

**AGRICULTURAL DEVELOPMENT AGENTS
TRAINING MANUAL
LINKING AGRICULTURE AND
NUTRITION
FOR
HEALTHY AND STRONG ETHIOPIAN
FAMILIES**



Developed by Hawassa University, Ethiopia in collaboration with Centre for Development Innovation, Wageningen UR, The Netherlands

February 2015

Content

1.	Introduction	1
2.	Background	1
3.	How can agriculture help to improve nutrition outcomes	4
4.	Training sessions	
4.1	Session: Nutrition and Healthy Diet	5
4.1.1	Training Activity: Basic Nutrition Concepts	6
4.1.2	Training Activity: A diverse and Healthy Diet	9
4.2	Session: Under nutrition and Diet for children 6-23 months	11
4.2.1	Training Activity: Causes and pathways of under nutrition and micronutrient deficiencies	12
4.2.2	Training Activity: Diverse and Healthy Diet for children 6 -23 months	16
4.3	Session: Growing nutritious foods: vegetables and fruit	19
4.3.1	Training Activity: To plan a homestead garden	20
4.3.2	Training Activity: Garden Plan	23
4.3.3	Training Activity: Soil preparation and planting	27
4.3.4	Training Activity: Harvesting, Post harvesting handling and storage	35
4.4	Session: Producing nutritious food: Livestock and poultry	38
5.	Collaboration between health extension workers and agricultural development agents	42
6.	Methodology	44
7.	Sources	50
Annexes		
	Annex 1: Selected Vitamins and Minerals	
	Annex 2: Sample of Job Aids	
	Annex 3: Job description of the HEW's and DA's	
	Annex 4: Common behaviours observed in group discussions	
	Annex 5: Information Chart	

1. Introduction

This manual is developed to build awareness among agricultural development agents (DA's) on the importance of the contribution of the agricultural sector to improved nutritional outcomes to build healthy and strong Ethiopian families. In addition it also provides tools for action at community level.

Food insecurity and under nutrition are major problems in Ethiopia.

“Food security exists when all people at all times have **physical, social and economic** access to **sufficient, safe and nutritious** foods which meets their dietary needs and preferences for an active and healthy life¹”

At present time this is not the case for Ethiopia in general, and also not for Southern Nations, Nationalities and Peoples (SNNP) Region in particular. The average Ethiopian diet provides only 87% of the recommended caloric intake. About 15% of calories are coming from non-staples, which is far below the recommendation of 40-45%². Chronic under nutrition (low height for age) remains high, affecting 44% of children under five years of age.

Only focusing on **food availability** or **food accessibility** is not sufficient to lead to a well-nourished, healthy, productive, and nutrition secure population. Additional interventions are needed such as (environmental) health services, caring practices, focus on nutritious food to obtain nutrition security.

This manual focusses on the production and promotion of consumption of nutritious foods at community level, strongly linked with the promotion of the healthy diet by the Health Extension Workers (HEW's).

2. Background

The nutritional status of the population is being monitored through the Ethiopian Demographic and Health Surveys (EDHS). The nations nutritional situation is measured through levels of stunting (low height for age), underweight (low weight for age) and wasting (low weight for height). The last EDHS (2011) showed that in Ethiopia the major nutritional problem is chronic under nutrition - measured through stunting levels. According to the WHO classification system this a. Table 1 provides all the nutrition and mortality data for Ethiopia and SNNP in particular.

Table 1: Selected nutrition indicators and mortality data for national level and SNNP region.

	National	SNNP
Stunting	44%	44%
Underweight	29%	28%
Wasting	10%	8%
Low birth weight	11%	6%*
Infant Mortality rate (per 1,000 live births)	59	78
Under-five Mortality rate (per 1,000 live births)	88	116

* This is only a very small sample. Only 3.1% of births in SNNP region have registered weight at birth.

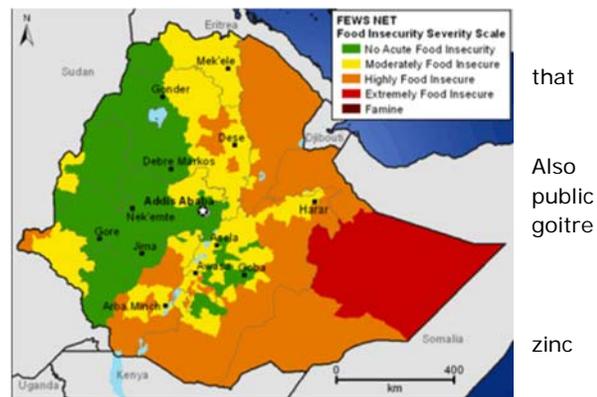
Figure 1 shows the stunting levels for Ethiopia per Region and although the SNNP region is not the most affected region, with stunting levels above 40%, the situation remains to be very serious and immediate action needs to be taken. Figure 1 also presents the food security data per region and shows that there is not always a logical overlap between high stunting levels and food insecurity. Regions with extreme food insecurity (red) present of the lowest stunting levels and other regions with a good food security situation (green) have very high stunting levels. There are regions with moderate and high food security (orange and yellow) that indeed report low - high stunting levels.

¹FAO, 2010

²SUN movement compendium 2014

Figure 1: Stunting level per region in Ethiopia (EDHS 2011) and Food Security situation (2010).

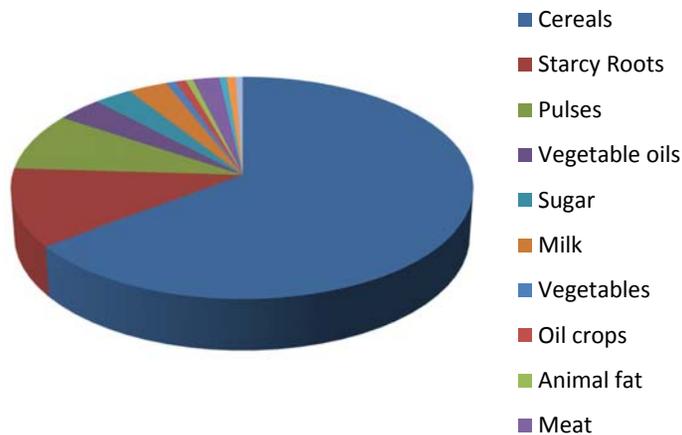
Micronutrient deficiencies are still prevailing in Ethiopia. Vitamin A deficiency affects 37.7% of Ethiopian children.³ A study done in 2010, shows one in every five women had iron-deficiency anaemia⁴, qualifying for moderate public-health significance based on the WHO cut-off point. Iodine deficiency disorders are still significant health problems in parts of Ethiopia. Endemic is quite prevalent in the south west Ethiopia. Median urinary iodine value of the study samples was found to be far lower than standards.⁵ Available data on zinc shows that deficiency remains of public health concern in Sidama zone, Southern Ethiopia⁶.



that
Also public
goitre
zinc

The FAO food balance sheet 2011 (see figure 2) for Ethiopia shows the main foods that contribute to the energy intake of Ethiopian people. The majority of energy comes from cereal and starchy roots. Other non-staple foods of importance are milk, vegetable oils and sugar (sugar and honey). Nutritious foods such as milk, vegetables, meat are only contributing very little to the daily caloric intake.

Figure 2 shows the composition of the diet (kcal proportion), food balance sheet 2011, FAO 2014.



The efforts of the Ethiopian government to address under nutrition, is described in the **National Nutrition Programme (NNP)** June 2013 – June 2015. These efforts will be strengthened through the Lifecycle Approach, a comprehensive approach that emphasizes the first 1,000 days of a child's life.

The first 1,000 days of life - the first day of pregnancy until the child is 24 months old - is a critical window of opportunity for health and development. This is the period in which nutrition requirements are greatest and when adolescent girls, pregnant women and young children in Ethiopia in particular are most vulnerable to inadequate care, inadequate access to health services and unsuitable feeding practices.

³ Demissie T, Ali A, Mekonen Y, Haider J, Umeta M., *Magnitude and distribution of vitamin A deficiency in Ethiopia*, Ethiopian Health and Nutrition Research Institute, Addis Ababa, Ethiopia, Food Nutr Bull, 2010 Jun; 31(2):234-41.
⁴ Jemal Haidar, *Prevalence of Anaemia, Deficiencies of Iron and Folic Acid and Their Determinants in Ethiopian Women*, J Health Popul Nutr. Aug 2010; 28(4): 359–368
⁵ Yinebeb Mezgebu, Andualem Mossie, PN Rajesh, and Getenet Bevene, *Prevalence and Severity of Iodine Deficiency Disorder Among Children 6–12 Years of Age in Shebe Senbo District, Jimma Zone, Southwest Ethiopia*, Ethiop J Health Sci. Nov 2012; 22(3): 196–204.
⁶ Gebremedhin S, Enguselassie F, Umeta M., *Prevalence of prenatal zinc deficiency and its association with socio-demographic, dietary and health care related factors in rural Sidama, Southern Ethiopia: a cross-sectional study*, BMC Public Health, 2011 Nov 29; 11:898. doi: 10.1186/1471-2458-11-898

For instance, ensuring that a new born is breastfed within 1 hour of birth could cut all neonatal mortality by 22 percent. Exclusive breastfeeding for the first 6 months of life can cut about 15 percent the number of child deaths, and adequate complementary feeding could prevent an additional 6 percent of all such deaths (Jones et al., 2003).

The interventions in this revised National Nutrition Programme will therefore target the following “windows of opportunity”: adolescent girls, pregnant women, infants 0–6 months old, and infants and young children 6–24 months old.⁷

Through the Strategic Objectives the Ethiopian Government guides the way to achieve the targets of reduction of chronic under nutrition for children under five and pregnant and lactating women. Strategic objectives 2 and 4 and its results are of importance for agriculture – nutrition linkages.

Strategic objective number 2 of the National Nutrition Plan:

To improve the nutritional status of infants, young children and children under five

Result 2.1 Improved nutritional situation of the children under five.

Initiatives:

2. Promote, support and create access to appropriate complementary feeding for 6–24month-olds:

- ✓ Promote timely initiation of semisolid/solid complementary foods at 6 months of age.
- ✓ **Promote and demonstrate the utilization of diversified foods**
- ✓ **Create access and promote use of micronutrient enriched complementary foods**
- ✓ Promote continued breastfeeding until the age of 24 months and beyond.
- ✓ Promote active and responsive feeding for children 6 to 24 months old, and involvement of fathers
- ✓ Promote feeding during illness and recovery.
- ✓ Conduct regular monthly growth monitoring and promotion for children 0–24 months with appropriate age-specific counselling.
- ✓ **Promote local production of complementary foods**

Strategic objective number 4 of the National Nutrition Plan:

Strengthen implementation of nutrition sensitive interventions across sectors

Result 4.1 Strengthen implementation of nutrition sensitive interventions in the agricultural sector

Initiatives:

1. Increase production of fruits, vegetables, nutritious roots, cereals and pulses to improve the consumption of a diversified diet at household level:
 - ✓ Promote homestead gardening.
 - ✓ Promote community horticulture production.
 - ✓ Strengthen/support fruit and vegetable nursery sites.
 - ✓ Promote appropriate technologies.
2. Improve access to and utilization of animal source foods
 - Dairy
 - ✓ Establish and support milk collection centers in milk belt and pastoralist areas.
 - ✓ Support market linkages to dairy products.
 - Poultry
 - ✓ Promote backyard poultry raising.
6. Promote consumption of diversified foods through the Agricultural Extension Programme and through agricultural development agents (DAs) at community level

⁷ National Nutrition Programme June 2013 – June 2014, Government of the Federal Democratic Republic of Ethiopia,

- ✓ Build the capacity of AEWs and agriculture programme managers at all levels to implement nutrition sensitive agriculture

7. Strengthen the capacity of the agriculture sector to integrate nutrition sensitive interventions into agriculture programmes

- ✓ Strengthen the linkages between HEWs and DAs for improved household nutrition practices.
- ✓ Mainstream nutrition interventions into the agriculture policy and investment framework

From these initiatives promoted in the **National Nutrition Plan**, agriculture can contribute to the highlighted activities by producing nutritious crops. Without these nutritious crops, families will not be able to provide their children with a diversified diet and not have nutritious food available at household and community level to create access to local micronutrient enriched complementary foods.

Nutritious rich commodities are, as defined by USAID (2014):

- 1) Bio-fortified (orange sweet potato (high B-carotene content), iron rich beans, yellow cassava (high B-carotene content);
- 2) Is a legume (chick peas, lentils, common beans), nut or some seeds such as sesame, pumpkin of sunflower, wheat germs of sprouted legume seeds;
- 3) Is an animal source food, including dairy products;
- 4) Is a dark yellow or orange fleshed root or tuber;
- 5) Is a fruit or vegetable that meets the threshold for being 'high source' for one or more micronutrients for 100 calories and per 100 grams basis.

3. How can agriculture help to improve nutrition outcomes

As mentioned above, food insecurity and nutrition deficiency are a common phenomenon in Ethiopia. The three pillars of food security - the availability, the access and utilization - are still not fulfilled for large parts of the population in Ethiopia especially in the surplus producing areas.

Nutrition-sensitive agriculture aims to maximize the positive impact of the food system on nutrition outcomes while minimizing any unintended, negative consequences of agricultural policies and interventions for the consumer. It is placing a nutrition lens on the food and agricultural sector as a whole without detracting from the agriculture sector's own goals, which historically focus on increasing production and improving income.

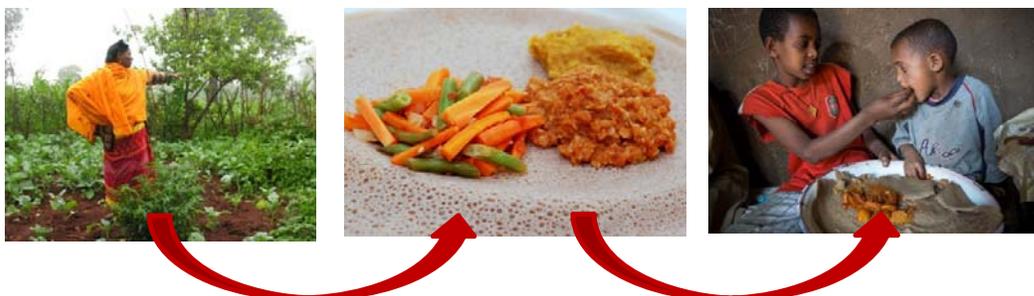
Nutrition-sensitive agriculture involves the design and adoption of cropping and farming systems (crops and animal) as well as value chain strategies which can provide agricultural solutions to the prevailing nutritional problems.

