word for *meat*. This recipe can be either *Ndizi na Nyama* (Plantains with Meat) or *Nyama na Ndizi* (Meat with Plantains). Make the dish without any meat and you will have a *Mchuzi wa Ndizi* (Plantain Curry).

Ingredients

- One cup water
- One to two pounds of beef (or similar), cut into bite-sized cubes
- One teaspoon salt
- One-half teaspoon curry powder
- Cayenne pepper or red pepper, (optional)
- Three tablespoons cooking oil
- One or two onions, thinly sliced
- Two tomatoes, chopped
- One cup coconut milk
- Three to six plantains, peeled and sliced

Procedure

- In a pot or pan, bring one cup of water to a boil. Add the meat, salt and curry powder. Cover, reduce heat, and simmer.
- While meat is simmering: Heat oil in a separate pan. Fry the onions for a few minutes. Add the tomatoes and cook for several minutes. Reduce heat. Cover and simmer.
- Add sliced plantains to meat. Cook for ten minutes or until meat is done and plantains are tender.
- Combine the onion-tomato with the meat and plantains. Stir. Adjust seasoning to taste.
- Serve with rice or ugali.

Stewed green bananas

Ingredients

- Vegetable oil
- Onion, chopped
- Salt
- Tomato, chopped
- Pepper, chopped
- 10 green bananas, whole
- Water

Procedure

- Heat vegetable oil. Sauté onion until golden. Add salt.
- Add tomato and pepper and cook for another 3 minutes.

- Add bananas and some water.
- Cover and cook over low heat until water is nearly gone and the bananas are soft.
- Mash and serve with any sauce.

Banana flour

Ingredients

Green bananas

Procedure

- Peel the green bananas and slice them into thin slices
- Sun dry the slices on a clean sheet until dry
- Grind dry slices in a flor using a mortar and pestle. Pieces that do not easily grind can be dried further.
- Sieve the flour and re-grind the coarse pieces
- Store the flour in a dry airtight container
- The flour can be added to flour for porridge, ugali, doughnuts or baked products

Banana porridge

Ingredients

- 1 heaped tablespoon of banana flour
- 4 heaped tablespoons of millet flour
- 1 heaped table spoon of soya flour
- 2 tablespoons of sugar
- 6 cups of water
- 1 lemon

Procedure

- Bring five cups of water to boil
- Mix the flour and make a paste with the remaining one cup of water
- Pour the paste into the boiling water and keep stirring to prevent lumps
- Make juice from lemon while pot continues to boil for 20 minutes
- The cooked product should jell
- Remove from the fire add lemon juice and sugar
- Cool then serve warm.

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Fried plantain

Banana, groundnuts and Amaranth

Banana, onions and tomatoes

Banana, beans and Amaranth

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