But how can we do this? There are several pathways for agriculture to contribute to nutrition:

- **Increased production of nutritious foods for own consumption.**
- **Increased income from sale of agricultural commodities, on condition that nutritious food is bought and consumed.**
- Enhanced empowerment of women.
- Decrease in food prices, on condition that nutritious foods are bought with surplus income.
- Macro-economic effects of economic growth, with the risk of uneven distribution of benefits.

The pathways of increased production of nutritious foods for own consumption is most suitable for agricultural development agents, who are working directly with farmers at community level. Figure 3, illustrates this pathway, production of nutritious foods, will provided availability of nutritious foods for food preparation and consumption of these nutritious foods by the family.

Figure 3: Illustration of the pathway of production of nutritious foods, food preparation to consumption.



When the agricultural development agents team-up with the Health Extension Workers, they can also address the nutrition outcomes through the pathway of increased income from sale of agricultural commodities, on condition that nutritious food is bought and consumed. This latter part need nutrition education both for women and men, which is provided by the health extension workers.

This manual will not only provide the information on the importance of nutrition, but also what agriculture can do to improve the situation and how the health extension workers and the agricultural development agents can team up and work together to build healthy and strong Ethiopian families.

4. Training sessions

This chapter provides the training sessions. Each training session deals with one topic, and is structured in the same way. Some of the training sessions will have several training activities.

The training session / activity is structure the following way:

- Topics of the training session / activity
- The objectives
- The estimated time needed
- Materials needed
- The content of the training sessions
- The methodology
- Key messages

Make sure that you read each session / activity care full and follow the sequence provide under the methodology.

4.1 Training session: Nutrition and Healthy Diet

This session provides an overview of basic nutrition concepts and discusses diverse and healthy diet for Ethiopians. This session has two components:

- Key concepts of Nutrition (activity 4.1.1)
- Diverse and Health Diet in the Ethiopian setting(activity 4.1.2)

The objective of this training session:

- 1) Introduction of the key concepts of a diverse and healthy diet.
- 2) Identify and describe the nutrient and food groups and their basic function for the human body.

Total time: 60 minutes

Materials needed

- Cards of representing the daily functions and the food
- Food cards
- Food model

4.1.1 Training Activity: Basic Nutrition Concepts

Objective of this activity:

Identify and describe the different food groups and their basic functions.

Time of this activity: 30 minutes

Materials needed:

- Cards of representing the daily functions and the food
- Food cards

Content:

Every day we prepare and consume food. Many of you are also involved in food production, either in growing plant crops such as cereals, fruits and vegetables and/or in (small) husbandry, such as rearing cows, chickens, goats etc. But why do we need to eat food?

We need to eat food for:

- Working and having strength
- The functioning of our body (breathing, circulation of our blood)
- Staying warm
- For growing (children) and pregnancy
- Repairing the body (for healing of wounds etc.) and recovering from illness and disease
- Protect against infection, so we do not get ill
- Thinking and learning (at school)

We need food for many different functions of the body and for executing different daily tasks such as walking, carrying etc. But what foods do we have available to prepare and consume for the function of the body and for our daily tasks?

What foods do we have available in Ethiopia and in **SNNPR** particular:

- Cereals: **teff, wheat, barley, maize**, sorghum, millet, **enset**
- Tubers: **taro, cassava, yam, potato (Irish and sweet)**
- Legumes (pulses): faba beans, **common bean, chickpea**, soya bean, **lentils**
- Fruits: **banana, mango, papaya, orange, avocado**
- Vegetables: **pumpkin, gomen, spinach, lettuce**, Swiss chard, **carrots**, tomatoes
- Meat: **beef, goat, sheep, poultry**
- Milk and milk products: **milk, cheese, yoghurt**
- Oil seeds: sesame, pumpkin, sunflower
- Fish: fish
- Other: **eggs, butter, oils and fats, sugar and honey**

Does each type of food provide the nutrients we need for functions of the body and the daily tasks we need to perform? But before we can answer this question we need to know what nutrients are.

Nutrients are substances which the body uses for growing and functioning and can be divided into four groups. Besides the four groups we have other important substances (water and fibre), that are needed for the normal functioning of the body.

The four nutrient groups are:

Carbohydrates: This nutrient gives our bodies energy to move, work, give us strength and help think. They also help to keep us warm. Cereals and starchy tubers are the main suppliers of carbohydrates, and need to be eaten in larger quantities. Please note that **sugar** is a carbohydrate, but should only be eaten in small quantities.

Protein: This nutrient is needed to help our bodies grow, maintain and repair itself. Meat, fish, legumes, eggs and milk and milk products are the major suppliers of proteins and although very important we do not have to eat this nutrient in the same quantities as carbohydrates.

Fat: This nutrient provides the body with energy to move, work and to keep us warm. Fat, oil, seeds as sunflowers, sesame and pumpkin seeds are providers of fat, and need to be eaten also in sufficient quantities, but not as much as carbohydrates.

Vitamins and minerals: Vitamins and minerals are also called micronutrients. Our bodies need small amounts of these substances which helps to protect us from illnesses and diseases. Fruit and vegetables are suppliers of vitamins, minerals and fibre and need to be eaten on a daily basis and in sufficient quantities (about 400 grams a day). For more details on the micronutrients see annex 1.

The other substances are

Water: this is not a nutrient, but it is substance that is very important for the functioning of the body. The human body contains about 60% water and it needs water not only helps to produce the bodily fluids, like spit, urine, breast milk, but also to help the body to keep cool. We need to drink at least 8 glasses, or 3x500 ml bottles of water a day.

Fibre: Fibre is also called roughage. It is important for helping our bodies to digest food and remove waste. It is important to eat fibre with plenty of water. Fruits, vegetable, and legumes provide us with fibre.

Nutrients which need to be eaten in large quantities, such as carbohydrates, proteins and fat are called macronutrients and the nutrients that are needed in small quantities such as vitamins and minerals are called micronutrients. Foods that contain micronutrients and/or proteins are called nutritious foods.

Coming back to the earlier question: *Does each type of food provide the nutrients we need for the daily functions of our body?* Then the answer has to be no. Not each food contains all the nutrients, sugar for example only provides carbohydrates and milk is major supplier of protein, but milk also contains fat and micronutrients such as calcium, vitamin A and D. Therefore it is important to eat a variety of foods every day to get all the nutrients needed to build healthy and strong families. We call this **"A diverse and healthy diet"**.

Methodology: Interactive Lecture

- Introduce yourself and your colleague and thank the participants for their presence.
- Ask the participants to introduce themselves
- Explain the purpose of today's training activity
- Discuss with the participants the reasons why we have to eat food every day by asking the question: ***why do we need to eat food?***
- List the answers of the participants by use food cards with the different functions (see annex 2)
- Make sure that you correct misconceptions
- Summarize this part by listing again the reasons of why we have to eat food and ask if there are any questions

- Discuss with the participants which foods are available in the SNNP region
- Use the food cards, when the participants mention a food, you can pull the right card out, confirm with the other participant that they agree on the foods and put the card in the middle of the group
- If they have listed all the foods, you can move to the next exercise, if not all foods have been suggested by the participants, you can take the cards with the missing foods and discuss it with the participants
- Explain nutrients groups and relate them to the food, using the food cards
- Summarize the nutrient groups and ask if there are any questions

- Summarize this session and discuss the key messages

Key messages: (Repeat at the end of the session)

- We need food to work, learn, keep warm, reproduce and grow
 - There are 4 nutrient groups; carbohydrates, protein, fat, vitamins and minerals.
 - Also important is drinking sufficient water and consuming enough fibre.
-

4.1.2 Training Activity: A diverse and Healthy Diet

Objective of this activity:

Introduction of the concept of a diverse and healthy diet in the Ethiopian setting

Time of this activity: 30 minutes

Materials needed:

- Food cards
- Food model

Content:

The Ethiopian diet is based upon injera (a fermented product made of teff), where different dishes are added, such as a dish of legumes, or vegetable and/or meat sauce. Please see photograph 1 for a typical Ethiopian meal. There will vary between regions because of availability of foods, habits and fasting season.

Photograph 1: Typical Ethiopian Meal



Photograph1 shows a healthy Ethiopian meal ideally consisting of one third of starch in this case teff. One third out vegetables, and the last one third consisting out of protein in this case legumes.

Many times it is not possible to prepare every single meal with this diversity of ingredients which is needed for a diverse and healthy diet.

The Ethiopian food balance sheet data (see figure 2) shows that the diversity of the Ethiopian diet is very limited and the majority of the foods eaten are starchy staples. Presently, starchy staple foods like teff, maize, enset and barley are representing around 85% of the Ethiopian diet, which is much

higher than recommended 55-60%. The proportion of nutritious foods (fruits, vegetables, animal products, legumes) is at the moment 15% of the diet, far much lower than the recommended 40-45%.

The diversity in the Ethiopian diet is limited, despite that the production possibilities are not a limiting factor, because many products grow in Ethiopia. Factors that affect the diversity in the Ethiopian diet are eating habits and that nutritious crops are not produced and thus also not consumed.

But how should a diverse and health diet for Ethiopians look like. This can be explained using the plate food model, See figure 5.

Figure 5: Food model (plate version) for a diverse and healthy diet.

This food model has 5 foods groups divided in 3 main parts: the part with green rim, about one third of the plate. The part with the yellow rim also one third of the plate. And the last third of the plate with the blue, purple and pink rim.

The yellow rim (one third) of the plate is filled with starchy foods, like teff, wheat, barley, maize, sorghum, millet, and enset and starchy tubers like taro, cassava, yam, potato (Irish and sweet).

The green rim (one third) of the plate is filled with fruits and vegetables, like banana, mango, papaya, orange, avocado, pumpkin, gomen, spinach, lettuce, Swiss chard, carrots, and tomatoes.

The blue, purple and rim (pink) of the plate represent the protein rich foods and fat.

- The pink rim part of the plate is filled with protein rich foods (non-dairy), such as beef, goat, sheep, poultry, faba beans, common bean, chickpea, soya bean, lentils, fish and eggs;
- The blue rim part of the plate is filled with protein rich food from dairy such as: milk, yoghurt and cheese.
- The smallest part (the purple rim) of this one third is filled foods rich in fat like butter, oil and seeds. These foods although important should be only eaten in small quantities.

Besides these food, at least 1.5 litres of safe and clean water should also be drunk in one day.

Methodology: Interactive lecture and discussion

- Thank the participants for their presence.
- Summarize the previous session and repeat the key messages of the training activity.

Key messages of previous training activity:

- We need food to work, learn, keep warm, reproduce and grow
- There are 4 nutrient groups: carbohydrates, protein, fat, vitamins and minerals.
- Also important is drinking sufficient water and consuming enough fibre.

- Explain the purpose and the structure of the today's training activity.
- Ask the participants to put an example meal together using the food cards
- Discuss the ingredients of the meal using the four nutrient groups
- Explain the diverse and healthy diet using the food model (Plate version) and relate to the example meal the participants provided
- Ask the participants which food they are not having on a regular basis at their house, and the reasons why
- Summarize the diverse and healthy diet and ask if there are any questions
- End the session with the key messages

Key messages: (Repeat at the end of the session)

- Foods have different nutrients and we have to eat a mixture of foods every day to have diverse and healthy diet.
- A diverse and healthy diet, consist for a third out of starchy foods, a third out of fruits and vegetables and the last third out protein rich foods, fats and milk and milk products. Drink at least 1,5 litres of water a day

4.2 Training Session: Under nutrition and Diet for children 6 -24 months

This training session discusses the causes and pathways of under nutrition and micronutrient deficiencies and discusses the contribution of agriculture towards a diverse and healthy diet for children 6 -23 months of age. This training session has two separate training activities:

- The causes and pathways of under nutrition and micronutrient deficiencies (activity 4.2.1)
- The contribution of agriculture towards a diverse and healthy diet for children 6-23 months of age (4.2.2).

Objectives of this training session:

- 1) To understand the causes and pathways of under nutrition and micronutrient deficiencies
- 2) Identify the contribution of agriculture towards a diverse and healthy diet for children 6 – 23 months

Total time: 60 minutes

Materials needed

- Cards health boy and a health girl
- Food cards
- Food model
- Card with FAO conceptual framework
- Counselling card complementary food (Alive & Thrive)

4.2.1 Training Activity: Causes and pathways of under nutrition and micronutrient deficiencies

Objectives of this activity:

To understand the causes and pathways of under nutrition and micronutrient deficiencies

Time of this activity: 30 minutes

Materials:

- Cards healthy boy and a healthy girl
- Card with FAO conceptual framework

Content:

In the previous training session we have learned that we need food and certain types of foods for our daily activities for work, to stay warm, for growth, to protect against illnesses and to learn. But what happens, if we do not eat not enough of these foods or only the same foods every day?

One of the impact of not eating enough food is malnutrition. Malnutrition is a general term that includes many conditions, such as under nutrition, over nutrition and micronutrient deficiency disorders (like vitamin A deficiency, iron deficiency anaemia, iodine deficiency disorders and zinc deficiency).

Under nutrition and micronutrient deficiencies are most frequent among Ethiopians, especially children under the age of 5 and pregnant women are high affected by under nutrition.

Under nutrition:

There are three types of under nutrition, which are measured in children under the age of 5:

- **Chronic under nutrition**, when over a long period of time starting during pregnancy and/or during the first two years of life the child does not receive enough to eat and/or not receive a very diverse diet. The impact of this kind of chronic is that children are too short for their age (stunting);
- **Acute under nutrition**, when over a short period of time children do not receive enough to eat and in short period of time lose a lot of weight. This could be because just before the new harvest, families have run out of sufficient food, or children have suffered from an illness and have lost their appetite and did not eat sufficient.
The impact is that they lose weight over a short period of time and then have a low weight for their height (wasting);
- **Underweight**, when a child does not eat enough and the diet is not diverse enough and suffers from frequent infection, leading to deficiencies in calories, protein, vitamins and mineral. The impact is that the child has a low weight for age (underweight)

Micronutrient deficiencies:

- This occurs when the diet of the child and pregnant woman is not diverse enough and does not contain sufficient vegetables and fruits. The most common deficiencies are vitamin A deficiency, iron deficiency anaemia, iodine deficiency disorders and zinc deficiencies.

Over nutrition

When diet contains too much nutrients especially, fat, sugar and carbohydrates this could result in over nutrition (overweight and obesity).

Under nutrition

In Ethiopia and SNNP region children and women of reproductive age are highly affected by under nutrition and micronutrient deficiencies rather than over nutrition. Therefore we will only look at the causes and impact of under nutrition in this manual.

Under nutrition is estimated to contribute to more than one third of all child deaths, although it is rarely listed as the direct cause. Under nutrition is a complex situation that often has multiple causes:

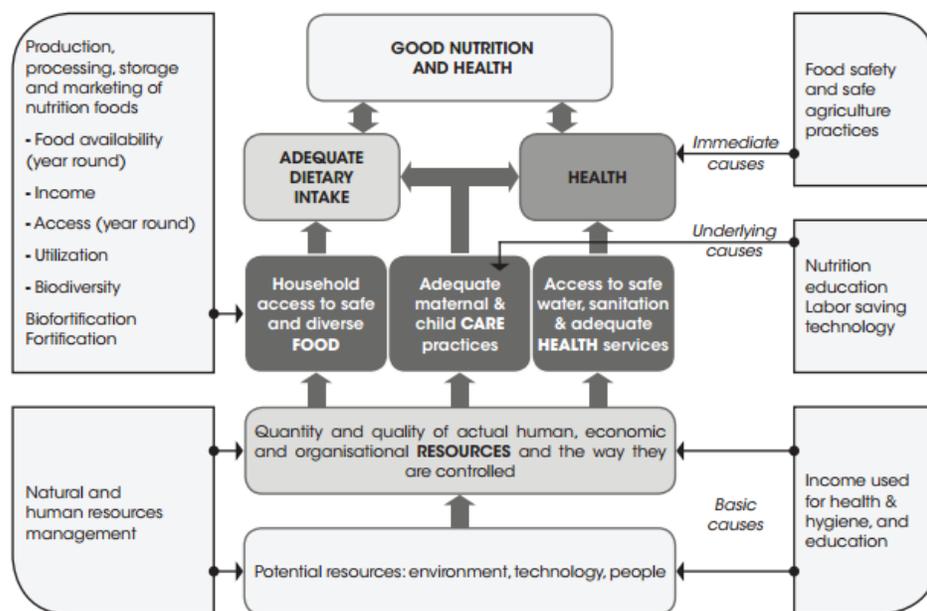
- Lack of access to nutritious foods, especially in the present context of rising food prices, is a common cause of malnutrition.
- Poor feeding practices, such as inadequate breastfeeding, offering the wrong foods, and not ensuring that the child gets enough nutritious food (caring and feeding practises), contribute to malnutrition.
- Infection – particularly frequent or persistent diarrhoea, pneumonia, measles and malaria – also undermines a child's nutritional status.

The impact of under nutrition on a child's life is quite severe and every child runs the risk of:

- Increased Morbidity and Mortality in childhood.
- Low school performance and learning capacity
- Lower work capacity and productivity
- Adult stature (height) is smaller than it should be
- Increase risks of obesity and non-communicable diseases (diabetes, hypertension)
- Have a lower cognitive, motor and social development.

The FAO Conceptual framework of malnutrition and the role of agriculture in addressing cause of malnutrition⁸ (figure 6) shows the causes and their relationships. Also the under nutrition situation in Ethiopia and specific in the SNNP region are a combination of immediate causes and underlying cause.

Figure 6: Conceptual framework of malnutrition and the role of agriculture in addressing cause of malnutrition



Reviewing the different levels of causes:

⁸ Strengthening the links between resilience and nutrition in food and agriculture, a discussion paper, FAO Rome 2014

The **immediate cause** of under nutrition is a result of a lack of dietary intake, and/or disease. This can be caused by consuming too few nutrients and/or an infection which can increase requirements and prevent the body from absorbing those consumed. Food safety and safe agriculture practices influences can positively influence the reduction of infections and diseases.

The **underlying causes** of under nutrition. Whether or not an individual gets enough food to eat or whether he or she is at risk of infection is mainly the result of factors operating at the household and community level. Within the framework just described these are classified as underlying causes. They can be grouped into three broad categories:

- Household inadequate access to safe and diverse food.
- Inadequate maternal and child care practices
- Unhealthy household environment and lack of health services (poor public health)

Nutrition education and labour saving technology positively influence inadequate maternal and child care practices. Household inadequate access to safe and diverse food is being positively influenced by several factors such as: all year round food availability, improved income and improved production, processing, storage and marketing of nutritious foods.

The third level of factors contributing to under nutrition identified by the conceptual framework is considered the **basic causes**. These refer to what resources are available (human, structural, financial) and how they are used (the political, legal and cultural factors). These can be thought of as the real reasons behind the underlying causes. These basic factors can be positively influenced by natural and human resource management and increased use of income for health, hygiene and education.

Of course the problem of under nutrition is complex, this manual is not developed to solve the complex situation of under nutrition that communities in Ethiopia are faced with. But provides a contribution towards providing a better household food security and to more adequate diet by addressing the pathway of **increased production of nutritious crops for own consumptions**, alongside the other staple crops.

Methodology: Interactive lecture

- Welcome the participants back.
- Summarize the previous session and repeat the key messages, by asking the participants what they have learned last session and what the key messages were.

Key messages training session: Nutrition and Healthy Diet

- We need food to work, learn, keep warm, reproduce and grow
- There are 4 nutrient groups; carbohydrates, protein, fat, vitamins and minerals.
- Also important is drinking sufficient water and consuming enough fibre.
- Foods have different nutrients and we have to eat a mixture of foods every day to have diverse and healthy diet.
- A diverse and healthy diet, consist for a third out of starchy foods, a third out of fruits and vegetables and the last third out protein rich foods, fats and milk and milk products. Drink at least 1,5 litres of water a day

- Explain of the purpose of the today's training activity.
- Explain malnutrition and how it affects children's health and impact on their future?
- Explain the conceptual framework and the different levels.

- For each level (immediate causes, underlying causes and basic causes) ask examples of a cause the participants can identify.
- Summarize this and ask if there are any questions and repeat the key messages.

Key messages: (Repeat at the end of the session)

- Under nutrition is affecting many children in SNNP regions, due to food insecurity and diet lacking nutritious foods.
 - Farmers can help to prevent under nutrition by producing and stimulating consumption of nutritious foods among their families
-

4.2.2 Training Activity: Diverse and Healthy Diet for children 6 -23 months

Objectives of this activity:

Identify the contribution of agriculture towards a diverse and healthy diet for children 6 – 23 months

Time of this activity: 60 minutes

Materials:

- Cards healthy boy and a healthy girl
- Food cards
- Food model
- Counselling card complementary food (Alive & Thrive)

Content:

In the previous session the impact of under nutrition has been discussed, but as indicated under nutrition is a complex situation. This training will not be able to solve all these issues, but farmers can contribute by growing nutrition foods and make sure that these foods are available in their households.

These efforts will support the activities already established by the health extension workers through nutrition counselling for divers and healthy diets of children aged 6 -23 months and the implementation of the community based nutrition programme, amongst other activities.

But before the agriculture aspects are being discussed, first some background on the diverse and healthy diet for children 6 – 23 months, because this is general knowledge each parent should have and farmers can make important contribution to the diverse and healthy diet for their children and the community at large.

Diverse and Healthy Diet for children 6 -23 months

The first 24 months of a child's life is critical for the following reasons:

- Rates of malnutrition usually peak during the first 24 months of a child's life with consequences that persist throughout life.
- This period is important to ensure optimal child growth, health, and development.
- Good diet in the first two years of life lays the foundation for future health, growth, and educational achievement.
- Children at this time are especially vulnerable to irreparable growth retardation, damaged mental development, micronutrient deficiencies, and common childhood illnesses.
- Attention to feeding practices is important because inadequate knowledge about appropriate foods and feeding practices is more often a cause of malnutrition than lack of food.
- Poor health and hygienic conditions also contribute to malnutrition and need to be addressed.

When the baby has become 6 months, other foods need to be introduced, because after 6 months breast milk cannot meet all of the baby's energy and micronutrient requirements.

- Complementary feeding is needed to fill the gap between total nutrient needs of the growing baby and the nutrients provided by breast milk.
- At 6 months a baby's digestive system is mature enough to digest different foods, and finely minced foods will not cause choking.
- Children need enriched foods because their stomachs are small, and they cannot eat large amounts of foods at each meal.
- **Porridge made from a single staple cannot meet a babies' nutritious needs fully.**
- Simple household processing methods can make porridges more nutrient and energy rich, and easy for the child to eat.

So what can be done to provide children the best start in live? The counselling on child feeding done at the health facilities will advise the following.

Cereal or root based complementary foods can be enriched by:

- Adding a small amount of germinated flour.
- Replacing water used for preparing porridges with milk.
- Adding butter/oil which will also make the thick porridge easier to eat.
- **Mixing legumes** such as pea, chick pea, or broad bean flour with the staple flour.
- Adding finely chopped **meat, fish, or eggs**.
- Adding finely chopped **kale, carrots, or other vegetables**.
- Adding mashed **avocado, banana, papaya, or other fruits**.
- Using iodized salt instead of normal salt when preparing complementary foods.

The highlighted foods are nutritious foods, they contain proteins and/or micronutrients. Fat from oil/butter is important in a children's diet, because it contains a lot of energy in a small quantity of food. For growing children who need a lot of energy, but have small stomachs, foods that provide a lot of energy in small quantities of food are important to provide them with sufficient calories for their growth and development.

Why are fruits and vegetables a good way to enrich complementary foods?

- Fruits and vegetables protect against illness and help babies stay healthy and grow strong.
- When available, good foods to give children as often as possible include orange coloured fruits and vegetables and dark green leafy vegetables.

Why are animal source foods a good way to enrich complementary foods?

- Animal-source foods are valuable for the baby's physical and brain development. Priority should be given to feeding them to children as often as possible. Animal foods can be mashed or chopped into small pieces to make them easy for the child to eat.
- When available, adding small amounts of finely ground meat, fish, or chicken to complementary foods adds nutrients and is good for the child.
- Organ meats such as liver, heart, and kidney are often less expensive and can be used to enrich complementary foods.

How often and how much complementary food should I give my child?

Table 2: The frequency of complementary feeding, the amount and type of food.

Age		Recommendations	
When?	Types of foods	How often? The number of times a child needs to be fed within a day	How much? The amount of food an average child will usually eat in a day (in addition to breast milk)
At 6 months 	Breastfeed on demand Start with soft enriched porridge + Animal-source foods (eggs, liver, meat powder, etc.)	2 to 3 times plus frequent breastfeeds	Start with 2 to 3 tablespoons and gradually increase the amount to three coffee cups
From 6 up to 12 months 	+ Enriched flour made from 3 portions of cereal (i.e., barley, sorghum) one portion of legumes (peas, chick peas, lentils, etc.)	2 to 3 meals plus frequent breastfeeds 1 to 2 snacks may be offered	3 full coffee cups 
From 12 up to 24 months 	+ Fruits (banana, papaya, avocado, etc.) + Vegetables (kale, carrots, pumpkin, sweet potatoes, etc.)	3 to 4 meals plus breastfeeds 1 to 2 snacks may be offered	4 full coffee cups 

Federal Democratic Republic of Ethiopia, Ministry of Health. Essential Nutrition Actions (ENA) Counselor's Guide (to improve nutrition of women and children), January 2005

As mentioned above, complementary feeding is needed to fill the gap between total nutrient needs of the growing baby and the nutrients provided by breast milk. But how often should a child between 6 -23 months get complementary food to fill the gap of the total nutrient need? This depends on the age group. Table 2 show the frequency of feeding, what can be given and how much.

Methodology: Interactive lecture

- Welcome the participants back.
- Summarize the previous session and repeat the key messages.

Key messages previous training activity:

- Under nutrition is affecting many children in SNNP regions, due to food insecurity and diet lacking nutritious foods.
- Farmers can help to prevent under nutrition by producing and stimulating consumption of nutritious foods among their families

- Explain of the purpose of the today's activity.
- Show the cards of the healthy boy and girl, ask the participants what they see.



- Ask the participants what they wished for their own children.
- Use the answers of the participant and connect to the complementary feeding issue using the counselling card
- Explain why complementary feeding is needed starting at 6 months and why this foods need to be prepared separately from family foods.
- Explain which food can be added (use the food cards) to enrich the complementary food and explain why they are nutritious.
- Explain how many meals extra the child should have.
- Summarize this and ask if there are any questions
- Close the session with an overall summary and with the key messages.

Key messages: (Repeat at the end of the session)

- Complementary feeding is needed to fill the gap between total nutrient needs of the growing baby and the nutrients provided by breast milk.
 - When not all foods are available in the household to make the complementary food recipe, always add what is available, even if it is just one ingredients extra.
-

4.3 Training Session: Growing nutritious foods: vegetables and fruit

This session provides an overview on the basic needs to start a homestead fruit and vegetable garden, including legumes. The production of nutritious foods will increase the diversity at household level and thus the diversity of diet of the children aged 6- 23 months and the family at large. This session has training activities:

- The necessary elements to start a homestead garden and a garden plan (activity 4.3.1)
- Soil preparation and planting (activity 4.3.2)
- How do we look after the garden? (activity 4.3.3)
- Harvesting, storing and processing of the vegetables (activity 4.3.4)

The objectives of this session:

- 1) To understand the role of vegetable and fruit have in the prevention of under nutrition.
- 2) To understand how to implement a successful homestead fruit and vegetable garden.
- 3) To understand the important of a garden plan, to cater for the need of the household (household consumption and additional income)

Total time: 1 day

Materials needed

- Crop list
- Food cards
- Paper and markers to draw a garden plan
- Demonstration plot
- Seeds and garden tools

4.3.1 Training Activity: To plan a homestead garden

Objectives of this activity:

- 1) To understand the role of vegetable and fruit have in the prevention of under nutrition.
- 2) To understand how to implement a successful homestead fruit and vegetable garden.

Time of this activity : 45 minutes

Materials:

- Paper and markers to draw a garden plan
- Demonstration plot
- Crop list

Content:

In chapter 3 we have already identified the way agriculture can contribute to improved nutritional outcomes. In the previous two sections we have explained the importance of nutrition, a diverse and healthy diet and the impact of inadequate diet and the importance of the production and the consumption on nutritious foods.

When discussing about nutritious foods we have focussed on fruits and vegetables because they are an important source of micronutrients and fibre. The vitamins and minerals (micronutrients) in fruit and vegetables will help our bodies to protect against illnesses and diseases. Also we have focussed on animal products, which are a source of protein and micronutrients. Protein help our bodies grow, maintain and repair itself. This section will discuss the contribution of horticulture, not only providing a diverse and healthy diet, but also its contribution to household food security situation and possible household income.

During health facility based nutrition counselling, families are advised to increase the availability of nutritious fruits and vegetables through a homestead garden in a small plot of land near the home. The purpose of a homestead garden is to grow fruits and vegetable for home consumption and to make these product available in the household to diversify the diet and have strong and healthy children and families. Using relay planting methods fruits and vegetable will be available to the household all year round and increasing the food security situation of the household. In addition, by making a garden plan and taking into account not only home consumption, but also that surplus should be available, the homestead garden could also add to the household income.

Careful planning is important for a successful homestead garden. The following criteria should be considered for better utilization of the limited space around a house and maximize the production of vegetables and other food crops.

- **Space.** The amount of space around a house will determines what techniques can be used and how many vegetables can be produced. Also is there space for fruit trees?
- **Shade versus full sun.** All plants need sunlight to grow, but too much sun and heat can dry out the soil and burn plants. (Fruit) Trees are good for adding shade to a garden, cooling hot winter temperatures and helping to prevent moisture evaporating from the soil, especially in dry areas.
- **Trees and competition.** While (Fruit) trees are good for shade and moisture retention, they require a lot of water and can rob the garden vegetables of vital moisture and nutrients.
- **Access to water.** Access to water all year round must be considered when planning a homestead garden.
- **Clean drainage or channels** so that excess rainwater does not flood the garden or your neighbor's yard.
- **Footpaths** to walk on without stepping on the crops.
- **Household labour capacity.** Is there enough labour capacity available in the household for a homestead garden besides the other agricultural production tasks? For example:
 - o The younger children can help to remove stones; weed; catch worms and bugs and help with the harvesting,

- The older children can help weed and plough the soil, plant, water and harvest,
- The parents can teach their children how to perform the tasks and work together to produce a fine vegetable garden
- **Fencing.** The homestead garden should be properly fenced to prevent damage to the vegetables by domestic animals.
- **Access and availability of seeds and other necessary inputs.** We need to make sure that the seeds are available in the area of programme implementation and some garden tools (e.g. spades, shovel, hoe, garden fork, trowel, Dibbers or Trans planters, watering can).

Other criteria to consider are:

- A garden plan (The type of vegetable selected, based upon the habits, nutrition value, the production possibilities and the willingness to consume the vegetables)
- There is a need for continuous activities for soil improvement (crop rotation, mulching).
- The use of non-chemical methods of pest and disease control.
- Production of some varieties of seeds.
- The production should focus on home consumption of the vegetables and fruit and only surplus should be sold.

Methodology: group work and demonstration

- Welcome the participants back.
- Summarize the previous session and repeat the key messages.

Key messages training session: *Under nutrition and Diet for children 6 -24 months*

- Under nutrition is affecting many children in SNNP regions, due to food insecurity and diet lacking nutritious foods.
- Farmers can help to prevent under nutrition by producing and stimulating consumption of nutritious foods among their families
- Complementary feeding is needed to fill the gap between total nutrient needs of the growing baby and the nutrients provided by breast milk.
- When not all foods are available in the household to make the complementary food recipe, always add what is available, even if it is just one ingredients extra

- Explain of the purpose of the today's activity.
- Ask the participants if they have a homestead garden and what they grow in their gardens.
- Ask the participants how many of them sell the products of the garden.
- Explain the relationship between the production of fruit, vegetables and legumes and :
 - the prevention of under nutrition
 - the possible increase of household food security situation
 - increased household income.
- Ask the participants what criteria they have to considered when constructing the homestead garden.
 - Space
 - Shade versus full sun
 - Trees and competition
 - Access to water
 - Clean drainage or channels
 - Footpaths
 - Household labour capacity
 - Fencing

- Access and availability
- Build upon this to go through the list of criteria to take into consideration when planning for a home stead garden. While going through the factors it is good to review these factors at the demonstration plot
- Summarize this part of the session and ask if there are any questions

Key messages: (repeat at the end of the session)

- Fruits and vegetable are rich in micronutrients and helps to strengthen the immune system and keep us strong and healthy to resist infections.
 - Homestead gardens can help to diversify the diet of the family when the produce is prioritized for home consumption.
-

4.3.2 Training Activity: Garden Plan

Objective of this activity:

To understand the important of a garden plan, to cater for the need of the household (household consumption and additional income)

Time of this activity : 45 minutes

Materials:

- Paper and markers to draw a garden plan
- Demonstration plot
- Food cards
- Crop list

Content:

Now we have learned what the criteria are to establish a homestead garden, we are going to establish what we would like to grow. It is important to know what and how much we are eating and how we can use the garden for improving diet diversity and quality of our children and families.

Before planning the garden we need to understand what the family needs. In order to know what we need per month with regard to fruits and vegetables we prepare a shopping list. This shopping list should be based not only on the consumption at present (which might be much lower than desired), but also look what there should be available at household level. Knowing the demand makes it easier to plan our garden, planting those vegetables, fruits and legumes we already know and adding new ones, which will improve our nutrition.

After doing some research with our family and the community, let us also consult the health extension worker to find out the real demand.

Garden Plan:

In order to make a garden plan, you will have to answer the following questions:

Step1: Making a crop list

- Which are the vegetables and fruits, legumes that grow best in the area? → If there are any doubts, ask the DA.
- What is the sowing and harvesting time of each one? → You can ask the DA.
- Which are the nutritious vegetables and fruits, legumes that you would like to plant? → Ask the Health Extension Worker and the DA.
- How much do you want to produce of each vegetable and fruit? → Only enough for family use? Enough to sell?

Step 2:

Which of the vegetable, fruits and legumes need what kind of space:

- Large Surface: pumpkin, potatoes, beans
- Small Surface: Leafy vegetables, carrots

Step 3: Planting methods:

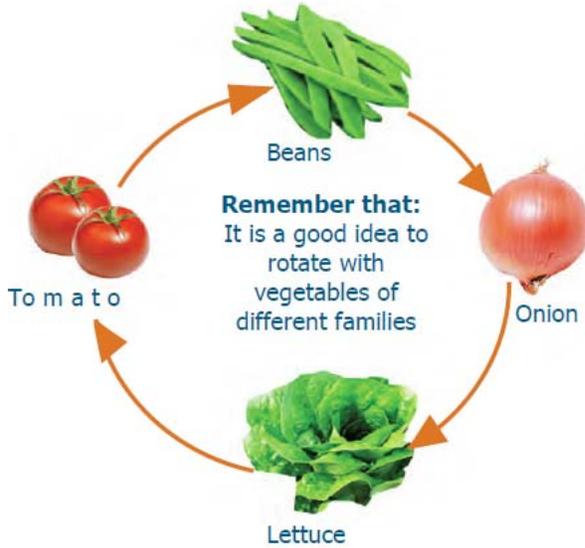
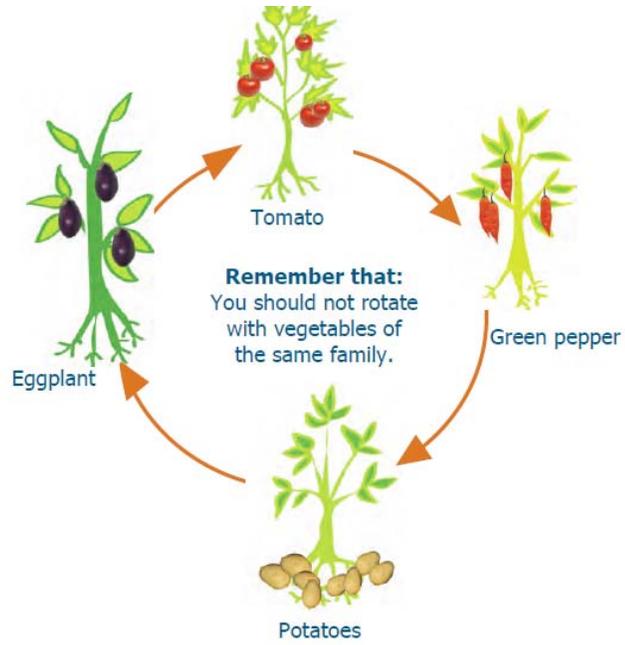
1 -Crop rotation

It is not a good idea to always plant the same vegetables in the same place in the garden. You should rotate your plants; this means to change the type of vegetables planted each season.

This way you will avoid:

- The depletion of the same nutrients in the soil.
- The appearance of many weeds, pests and diseases.

Knowing the main vegetable families is very useful. The chart in annex 5 of this manual explains the vegetable families of all the vegetables you may wish to plant.



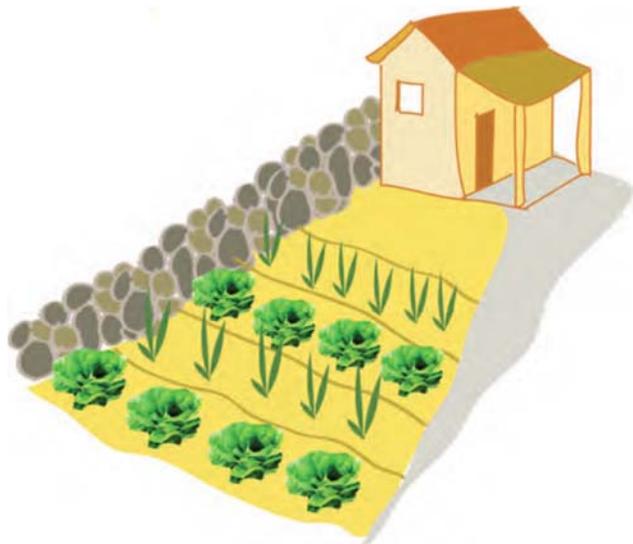
Solanaceous Family	Tomatoes Eggplant Green pepper Potatoes
Leguminous Family:	Peas Beans
Cucurbitaceous Family:	Pumpkin Melon Watermelon

2- Inter-planting

Inter-planting is planting two or more species in alternating rows. By doing this you:

- Take better advantage of the land and minerals
- Have better weed control

For example: it is possible to plant climbing vegetables on poles with low height vegetables.



3- Relay planting

Remember that there are vegetables that can be sown several times a year. With these it is possible to plant on different dates. This is relay planting. This method lets you have continuous vegetable production.

For example: you can sow seeds at 30 day intervals for the following vegetables: lettuce, swiss chart, and radish. So you will always have fresh vegetables!

Please note: It is not necessary to apply this for vegetables that store well for long periods, like pumpkin, onion, potato and garlic.

4- Intercropping

It is possible to sow early season crop seeds and late season crop seeds. This is intercrop planting and with this method you:

- Can take better advantage of space.
- Leave less room for weeds.

When the crops have been chosen, and the plot of land is secure, a drawing representing the homestead garden can be made to visualise the planting. The garden plan is complete.

Methodology: group work

- Welcome the participants back.
- Summarize the previous session and repeat the key messages.

Key messages previous training activity:

- Fruits and vegetable are rich in micronutrients and helps to strengthen the immune system and keep us strong and healthy to resist infections.
 - Homestead gardens can help to diversify the diet of the family when the produce is prioritized for home consumption.
-
- Explain of the purpose of the today's activity.
 - Explain the principle garden plan, list the steps and the importance of making a garden plan. Use the demonstration plot as the homestead garden site.
 - Divide the participants into 2-4 groups and have them make a crop list.
 - What does grow easy in the area?
 - Which crops are nutritious crops?
 - Planting and harvesting times?
 - What is the purpose of your produce
 - When the groups have completed the exercise, ask one group to present their crop list, focussing on the need of the household diversity, the nutrition value of the crop, generate additional income, and planting constraints.
 - Other groups can contribute their ideas and wishes and at the end of the exercise the participants agree on a final crop list.
 - Discuss the different planting methods.
 - Ask the groups to discuss the different methods and each group will discuss how they going to implement the homestead garden based upon their selected crop list, the purpose of the production of the crops and what method would be most suited to obtain the highest yield.
 - Have another group present their completed garden plan.

- Summarize this part of the session and ask if there are any questions.

Key messages: (Repeat at the end of the session)

- The first priority in homestead gardening is home consumption, and only then additional income.
- Making a garden plan allow families to produce nutritious fruits, vegetables and legumes not only for home consumption but also for additional income if desired.

4.3.3 Training Activity: Soil preparation and planting

Objectives of the session:

1. To understand the importance of soil preparation, and how to prepare land and how to plant the crops.
2. To understand what threats there are when the crops planted and what preventative measures can be taken to protect the crops

Time of activity : 60 minutes

Materials:

- Demonstration plot, including compost making
- Seeds, seedlings and tools
- Crops with pests and diseases

Content:

Now we have our garden plan, we can actually preparing the land and start planting our nutritious fruits, vegetables and legumes.

Soil preparation:

Although we do not see them because they are very small, the soil is inhabited by millions of insects and plants that are beneficial to your vegetables. These are microorganisms. If the microorganisms die, the soil also “dies” and will not be able to nourish plant growth. It is important to take care of the soil and give it back the nutrients that were used to produce the harvest

The microorganisms in the soil are almost always very busy decomposing plant and mineral waste. They prepare the soil nutrients that serve as plant food. The final state of decomposition produces **humus** which is organic matter and makes the soil rich in nutrients and more porous, which :

- increases the capacity of sandy soils to retain water.
- softens heavy soils (clay), increasing aeration and improving root growth.
- serves as food for the soil organisms.



Sandy soils

The water drains very fast and dries more easily

Clayey soils

Soils with organic matter

There are many types of organic matter

- 1- Organic fertilizer or “compost”.
- 2- Worm humus.
- 3- Farm-animal manure.

All of these improve the soil but some have more advantages than others! We will look only at the most Beneficial.

Organic fertilizers can be prepared in the home garden. The materials you need are easy to get: kitchen leftovers, vegetable scraps and animal manure.

Important! Never prepare organic compost with:

- Cat or dog excrement which can carry diseases and make people sick.
- Weeds with seeds that contaminate the ground.
- Toxic plants (like eucalyptus leaves, walnut leaves) which prevent the growth of other plants.
- Plants treated with herbicides.
- Scraps of infected plants.
- Poisonous plants.
- Glass, metal and plastic, materials that do not decompose.
- Leftover fats and meats that decompose very slowly and produce a stench.

Worm humus. The "California red worm" produces a very useful excrement for the garden soil which is called worm humus.

This worm:

Lives in a damp environment
and does not like light.

Lives in groups.

Feeds on animals and
Vegetation in decomposition



The garden soil can improve greatly if worm humus is added to the soil. Why?...

Worm humus

- Makes the ground more porous and therefore more permeable for water and air.
- It has substances that help plants grow.
- It has many microorganisms that make the soil nutrients more accessible to the plants.

Farm animal manure:

If you want to start your home garden right away, don't worry if you do not have organic compost or worm humus. Animal manure is a good alternative, provided it is well prepared.

Manure provides:

- organic matter
- nutrients

Manure from these animals can be used:

- birds and poultry
- horses
- cows
- pigs
- goats
- sheep
- rabbits

Note: It is important to prepare farm animal manure by decomposing it before use. Fresh manure:

- can burn seedlings if it is placed too close to them.
- may contain many weed seeds.

Decomposed manure:

- is safer for the plants.
- many weed seeds have been destroyed during the decomposition process.

To decompose the manure: make a compost heap and let the microorganisms act for 10 days

After the crops have been chosen, discuss the specific planting issues of each crop that is selected for planting. Issues to be discussed are:

- **Land preparation**, heaps, or trench gardening etc
The land has to be cleared properly!
The following needs to remove:
 - Trees and shrubs, use this for firewood.
 - Small brushwood, use the branches and the leaves to prepare organic compost.
 - Tins, glass, bones, bottles and stones must be placed in a separate part of the yard



It is highly preferable to plant your vegetables on a slight slope, so that rain, or irrigation water that is not used by the plants, can run off easily. There should be a ditch in the upper part of the vegetable garden that can be used for watering. Then there should be a ditch in lower end of the garden to serve as an exit channel. That way flooding can be avoided of your house or your neighbour's!

And now, to prepare the raised beds!

Raised beds are ideal when there is little land available; they allow you to take full advantage of the space. How are raised beds made?

Begin by marking rows 1 m (3ft) wide by 15 m (45 ft) long or less, leaving a corridor of 50 cm (20 inches) between rows. If the slope allows it, orient the rows from North to South.

Attention! If there is not much water for watering, the beds must be made narrower.



Also hygiene and sanitation practices need to be discussed to ensure safety of crops for consumption:

Clean soil

- Avoid the improper use of manure.
- Compost manure completely to kill pathogens, and incorporate it into soil at least two weeks prior to planting.
- Keep domestic and wild animals (including chickens) out of fields to reduce the risk of faecal contamination.
- Advice use of improved latrines instead of open defecations.
- Prevent run-off or drift from animal operations from entering produce fields.
- Do not harvest produces within 120 days of a manure application.
- Avoid consuming or selling crops recently sprayed with pesticides and animals fed with hormones.

Clean water

- Test surface water that is used for irrigation for faecal pathogens on a regular basis, especially if water passes close to a sewage treatment or livestock shelter.
- Keep livestock away from the active recharge area for well-water that will be used for irrigation.
- Keep chemicals away from the active recharge area for well-water that will be used for irrigation.
- Filter or use settling ponds to improve water quality.
- Where feasible, use drip irrigation to reduce crop wetting and minimize risk.
- Use potable water for making up chemical pest management sprays.

Clean surfaces

Tools and field containers must be kept clean. Wash and sanitize these items before each use.

Planting:

Some vegetables are reproduced by seeds and others through vegetative reproduction.

1- Seeds: Most vegetables are reproduced by seeds. That is why it is very important to use only good seeds. Normally the DA can help to obtain good quality seeds.

What are good quality seeds?

- All seeds must be of the same type.
- They must be clean, and free of foreign particles, dirt or weeds.
- Free of contamination, pests and diseases.
- Most seeds should be able to germinate under suitable conditions of temperature and moisture.
- The seeds must germinate quickly and the plants should be vigorous.

Can vegetable gardens produce seeds?

Yes, but you need to know the plants very well - when they bloom, how and when the seeds are to be harvested. It is easier to obtain seeds from some vegetables, such as pumpkin, zucchini, watermelon and beans. You should always keep the seeds of the best plants! These should be large, vigorous and free from diseases

2- Vegetative propagation: Some vegetables, although they can be reproduced by seeds, reproduce more easily through grafts, bulbs, tubers, stems or other parts of the plant (garlic, potato, strawberries)

How do you sow seeds? There are two ways to sow vegetable seeds:

Direct sowing: The seeds are placed direct in the soil in which they will grow. This method is used for vegetables with large seeds that are resistant to changes in weather conditions.

The plants begin growing within 5 to 10 days. The first plants have already appeared.

Now is time to pay attention to when the plants have 3 or 4 leaves, because then, you have to thin them. Thinning means eliminating surplus plants, leaving only those at fixed distances.

Loosen the soil between the furrows with the hoe. Use the weeding hoe to eliminate plants growing between the different groups, leaving only those at the desired distance. Manually remove small or weak plants, leaving only a single healthy plant

Seedlings and transplants: This method is used when the seeds are very small and need special care to germinate.

If the seeds that you want to sow are very small, or if they take a long time to germinate, or need special care, it is preferable to sow them in seedling beds, or seed trays. Planting in seedbeds uses the land better, because the plants spend part of their life in a small space. It makes it easier to take care of small plants. (weeding, fertilizing, watering) and protects the plants from the cold, the sun and the rain. There are fewer losses in seedbeds and less seeds are needed than with direct sowing.

Seedlings can be started in fruit boxes, plastic containers, used tins, flowerpots, etc. You can also have seedbeds in the soil if you have a lot of land and when you need many plants.

Care and management of seedlings

After you have finished preparing and sowing the seedbed, you need to:

- 1- Check the seedbed twice a day.
- 2- Remove the paper and dried grass as soon as the first seed germinates.
- 3- Water daily with water and nutrient solution.
- 4- Loosen the soil twice a week to avoid the formation of hard layers and the development of algae.
- 5- Earth up (mold) or put the substrate around the bottom of the plants to strengthen the development of the roots
- 6 – After a few days when the seeds starts to germinate, weeds will also start to grow. The weeds need to be removed because they compete with the seedlings for nutrients and water.

Transplanting If, 30 to 40 days after sowing, the seedlings have 4 to 5 leaves and are firm, they are ready to be transplanted. Transplanting means removing the seedlings from the containers and planting them in the spot where they will continue to grow until harvest. Before transplanting, you need to prepare the seedlings!

Water requirements.

How should the seed (beds) be watered after sowing? At first, the seeds can be watered with a spray hose, or a watering can, to make sure that the water reaches the seeds.

Later, when the plants start to grow, they can be watered by irrigation channel, sprinklers, or with a drip system, only when this is possible.

In rainy areas you only need to water when the weather is dry. In dry areas (arid or semi-arid) you should water frequently throughout the year. It is important to water only as much as necessary, neither more nor less.

If you water too much: The excess water will take nutrients deeper and out of reach of the roots. Also, too much water makes it easier for diseases to develop.

If you do not water enough: The roots will grow closer to the surface and will be unable to take advantage of the soil nutrients. The plants will be smaller and produce less

Weeding requirements

Weeds are plants that you have not planted and do not want in your homestead garden. The plants, weeds, take away light from your vegetable and legumes plants in the garden.

Weeds cause more damage when the vegetables are small and unable to compete for water and light. You need to control weeds from the very beginning, by doing the following:

- **Tilling the soil** to remove weeds consists of:
 - o Stirring up the soil between the furrows with a rake.
 - o Cleaning near the plants with a weeding hoe.

This should be done only on the surface to avoid damaging the roots. This job has to be done when the plants are still small.

Be careful not to infect the garden with seeds of weeds, either during the watering or from weeds near the garden.

- **Covering the soil with mulch** between the furrows with any of these materials:

- Organic compost
- Black plastic
- Dried grass
- Newspaper
- Dry leaves

Advantages of covering with mulch. Weeds cannot grow because of the lack of light. The soil remains moist and does not over heat during the day, nor get too cool during the night. The plant's leaves and fruit stay cleaner since mud does not splash. This method also avoids erosion.

- **Preventive control** is the measures that should be taken to prevent an excessive increase in the growth of weeds on the soil. What are those measures?
 - Using good quality seeds that are not mixed with weed seeds.
 - Using organic compost.
 - Planting crops in rotation.
 - If necessary, using something like nylon stockings to filter out weed seeds from water that is used for watering.
 - Keeping the garden clean of weeds.
 - Not using weeds with seeds in making organic compost.
- **Cultivating** is piling up the soil close to the base of the plant. It only done once in the season when the plants are fully grown and strong. This methods helps to control weeds, it improves soil aeration and preserves moisture. It helps to uphold the plants, making them more resistant to the wind and their own weight and it minimizes the attack of diseases.

Pest control

Pests are small insects that reproduce quickly, causing serious damage to crops because they feed off the plants. In many cases, the plants cannot resist pest attacks, and die.

There are some pests which are more frequent in a vegetable garden

Worms or larvae. Some worms are offspring of butterflies and emerge from the eggs 4 to 5 days after the butterfly has deposited its eggs on the backs of the leaves.



Aphids are small flying insects of different colours, mainly black or green. They suck the sap of the plants and in consequence, young leaves and flowers, especially, become yellow, turn, and dry.

Slugs appear in large quantities during the rainy season, when there is high humidity. They are active during the night and hide in dark places during the day. They eat the leaves of most of the vegetables.



Beneficial insects: Not all insects feed off plants: some feed off other insects so they help control pest infestations.



Ladybirds or Ladybird beetles: Ladybirds eat aphids, so therefore, help to control pests in a natural way. Ladybirds are colourful insects. They can be red, green, yellow and orange with black spots. They are 8 mm to 10 mm in size.

There are many things that can be done to "**avoid or prevent**" the destruction of plants by pests:

- Crop rotation planting: Remember that you should change the kind of vegetables you plant every year.
- Remove all vegetable scraps: Insects may stay on the scraps in the field multiplying. Use vegetable scraps to make organic compost.
- Use Inter-planting: it will be more difficult for insects to spread if the plants are separated by other vegetables. Some plants are beneficial to others when they are planted next to them. (See the table at the back of the Manual for information on which species to combine)
- Choose vegetables that are more resistant: some insects do not cause too much damage to some

vegetables. For example: Swiss chard, leeks, lettuce, onion, parsley, peas, spinach and others.

- Take good care of the vegetable garden: If the plants are big and strong the insects will not cause as much damage.

Pest control methods

Traps: Traps are better for catching some pests.

- Slugs: Place boards on the soil between garden plants. During the day the slugs will hide under them where you can trap them easily.

- White flies, aphids and thrips: Paint the inside of a not too deep can a bright yellow. Half-fill the can with water then hang it on a pole. The insects will be attracted by the colour and will drown upon falling in the water.

Use concentrated soap solution. Apply with a sprayer to control aphids and small larvae.

Barriers: You can prevent grubs from damaging small plants by placing rings made of cardboard around them. When the plants grow and bypass the ring they are strong enough to resist the grub attacks.

Sprays: There are some substances that do not damage plants or people yet help control infestations.

Example: Soap solution, to control aphids, spider mites and white flies. Mix 2 teaspoonful of detergent or liquid soap in 4 litres of water. Use this liquid to spray plants completely. Wash off the soap with clean water.

Collection: The whole family can trap insects by hand. Cutworms, weevils, chinch bugs, beetles and many others are easy to trap because they are large.

Colour traps: Use blue, yellow or White plastic flags covered with used engine oil to capture insects in the garden

Disease control

There are many diseases that affect plants, damaging crops and stored vegetables.

When is a plant sick? Sick plants look:

- Yellow or another unnatural colour.
- Faded or wilted.
- Weak
- With rotten fruit.

When the disease has reached an advanced stage, the plant cannot be saved. You must prevent the disease from spreading and affecting other, healthy plants in the garden. ***Preventive control is very important.*** You need to take the necessary precautions. The conditions in the garden should not be favourable for disease

Preventive control will not let diseases be a problem Some measures are:

Crop rotation: Do not plant vegetables from the same family in the same spot. Diseases can remain in the soil from one year to the next.

Resistant varieties: There are many varieties of vegetable resistant to one disease or another.

If necessary, consult the DA to find out if the vegetable varieties you want to use are pest resistant or not.

Do not leave vegetable scraps lying around: Always use vegetable scraps to prepare organic compost. If you leave them on the ground, they can contaminate the next season's crops.

Insect control: Some insects can also transmit diseases like viruses.

Weed control: Weeds help to create a humid environment that encourages the development of diseases. Remove weeds promptly.

Be careful that water does not stagnate: Water must not stagnate in the furrows. If this happens you should make exit channels.

Do not plant too densely: Plants should not be too close to one other (planted too densely). This encourages humidity and disease development.

Protect the fruit: You can protect fruits that have bent towards the ground because of their weight with guide stakes or trellises. For example: tomatoes, melons, pumpkin and watermelon.

Use good quality seeds: Seeds can also contain diseases that appear afterwards in the vegetable garden.

Plant in the right season: Each vegetable should be grown at the correct time. Consult the chart at Annex 5.

Methodology: Demonstration

- Welcome the participants back.
- Summarize the previous session and repeat the key messages.

Key messages previous training activity:

- The first priority in homestead gardening is home consumption, and only then additional income.
- Making a garden plan allow families to produce nutritious fruits, vegetables and legumes not only for home consumption but also for additional income if desired.

- Explain of the purpose of the today's activity.
- Ask the participants how they normally prepare their land, what planting method they use and what are the common problems they face.
- Demonstrate land preparation with the assistance of the participants and discuss the issues.
- Summarize the key issues

- Ask one or two participants to demonstrate planting with seeds and with seedlings. Ask them to discuss the issues that they are faced with, correct misinformation and add information when necessary.
- Summarize the key issues

- Demonstrate making of organic fertilizer and discuss the advantages and disadvantages.
- Summarize the key issues

- Discuss the issues of pest and disease control.
- Summarize the key issues and key messages.

Key messages: (Repeat at the end of the session)

- Good soil preparation with attention to clean soil, will provide not only good yield of the crops but also will produce safe crops for consumption.
 - Good management of planting methods, weed control and pest and disease control will provide the best yield possible.
-

4.3.4 Training Activity: Harvesting, Post harvesting handling and storage

Objectives of this activity:

To understand the when to harvest and how to handle the yields to minimize post-harvest losses.

Time of this activity : 30 minutes

Materials:

- Demonstration plot, with vegetables to harvest
- Processing demonstrations

Content:

Harvesting of crops

Vegetables and fruits have to be harvested at their exact point of ripening, because at that moment they have the highest nutritional content and they have the best taste.

What are other issues that you have to take into consideration:

- Harvest during the coolest hours of the day, early in the morning or late in the afternoon, when it has cooled down.
- Place everything you harvest in the shade as you go.
 - Handle the produce carefully. It should not be bruised or torn with your nails.
 - Harvest when the leaves have dried. In the case of onions, garlic, pumpkins and potatoes, you should harvest when the plant is dry. This means that the edible part is ready.
- Use a very sharp knife to cut leafy vegetables and to separate the edible part from the plant.
- Before harvesting root and bulb vegetables, loosen the soil with a strong garden fork to avoid having to pull at the plant, which may damage it.
- Leave a bit of stem (the peduncle) attached to the fruit. A piece of stem is left on many fruits like melons, pumpkin and peppers, so that diseases do not enter through the incision made when removing the stem.

Note

- Most vegetables shrivel easily when they are harvested green.
- Some produce that is harvested too early will never have the flavour or nutritional value that ripe vegetables have.
- Get to know every vegetable. With practice you will get to know the exact moment to harvest each one.
- Vegetables that are harvested too late (overripe) will rot and are unsafe and unpleasant to eat.

Post harvesting handling and storage

In some developing countries an estimated 25 percent of all food produced is never consumed by humans. Instead it spoils or is eaten by insects, rats and other pests. Measures to correct this situation can be taken in fields, households, and storage.

- If you want to always have fresh vegetables and fruits on the table you should harvest them only as needed. Your garden is the best place to keep vegetables fresh! If you want always to have vegetable ready to harvest plant them in relays.
- However, in some cases all vegetables and fruits needs to be harvest at once. For these type of vegetables and fruits relay planting is a good technic, to spread out the harvest over a longer period.

Most vegetables are easy to store. Some precautions are:

- Eliminate vegetables that are soft, damaged, and sick or infected with pests, as they will affect the healthy vegetables.
- When you cut the leaves on root vegetables like carrots, beets and radishes, trim tops to 1 cm. Leaves of beets and radish can also be consumed.
- Vegetables can be stored in any room, which is neither too cool, nor too hot. Also, vegetables always should be stored in a shady place. There always should be room for air to circulate.
- Some fruits, such as tomatoes and melons, can be harvested before reaching maturity and kept until they can be eaten.
- Others, like onions and garlic, have to be cured/dried after harvested or harvested when they are dry, and kept in bags or nets.

Legumes can be stored in dry and clean place for long periods of time, when they are dried and not getting attracted by insects, rats and other pests.

Control of insects, rats and other pests.

- Control of rats by trapping, poison, rat-proofing grain stores, etc.;
- Control of insects by use of insecticides, better food stores and airtight food containers;
- Control of fungi and food rot by storage of food in as dry a state as possible and by use of better containers;
- Protective measures against monkeys, baboons, porcupines, wild pigs and other destructive animals, even elephants;
- Educating people about safe and hygienic food storage at home.

Processing the vegetables, fruits and legumes

You can take advantage of the produce of the vegetable and fruits garden and make preserves. In this way, you will be able to consume vegetables and fruit throughout the year.

Some fruits and legumes can be dried, and when stored in a dry and cool place the self-life for these foods can be extended sustainably.

Develop locally applicable processing and preservation methods to increase year round availability

- Concentrated solar drying
- Powder production and packaging
- Storage systems for dried products using drying material.

Methodology: Group discussion and demonstration

- Welcome the participants back.
- Summarize the previous session and repeat the key messages:

Key messages of previous training activity:

- Good soil preparation with attention to clean soil, will provide not only good yield of the crops but also will produce safe crops for consumption.
- Good management of planting methods, weed control and pest and disease control will provide the best yield possible.

- Explain the purpose of the day's activity.
 - Discuss with the participants what they do with surplus of fruits, vegetables and legumes.
 - Ask the participant about their experience with, harvesting, storage of food, processing and their major problems and the ideas and experience to solve the issues. When possible seen what the traditionally storage methods are and which methods they which is more commonly used at the moment.
 - Demonstrate different skills and discuss the issues concerning the skill.
 - Summarize part of this session and repeat the key message and ask if there are any questions.
- End the session with the key messages from the whole session.

Key messages: (Repeat at the end of the session)

- When handled proper at harvesting, storage and processing fruit, vegetables and legumes can provide nutritious food options all year round.
- Only surplus yields should be sold for additional income.

4.4 Session: Producing nutrition foods: animal sources

This training session provides an overview which nutritious foods from animal sources can be easily be produced together with the homestead garden. Only adding small amount of animal products to the diets of children 6 – 23 months of age and pregnant and lactating women, have a positive impact on the nutritional status of the children and women.

The objective of this session:

1. To discuss what roles cattle and poultry have in the prevention of under nutrition.
2. How to stimulate the consumption of animal source foods.

Total time: 60 min

Materials needed:

- Counselling cards on complementary foods for children 6-23 months
- Demonstration of a semi-grazing system for chickens.

Content:

Ethiopia's livestock population is the largest in Africa, with cattle 40.6 million; sheep 14.3 million; goats 9.6 million; equines 5.7 million; camels 0.48 million and poultry 40.9 million. About 70% of the cattle and 30% of the goats are in the highlands above 1,500 m.⁹. Despite this wealth on livestock and poultry, the contribution of the animal source protein and micronutrients remain very limited as figure 2 indicated us.

Poultry

Poultry rearing has as main objective the production of eggs for consumption (home and sales), for chicken meat and production of chicks (expansion on the flock). But in general chickens are not very well cared for. They are left to roam around in the yard, and they feed on scrubs and crops, no immunization programme exist, and they are at increased risk of exposure of birds diseases and predators and reproduction entirely based on uncontrolled natural mating and hatching of eggs using broody hens .

But poultry farms are easy to start and can reach the poorest farmers and those with highest nutritional needs with this low cost intervention.

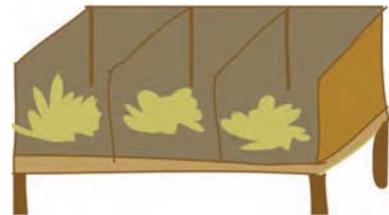
But in order to get good results with breeding chickens, you need to consider these three things:

- 1- Have proper facilities.
- 2- Breed the best birds
- 3- Feed them well

1. Have proper facilities

Build the fowl coop on hard, dry, level ground that does not flood when it rains. Use materials that are around the yard, such as wood, zinc, wire, mesh, bamboo or any robust, durable material. The chicken coop could be two metres long and one-and-a-half metres wide by one-and-half metres tall. The hens will roost in the coop, and lay their eggs there.

The floor must be covered with a layer of material that does not get wet easily, and that is easy to find in the surroundings at no cost. What kind of material could this be? Wood chips, rice husks, sugarcane bagasse, dried banana leaves, straw or chopped dried grass.

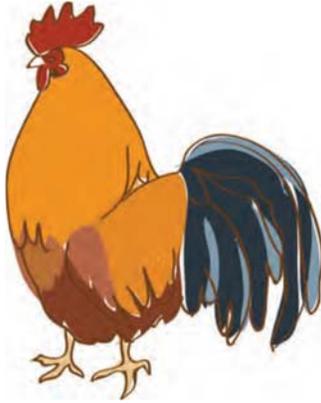


⁹ Livestock Feed Resources Assessment, Constraints and Improvement Strategies in Ethiopia, Malede BirhanMaledeBirhan and Takele Aduugna, TakeleAduugna,University of Gondar, Faculty of Veterinary Medicine, Middle-East Journal of Scientific Research 21 (4): 616-622, 2014

The nest boxes can be built of wood or bamboo. Place a bed of leaves, dried grass or wood chips in the nest box. Place the nest box up high so that the birds have to jump. The nests must be in darkness so that the hens can rest peacefully. One nest box is large enough for three yard hens.

Further you need feeding and drinking troughs, and perches

2. *Breed the best birds*



The yard rooster should be from a good laying hen and his siblings should be early layers. He should be big and healthy, and his crest, beak and talons should be well developed. Keep ten hens and one rooster.

Yard chickens are sturdy birds that are resistant to disease and pests. They feed on seeds and indigenous plants, insects and kitchen waste.

3. **Feed them well**

The hens need a balanced diet, one that contains all the nutrients they need for fast, healthy growth and development and for producing meat and eggs.

Proteins help the development of muscles (meat), internal organs, skin and feathers. They enable growth and increase egg-laying.

Vitamins are needed for producing eggs, and for growth and the formation of bones and feathers. They help to coordinate movement.

Minerals such as calcium and phosphorus are important for bones, the formation of eggs, and for blood circulation.

Carbohydrates and fats provide the poultry with energy for digestion, movement, growth and reproduction.

So, how do we feed the hens?

Grains are very important in the hens' diet. Maize is especially important because not only is it very nutritious but it also provides carbohydrates and makes the yolk of the egg more yellow.

The protein bank is a plot of land planted with fodder bushes of high protein content, such as pigeon peas, soya, Gliricidia, or Mexican lilac, tree marigold, mulberry, hibiscus, ramie, and so on.

Where can you find a source of **animal protein for the hens**? The main sources of protein are insects, earthworms and grubs. In order to have them at hand, you need to raise them in larval hatcheries.

The hens need minerals to help them grind their food and they need calcium for the formation of the eggshells. Collect the eggshells, dry them by the fire or in the sun, and mash them before feeding them to the hens. This will help them to lay eggs with stronger shells. The hens get 80% of the calcium they need from the eggshells. They can get vitamins from leaves of Swiss chard, lettuce, carrot or any other vegetable you have in your home garden.

They like kitchen waste very much, especially vegetables, fruit, cooked rice, banana, and so on.

They also like crop residues such as rice and corn husks, and guava, banana and other fruit. Don't give the hens salty or fatty foods because this makes them fat and they stop laying eggs. A properly-fed bird stays healthy, is more productive and is worth much more!

Also with taking care of birds and other animals standards of hygiene is important:

- Do not mix ducks, turkeys, geese or guinea fowls with the yard fowl because your poultry can be infected with the diseases carried by these birds.
- Remember to wash the feed and water troughs daily, and to pick up the broken eggs because they can contaminate the nests.
- Clean and disinfect the bedding and mesh of the coop.
- Remove sick birds from the coop so that they don't infect the other fowl, and treat them in an area far away from the coop.
- Dead chicken should not be eaten because of the health risk and they must be buried covered with quicklime.
- The poultry manure can be spread over the empty half of the enclosure in the yard or you can use the manure for making decomposed manure for your vegetable and fruit garden.
- De-worm the hens every four months to keep them free of worms.

Livestock: cattle

But the role of livestock in Ethiopia is not primarily as a food source but also an economic source. Livestock supply power for farming and transport. Livestock also supply their owners with financial services: by providing a substitute for credit and by serving as a form of insurance, as well as giving their owners a way of spreading risk¹⁰.

In the SNNP region, cattle, sheep, goat and poultry are kept, but not much consumed by households. Looking at the available data, it shows that meat contribute the same small proportion as milk, milk products and eggs to the diversification of the Ethiopian diet. Despite the fact that these are excellent sources of protein and micronutrients and fat as well, they are not contributing much.

Methodology: Discussion and demonstration

- Welcome the participants back.
- Summarize the previous session and repeat the key messages, by asking the participants to what they have learned in the previous last session and what were the key messages were.

Key messages previous session:

- Fruits and vegetable are rich in micronutrients and helps to strengthen the immune system and keep us strong and healthy to resist infections.
- Homestead gardens can help to diversify the diet of the family when the produce is prioritized for home consumption.
- The first priority in homestead gardening is home consumption, and only then additional income.
- Making a garden plan allow families to produce nutritious fruits, vegetables and legumes not only for home consumption but also for additional income if desired.

- Explain of the purpose of the today's session.

¹⁰ The Contribution of Livestock to the Ethiopian Economy, Policy brief number |CPALDnumber|CPALD 5/CLE/8/2013IGAD, Centre for Pastoral Areas & Livestock Development (ICPALD)

- Ask the participants if they have livestock and poultry and the reasons of keeping the animals.
- Ask the participants how often they provide they give eggs, milk and, meat to their children and why? is that?
- Explain the importance of the animal product for the growth and development of children and their wishes for their own children.
- Summarize this part of the session

- Ask the participant the problems they have with their cattle and/or poultry.
- Discuss ways to improve the production of their livestock and/or poultry.
- Summarize this part of the session and ask if there any questions

- Close the session with the key messages

Key messages: (Repeat at the end of the session)

- Animal products such as milk and eggs are very nutritious and contribute greatly to the growth and development of the children.
- Animal products should be used not only as income

5. Collaboration between Health and Agricultural Development Agents

This section describes the preparatory activities needed to be taken to implement this training programme. It is important that health extension workers (HEW) and agricultural development agents (DA) coordinate the training activities. This is to optimize the impact of the training and support ongoing and planned activities of both the health extension workers and agricultural development agents, taking into consideration the planting seasons activities of the nutritious crops.

Therefore it is important to organize a meeting between health extension workers and agricultural development agents to discuss each other's work and make a plan of action to implement the training programme and discuss the target group.

5.1 Job descriptions

Both health extension workers and agricultural development agents have a busy schedule and this requires general understanding about each other's responsibilities and agenda's. This discussion will also clarify the roles and responsibilities each cadre has and where the interface lies between both areas of work. In annex 4, there is an official job description of both extension workers.

This training should be jointly planned and implemented. Table 4 provides an example of how this can be done. By filling the table by both HEW and DA's, they can see when the activities could take place. Besides the activities of both HEW and DA's, also the planting and harvest season can be added.

Table 4: An example of joint planning of the agricultural development agent and health extension worker

Agricultural Development Agent		J	F	M	A	M	J	J	A	S	O	N	D
Activity	Responsible person												
Land preparation													
Planting of staple crops													
Interface where activities can be jointly planned													
Community based nutrition													
Vitamin A week													
Health Extension Worker													

After the table has been filled, the appropriate time can easily be identified.

5.2 Target group identification

This training programme is developed to contribute to reaching the targets set by the National Nutrition Programme June 2013 – June 2015 of the Federal Democratic Republic of Ethiopia.

The target group of this training programme is selected by the National Nutrition Programme strategic objective number 2 which aims to improve the nutritional status of infants, young children and children under five. Agriculture is expected to contribute towards these results by the production of nutritious foods at household level. Therefore the target group for this training programme are: **the farmers (female or male) of the families with pregnant and lactating women and with children under five years of age.**

5.3 Change of Experience

Both the agricultural development agent and the health extension worker are in contact with the target group. They each interact with the target group from their specific area of expertise. It is advisable for both to sit and brainstorm about nutritious foods, what is available, what is missing, what can be grown, what is be eaten etc. This will provide a good basis to start the training.

6. Methodology

This chapter discusses the target group, facilitation skills and different ways of delivering information. Understanding key facilitation skills necessary for conducting community meetings and community conversations are important.

6.1 Target group

A target group is a specific group of people which the programme is aiming at. In this case for nutrition sensitive agriculture, the primary target group are farmers (female and/or male) with children under five years of age. This includes also farmers with pregnant for the first time or who have spouse who are pregnant and/or lactating for the first time.

This target group is chosen because is among the focus target groups of the National Nutrition program. In addition the Health Extension Workers are also targeting this group in their Community Based Nutrition (CBN) programme that has been implemented and will be rolled-out starting 2015. The activities described in this manual will be complementary to the CBN programme.

It is important to understand the target group and their concerns regarding agriculture and nutrition. In addition, other characteristics are important to know such as the age group, gender, the size of the land used, location of the land and access to water, etc.

Although you are familiar with the farmers in your area, if you work with a specific group of farmers, it is good to get yourself familiarised with this specific group.

6.2 Facilitation

Facilitation involves a variety of tasks and roles. Some of the most important ones include:

Facilitation and teaching skills:

As facilitator we there are some specific facilitation skills that is needed to have effective learning sessions, encouraging and motivating active participation.

✓ **Use of open-ended questions:**

Open-ended questions are ones that require more than one word answers. The answers could come in the form of a list, a few sentences or something longer such as a speech, paragraph or essay. Open-ended questions are used to probe and encourage active discussion.

For example:

- ✓ What kind of foods are we eating?
- ✓ Why do we need food?

✓ **Use of closed-ended questions:**

If you can answer a question with only a "yes" or "no" response, then you are answering a closed-ended type of question. These questions should be as much as possible avoided, but they can be very useful when confirming if participants are agreeing or not?

For Example:

- ✓ We can grow pumpkin in August?
- ✓ We have a second planting season in September?

✓ **Speak loudly and clearly**, so that all participants can hear you as facilitator.

✓ **Use of visuals:**

When visuals are available, show the visuals included in the learning session. Make sure that all participants can see the visuals (moved around the group, passed them around, used a member to circulate with them or asked for participants to assemble around a picture to see it better).

- ✓ **Checking understanding.** Make sure you check understanding and comprehension of material before proceeding to the next point. This can be done by asking open-ended questions, where a participant is being asked to reflect what just have been explained and ask the other participants if they agree, and if they have anything to add. (This is a short process)
- ✓ **Attitudes displayed.** Sometimes, we facilitator will take up typical lecture role. We tell participants what to do, without building upon their knowledge and experience. There are several ways to change this:
 - Provide praise/affirmation to the participants, even if they contributed something small.
 - Help participants feel at ease with participating
 - Attempt to create a dialogue and/or limit "lecture style"

Coordination:

- Several of the session will be done jointly with the Health Extension Workers in your area of work. Make sure that you have an understanding with your health colleague about the time, place, content and the facilitation of the session and the roles both of you play in the sessions.
- Making sure that activities are clear, and that all participants have understood and accepted them.
- Raise critical and decisive questions, identifying and designing better strategies to bind the whole process together.
- Encouraging the participants to respect what can and cannot be done.

Directing the learning process:

- Creating a clear picture of the process and helping participants to reach a consensus on the process.
- Build upon the experiences already existing with the participants.
- When necessary, being able to look at the process from a different vantage point.
- Creating a favourable situation for participants to express their opinions and feelings without being told what is right or wrong.
- Providing opportunities that allow participants to gather/summarize ideas/information, carry out a situation analysis, and make their own decisions.
- Repeat the key messages of each of the sessions at the end of the sessions and start each of the sessions with the summary of the previous session and the key messages.

Encouraging and motivating active participation

Ensuring full participation, allowing all opinions to be expressed, and encouraging mutual learning among participants:

- Encouraging participants to contribute different ideas.
- Reflecting behaviours and conducts that are acceptable to the participants.
- Being a model by respecting the feelings of participants.
- Indicating clearly that mocking, blaming, or belittling others is not allowed
- Make sure that participants who are traditional (women, young community members) not the front when expression opinions, have a chance to speak and express their opinions and ask questions they need to ask.

There are common behaviours observed in group discussions that you, as facilitator will have to deal with. Please find the list in annex 1. Please be aware that these are suggestions on how to deal with these types of people. Each facilitator can choose his or her own way, as long as he/she respects the feelings and culture of other participants.

6.3 Method: Lecture

A lecture is an oral presentation intended to present information or teaching people about a particular subject. Lectures are used to convey critical information, history, background, theories and equations.

Objective: To inform a group of people on general information.

Number of participants: 15-30 persons

Materials: Job aids such as posters, pictures, etc

Duration: 30 -45 minutes

Preparation:

- Prepare the lecture, read through the background materials, prepare the job aids and make sure that you remember the key messages.

Lecture:

- Welcome the people before starting the lecture and thank them for participating; whenever (smaller groups) possible know people by name.
- Create a favourable situation for participants, using traditional ways on bringing people at ease, such as songs, dance and a coffee ceremony.
- Although it is a lecture, use examples and knowledge already existing among the participants. Ask participants for examples, etc. This will motivate participation.
- Use clear, simple language, which is cultural acceptable and understandable, in order for the community to adopt best practices.
- The duration of a lecture should not exceed 30 -45 minutes, otherwise participants will lose their interest.
- At the end of each session, ask participants to summarize the issues addressed and correct any mistakes or misconceptions.
- Close the lecture with the summary of the key messages.

Interactive lecture: This is a lecture, where you start your lecture based upon the knowledge already existing with the participants. You start each lecture with a question and you correct the incorrect information and build your lecture from here.

6.4 Method: Demonstration

Demonstrations can be used to provide examples that enhance lectures and to offer effective hands-on, inquiry-based learning opportunities.

Objective: Change of practices in the area of the nutrition and agriculture.

Number of participants: a maximum of 12 -15 persons

Materials:

For agricultural demonstrations:

- A piece of prepared land
- Agricultural tools
- Seeds
- Water

For nutrition demonstrations:

- Recipes (See Alive and Thrive recipes)
- Ingredients (which ones the mothers do not have but are important for the demonstrations)
- Cooking utensils
- Firewood, other fuel for cooking
- Water

Duration: 30 - 90 minutes

Preparation:

For agricultural demonstrations:

- Prepare the plot of land where the demonstration will take place
- Prepare the utensils, seeds and water etc, what you need for the demonstration.

Demonstration:

- Make sure that you are in time for the demonstration.
- Check if you have all materials and ingredients ready for the demonstration.
- Welcome the people before starting the demonstration and thank them for participating; whenever (smaller groups) possible know people by name.
- Give all participants a task during the demonstration.
- After the first steps of the demonstration it is good to have the participants repeat the steps themselves.
- Repeat the important information to the participants (maximum of 5 key messages).
- At the end of the demonstration it is good to summarize the information with a visual aid.
- Make sure you provide the participants with sufficient time to ask questions.

6.5 Method: Group Discussion

A discussion group is a group of individuals with similar interest who gather either formally or informally to bring up ideas, solve problems or give comments. The Facilitator will be the resource person and when necessary and correct any incorrect information in the group.

Objective: To solve specific problems, using the experience of the participants

Number of participants: Maximum 10 participants

Materials: Job aids when needed, if applicable flipcharts and markers

Duration: 30-60 minutes

Group Discussion:

- Identify the problems, practices and habits that need to be changed among the participants, for example, growing of nutritious crops
- The facilitator asks the participants what their experiences are regarding the problem and how to resolve it.
- During the discussion the participants exchange experiences with the other participants.
- At the end of the discussion the participants and the facilitator select the best experience as an option to the try put.

6.6 Theatre

Objective: To educate the community on specific problems.

Number of participants: Depends, it can be large group or a small group

Material: A theatre group, a story and key messages.

Duration: A theatre session should not exceed 20- 30 minutes, depending on the topic it could be as short as 10 minutes.

Preparation:

- Identify a (community) theatre group and discuss the topic and the key messages.
- Ask them to prepare and adjust to the local environment.
- Have a try-out with a small group of people to see whether the key messages are being understood by the audience.
- Based upon the comments of the try out audience, adjust the performance.

Theatre:

- Agree a time and place with the community and spread the word about the theatre performance within the community.
- Provided some time for the people to arrive.
- Play the performance.
- After the performance discuss with the all community members what they think of the performance and what are the message they have received. When the message received are not correct, provide the correct information.

At the end summarize the key message. Make sure that the messages are correct and summarize them

7. Sources

This manual has been prepared based upon the following sources:

- **Infant & Young Child Feeding Quick Reference Book (0- 24 months)**, Ministry of Health Federal Democratic Republic of Ethiopia, 2010 with the technical and financial contribution of Alive & Thrive, with support from the Bill & Melinda Gates Foundation;
- **UNICEF conceptual Framework of under nutrition**, UNICEF, <http://www.unicef.org/nutrition/training/2.5/4.html>
- **Integrating Agriculture and Community Based Nutrition to improve nutrition**. A training manual for Agriculture Development Agents and Health Extension Workers, CASCAPE, UNICEF, draft, January 2014
- **SUN Compendium Ethiopia**, Scaling-up Nutrition Initiative, 26 October 2014
- **Community based Nutrition: Training Guide for Training of health Workers & health Extension workers**, revised march 2009
- **National Nutrition Programme June 2013 – June 2015**, Government of the Federal Democratic Republic of Ethiopia
- Manual “A Vegetable Garden for All” 5th Edition, FAO, 2014 <http://www.fao.org/3/a-i3556e.pdf>

Annex 1: Selected vitamins and minerals

Micronutrient	Function	Food source
Vitamin A Retinol, beta-carotene and various other carotenoids	Helps maintain good vision (necessary for night vision), resistance to infections, and supports growth and repair of body tissues.	Retinol: Milk, eggs, meat, fish liver oils. Beta-carotene and other carotenoids are found in: Green leafy vegetables: kale, spinach, broccoli, collard greens, parsley, turnip greens, escarole. Yellow vegetables: carrots, sweet potatoes, winter squash, pumpkin. Yellow and orange fruits: mango, cantaloupe, papaya, and apricots.
Vitamin B1 (Thiamine)	Helps metabolize carbohydrates, maintain appetite and normal digestion. Supports normal appetite and nervous system function.	Found in many foods: whole grain cereals, legumes, beans, nuts, brewer's yeast, wheat germ, pork, ham, and liver.
Vitamin B2 (Riboflavin)	Supports normal vision and skin health.	Milk, yogurt, other dairy, meat, leafy greens, whole grains.
Vitamin B3 (Niacin, nicotinic acid, Niacinamide)	Supports health of skin, nervous system and digestive system.	Tuna, dairy, meat, whole grains, nuts and all protein containing foods.
Vitamin B6 (Pyridoxine, pyridoxal)	Significant role in protein metabolism	Green leafy vegetables, meats, fish, poultry, shellfish, legumes, fruits, whole grains.
Vitamin B12 ()	Helps to maintain nerve cells.	Animal products (meat, fish, poultry, shellfish, eggs, cheese, milk).
Biotin	Part of a coenzyme used in energy metabolism, fat synthesis, amino acid metabolism and glycogen synthesis.	Widespread in foods.
Vitamin C (ascorbic acid)	Essential element in collagen formation (strengthens blood vessels, forms scar tissue, is a matrix for bone growth); an antioxidant; strengthens resistance to infections; and improves absorption of iron.	Abundant in most fresh fruits (esp. citrus) and vegetables.
Calcium	The principal mineral of bones and teeth, also involved in normal muscle contraction (including heart muscle)	Milk and milk products, small fish with bones, tofu, broccoli, chard and legumes
Vitamin D (cholecalciferol, ergocalciferol)	Member of a large and cooperative bone-making and bone maintenance team. Regulates absorption of calcium and phosphorus for bone health.	Formed in skin when exposed to sunlight. Also found in dairy products, egg yolk, fish liver oils, tuna, mackerel, herring, sardines, oysters, yeast.
Vitamin E	Fat-soluble antioxidant. Helps maintain cell membranes, red blood cell integrity, protects vitamin A and fatty acids from oxidation.	Found primarily in plant oils, green, leafy vegetables, wheat germ, whole grains, egg yolk, nuts, seeds, and liver
Folic acid	Essential for blood cell formation, protein metabolism, and prevention of neural tube defects	Green leafy vegetables, liver, fortified grain products, legumes and seeds.
Fluoride	Involved in the formation of bones and teeth.	Drinking water (if fluoridated) tea, seafood.
Iodine	Essential component of thyroid hormones that regulate tissue growth and cell activity	Iodized salt, seafood, plants.
Iron	Part of the protein haemoglobin which carries O ₂ in the body.	Red meats, liver, poultry, fish, shellfish, beans, peas, dried fruit, eggs. Certain foods contain phytates, which may inhibit iron absorption.
Vitamin K	Helps make factors that promote blood clotting.	Bacterial synthesis in the digestive tract. Diet generally supplies remaining need. Green, leafy vegetables, cabbage-type vegetables and milk.
Zinc	Zinc is important for a healthy immune system, properly synthesizing DNA, promoting healthy growth during	A wide variety of animal foods and plant foods

	childhood, fighting infections and healing wounds.	
--	--	--

Annex 2: Job aids.

Photos of the daily tasks for which we need food.

Working in the field



Learning at school



Stay warm



Reproduction



Recovering for illness/disease



Selected Photos of foods (samples)

Teff



Barley



Gomen



Cabbage



Advocado



Mango



Milk



Oil



Lentils



Chickpeas



Meat



Poultry

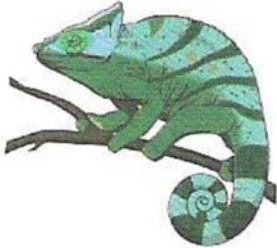
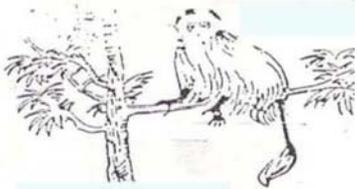
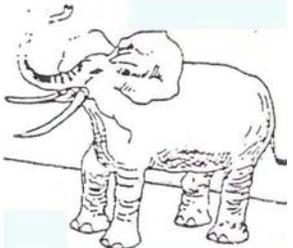
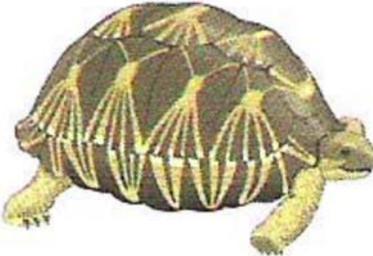


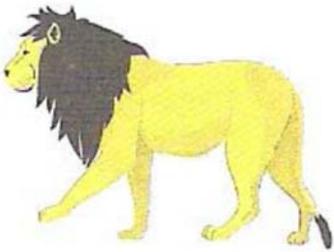
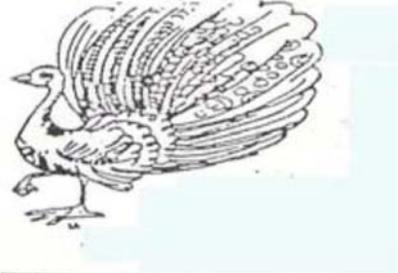
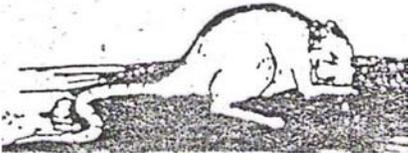
Cards with a healthy boy and girls adapted from the Alive and Thrive materials



Annex 3: Job description HEW's and DA's

Annex 4: Common behaviours observed in group discussions

Animal	Behaviours	How to handle
<p>The Chameleon</p> 	<p>Who changes colour according to the people he/she is with. He/she'll say one thing to this group and something else to another.</p>	<p>Ask these persons first to know their idea (stand). Otherwise they change their stand according to the group they join.</p>
<p>The Ostrich</p> 	<p>Who hides his or her head in the sand and refuses to face reality or admit there is any problem at all.</p>	<p>Try to show data or the reality and make the data clear and show the facts.</p>
<p>The Monkey</p> 	<p>Who foots around, chatters a lot and prevents the group from concentrating on any important issue</p>	<p>Try to focus on specific issues and remind the person of the topic of discussion so that you do not lose focus.</p>
<p>The Elephant</p> 	<p>Who simply blocks the way, and stubbornly prevents the group from continuing along the road to their desired goal.</p>	<p>Conduct sensitization prior discussion with these people and convince them</p> <p>Include model families in the conversation and let them share their experience</p>
<p>The Tortoise</p> 	<p>Who withdraws from the group, refusing to give his or her ideas or opinions.</p>	<p>Encourage participation by asking these persons to share their ideas</p>

<p>The lion</p> 	<p>Who gets in and fights whenever others disagree with his/her plans or interfere.</p>	<p>Refer and show the ground rules (e.g. Respect each other, respect one's idea, ...)</p>
<p>The Peacock</p> 	<p>Who is always showing off, competing for attention 'see what a fine fellow I am.'</p>	<p>These people want to be recognized by the discussants. They have something to show. It can be knowledge or other talent. Therefore, recognize them.</p> <p>Give them a chance to show their talent (it can be sharing of their broad experience, or). They may help the facilitator a lot if their talent is used.</p>
<p>The mouse</p> 	<p>Who is too timid to speak up on any subjects.</p>	<p>These people are very smart when they do something alone. But they are shy to do it in front of people.</p> <p>Encourage them to participate and ask them to share their ideas, raise questions</p>

Annex 5: Information Chart

Vegetable	Type	Nutritional value (vitamins)	Root depth	planting system and depth in cm.
Vine tomatoes	Vegetable	A and C	deep	1,5 - 2,0 seedling
Bush tomatoes	Vegetable	A and C	deep	1,5 - 2,0 broadcast with thinning seedling
cassava	3 year Perennial	C Carbohydrates	medium	stake transplant
Carrot	Root	A mineral	medium	1,5 - 2,0 broadcast with thinning
Zucchini, Squash,	Vegetable	C	medium	3,0 - 5,0 drilling*
Squash, Pumpkin	Vegetable	A and C Carbohydrates	deep	3,0 - 5,0 drilling*
				*In each hole: place 2 to 3 seeds

Spacing (cm.) after thinning or transplanting		Seeds in 10 m furrows	Days to maturity	When to harvest	Approx. yield in 10 m furrows
Between plants	Between furrows				
30 - 60	90 - 100	15 - 35 Plants	60 - 100	Firm nicely colored produce	40 - 50 kg.
10 - 20	120 - 150	1 - 2 Broadcast 50 - 100 plants	70 - 100	Firm nicely colored produce	30 - 40 kg.
90	120	10 - 15 stakes	250 - 300	well developed roots	25 kg.
3 - 6	30 - 60	4 - 5	65 - 85	Formed roots and colored	25 - 30 kg
70 - 100	100 - 150	6 - 7	80 - 120	Tender vegetables, soft when pressed with fingernail	70 - 100
100 - 150	250 - 300	7 - 8	100 - 120	Firm vegetables, firm when pressed with fingernail	25 - 30
					*In each hole: place 2 to 3 seeds

Spacing (cm.) after thinning or transplanting		Seeds in 10 m furrows	Days to maturity	When to harvest	Approx. yield in 10 m furrows
Between plants	Between furrows				
30 - 45	50 - 80	35 - 40 plants	70 - 110	firm well developed fruit	8 - 10 kg.
5- 10 (shrubby) 15 - 40 branch	50 - 70 70 - 90	80 60	55- 80	when the seed is one fourth of its ripened size	5 - 7 kg 7 - 10 kg
10- 15	30 - 70	70 - 100 plants 2 - 3 broadcast	130 - 150	5 cm. width at the base of the plant	10 - 12 kg.
2,5 - 5	25 - 45	3 - 4	20 - 40	2 cm. wide roots	5 - 8 kg.
5 - 8	45 - 70	6 - 8	65 - 100	6 cm. wide roots colored	15 - 20 kg.
15 - 20	60 - 90	60	60 - 80	full pods - seed somewhat immature	10 - 15 kg green
40 - 45	50 - 80	20 - 25 plants	70 - 120	well packed heads	20 - 25 heads
100 - 150	175 - 300	5 - 6	90 - 100	the part touching the soil turns from white to yellow	20 - 30 watermelon

Vegetable	Type	Nutritional value (vitamins)	Root depth	planting system and depth in cm.
Green Peppers	Vegetable	A and C	Medium	1,5 - 2,0 seedling
Green beans, string beans, kidney beans, Leeks	Leguminous vegetable	A and C proteins	Medium	3,0 - 5,0 drilling
Leeks	Bulb	C	shallow	1,5 - 2,0 broadcast thinning seedling
Radishes	Root	C minerals	shallow	1,0 - 1,5 broadcast thinning
Beetroot, Beets	Root	minerals	Medium	2,0 - 3,0 broadcast thinning
Lima Beans	Leguminous vegetable	A and C proteins	deep	3,0 - 5,0 drilling

Vegetable	Type	Nutritional value (vitamins)	Root depth	planting system and depth in cm.
Sweet corn	Vegetable	A (yellow) carbohydrates	shallow	4,0 drilling*
Melon	Fruit	A and C	medium	3,0 - 4,0 drilling*
Turnip	Root	C	medium	1,0 - 1,5 broadcast thinning
Oregano	Leaf perennial 5-6 years	herb	shallow	stem cutting transplant
Potato	Stem tuber	C-carbohydrates minerals	shallow	8,0 - 10,0 drilling, seed pieces
Cucumber	vegetable	C	medium	3,0 drilling
Parsley	Leaf	herb	shallow	1,5 -2,0 broadcast thinning

Spacing (cm.) after thinning or transplanting		Seeds in 10 m furrows	Days to maturity	When to harvest	Approx. yield in 10 m furrows
Between plants	Between furrows				
20 - 30	60 - 70	15 - 20	60 - 90	Full tender kernels - cobs	40 - 50
50 - 120	120 - 200	5	80 - 100	When they are separated from the stalk - or turn yellow in color	15 - 50 melons
10- 15	30 - 60	2 - 3	60 - 75	2.5 cm. wide roots	50 - 100 roots
20 - 30	40 - 80	30 - 40 Plants	90 - 180	harvest well developed leaves	2 to 3 leaves are enough per family
15 - 30	60 - 80	1.5 to 2.0 kg of seed tuber	90 - 120	drying yellow plants	15 - 25 kg
80 - 100	100 - 150	3 - 4	50 - 70	when the seeds are half the size of ripe ones	8 - 10 kg.
10 - 20	40 - 60	3 - 4	100	as needed cut larger leaves	50 - 100 plants

Vegetable	Type	Nutritional value (vitamins)	Root depth	planting system and depth in cm.
Hot peppers	Vegetable	A and C	medium	1,5 - 2,0 seedling
Garlic	Bulb	carbohydrates	shallow	bulbs drilling
Celery	Leaf (petioles)	minerals	shallow	0,5-1,0 seedling
Peas	Leguminous vegetable	A and C proteins	medium	3,0 broadcast with or without thinning
Eggplant	Seedling vegetable	A	medium	1,5 - 2,0 seedlings
Broccoli	Flowering vegetable	A and C minerals	shallow	1,0 - 1,5 seedling
Sweet potato, yams	Root	A carbohydrates	deep	15,0 - buried or cuttings or tuber sprouts

Spacing (cm.) after thinning or transplanting		Seeds in 10 m furrows	Days to maturity	When to harvest	Approx. yield in 10 m furrows
Between plants	Between furrows				
25 - 30	80 - 90 Plants	35 - 40	90 - 100	mature plants sun dried fruits	3 - 5 kilos
5 - 10	45 - 60	140 - 200 bulbs	135 - 210	plants turn yellow and dry	4 - 6 kilos
25 - 30	45 - 80	35 - 40 Plants	110 - 150	well developed petioles	30 - 40 plants
3 - 10	45 - 60	100 - 200	60 - 70	Full pods somewhat immature seeds	4 - 7 kilo green
30 - 60	70 - 90	17 - 35 Plants	80 - 120	well developed vegetable before it turns dull	10 - 12 kilos
40 - 50	45 - 80	20 - 25 Plants	80 - 150	first harvest green firm heads	20 - 25 plants
30	90	300 g. of cuttings	130 - 150	in fall before	15 - 20

Vegetable	Type	Nutritional value (vitamins)	Root depth	planting system and depth in cm.
Onion	Bulb leaves (green)	green: A and C and minerals bulb: carbohydrates	shallow	1,5 - 2,0 seedling
Cauliflower	Flowering vegetable	C minerals	shallow	1,0 - 1,5 seedling
Spinach	Leaf	A and C minerals	shallow	2,0 - 3,0 broadcast with thinning or seedling
Snap Beans, French Beans	Leguminous vegetable	A and C proteins	medium	5, 0 a drilling
Lettuce	Leaf	A and C minerals	shallow	1,0 - 1,5 broadcast relay or thinning

Spacing (cm.) after thinning or transplanting		Seeds in 10 m furrows	Days to maturity	When to harvest	Approx. yield in 10 m furrows
Between plants	Between furrows				
5 - 10	45 - 70	100 - 200 Plants	135- 180 bulbs 80 - 60 turn green	bulb: plants turn yellow and dry - turn green; well developed leaves	15 - 20 bulbs (Kg.)
40 - 50	45 - 80	20 - 25 plants	80 - 150	very firm and white heads	20 - 25 heads
20 - 25	45 - 60	4 - 6 a Broadcast 40 - 50 plants	60 - 90	fully grown leaves - harvest outer leaves or the whole plant	40 - 50 plants
15 - 30	45 - 70	100 - 200	70 - 120	Full pods - seeds somewhat immature grain	18 - 20 kilos green
25 - 30	45 - 60	3 - 5 Broadcast 40 - 50 plants	60 - 100	fully grown leaves - harvest the whole plan	30 - 40 plants