Natural Resources Conservation and Development III

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Curriculum

Unit of Competence: Promote Nutrition Sensitive Agriculture

Module Title: Promoting Nutrition Sensitive Agriculture

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East Africa Skills for Transformation and Regional Integration Project (EASTRIP)

Contents

LG #109	LO1. Promote safe handling of agricultural food products

This learning guide is developed to provide you the necessary information regarding the following content

- Identifying pre-harvesting activities
- Identifying postharvest nutritional losses
- Basic principles of postharvest handling
- Post harvest handling, process and preservation

This learning guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify pre-harvesting activities
- Identify postharvest nutritional losses
- Basic principles of postharvest handling
- Post harvest handle, process and preservation

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks)

Information Sheet-1	Id identifying the impact of pre-harvest activities on nutritional quality of products

1.1 Introduction

Definition and concept

Nutrition sensitive agriculture is an approach that seeks to maximize agriculture's contribution to nutrition by focusing on the production of nutritious foods, and entails targeting poor households, promoting gender equality, and providing nutrition education so that household resources are used to improve household members especially that of women and young children. Nutrition: The science of food and the nutrients and their body function and interaction with health. Whereby cellular organelles, cells, tissues, organs, systems, and the body as a whole obtain and use necessary substances obtained from foods (nutrients) to maintain structural and functional integrity. It is a complex, multifaceted scientific domain indicating how substances in foods provide essential nourishment (diet) for the maintenance of life. Optimal, balanced nutrition is a major determinant of health. It can be used to promote health and well-being, to prevent ill health and to treat disease.

1.1.1 Pre harvest activities.

Pre harvest activities have impact on nutritional quality of agricultural products. Where is the beginning of practices carried out during production? These activities that can affect the postharvest shelf life plant seed and trees are.

- Land preparation
- Fertilizer application
- Pest and disease management
- Proper feed and feeding,
- Health care

1.1.2 Land preparation

Among the objectives of site preparation are to remove competing vegetation from the site. Create conditions that will enable the soil to catch and absorb as much rainfall as possible. Provide good rooting conditions for the planting, including a sufficient volume of root able soil. Hardpans must be eliminated. Create conditions where danger from fire and pests is minimized.

Site preparation is directed toward giving the seedlings a good start with rapid early growth. In general, the methods used to achieve site preparation will vary with the type of vegetation, amount and distribution of rainfall, presence or absence of impermeable layers in the soil, the need for protection from desiccating winds, and scale of the planting operations. Additionally, the value of the crop to be grown is important in determining the amount of expense that may be justified in plantation establishment.

Methods of site preparation. In general, land or site preparation can be manual or mechanical preparation.

Manual Preparation is cultivate the soil and open up a good sized slot in the soil with the blade of the spade. This allows the seedling roots to spread more naturally. A narrower V-shaped slit will sweep up roots as the seedling goes in, leading to lop- sided root development and risk of toppling the seedling by wind. Place the seedling or vegetative seeds in the opened slot. Replace the soil around the roots- the seedling is pulled upwards, about 50–100 mm, to straighten any roots that may be twisted or swept up. Using the sole of the boot, not the heel, the soil is firmed around the seedling. Planters use the same technique for each seedling to ensure uniformity throughout a stand. .

Mechanical preparation several types of mechanical crop planters are in use: example; continuous furrow planters. Preparation of the site by hand is possible and economical only for relatively small-scale projects, where the labor of clearing the competing vegetation and working the soil is not too time-consuming. Under certain conditions, animal-drawn ploughs and harrows can also be economical for small-scale operations. Mechanical soil preparation, used increasingly in large-scale planting

programs, has become a common practice in will dry out the soil completely. many areas; often, this is because the supply of labor and the time available for ground preparation are too limited to permit large-scale projects to be undertaken by hand. Some operations, such as deep sub soiling and the breaking up of hardpans can only were done by machines. Whatever method of site preparation is used, a planting pit (of an appropriate size) should be prepared. The objective of creating planting pits is to aerate and loosen the soil in which the plants will grow. When these planting pits are prepared, they should not be left empty with the excavated soil lying on the ground, but refilled immediately; otherwise sun and wind

Soil preparation can be carried out in patches, strips, or by complete cultivation. complete cultivation is necessary for fruit species which are intolerant of competition from grass, forte, and woody growth hand planting methods fall into two general groups-whole and slit methods. whole planting can be done with a mattock, hoe or shovel. It is particularly adapted to rough, rocky land, plants with large, spreading root systems, finer textured (clay) soils and for inter planting in previously planted areas. Slit planting is much faster than hole planting and is especially adapted for tap-rooted species and use on coarse (sandy) and medium textured loam and silt loam soils.

1.2 fertilizer application

Consumers have become increasingly concerned about the quality of the food products the impact of plant nutrition on the quality of fruits produced. The quality traits required or purpose for which the crop is grown will help in selecting not only the type of fertilizer but the quantity used during production. For instance, an adequate supply of potassium fertilizer in tomato production improves fruit color and reduces the incidence of yellow shoulder fine hilts.

Insufficient supply of potassium in root and tuber plant production can also result in ripening disorders unlike potassium, an increase in nitrogen supply to greenhouse-grown plants, beyond a certain threshold level, may reduce fruit quality by decreasing the sugar content of the fruits High nitrogen supply of about 250 kg/ha can impair some

important quality traits of fruits, such as total soluble solids glucose, fructose, and pH Supply of reduced forms of nitrogen, such as ammonium, can result in improved fruit flavors .for trace elements use, the quality of crop fruit is affected predominantly by the amount of boron used, although other micronutrients may affect fruit quality only when the plants show severe however, the variation of phosphorus supply in soils for growing crops does not significantly influence quality traits such as the total soluble solids pH, acidity of the fruit characteristics

1.3 Pest and disease management

To grow your seedlings and plant them out. The last thing you want is to lose them to pesky pests and diseases. The best way to control pests and disease is to prevent attack. If your seedlings and plants vegetative have already been attacked, doesn't despair find out what pest is damaging them and gets rid of it? Animal pests a big risk is from farm and domestic animals, but a good fence will keep them out. (And consider growing a living fence—smart in the long run.) Smaller creatures like insects. Nematodes and rodents are harder to deal with. Insects that can cause damage in plant nurseries include grasshoppers and crickets (both eat young seedlings); caterpillars (especially cutworm, which cuts seedlings just above the soil while feeding); scale insects and mealy bugs, which weaken seedlings by sucking the sap; termites, which damage pots and disrupt the soil in them; and ants, which attract scales and mealy bugs, and harvester ants may carry away seeds. Some insects attack only specific plant species, like beetles, cypress aphids and nematodes are tiny worms that attack roots and cause swellings. Severe infection can stunt or even kill seedlings, cause chlorates (discoloration of the leaves) and wilting

How to control insects

Keep the area around your seedbed clear of other vegetation that offers the insect pests food and shelter. Plant nursery protected by chili plants to keep insect pests away. Grasshoppers are among the most destructive insect pests. Grow insect-repelling plants like pyrethrum, garlic, chilies and marigolds around the beds. Next, try to get clear of the insects without resorting to pesticides. Destroy the nests and queens of termites and

ants and pick insects off seedlings when you see them. If you find seedlings whose stems have been cut, look for grey or brown

Cutworms 1–2 cm long, in the soil beneath. Pick them out by hand and destroy them.

Spray seedlings infected with scale insects and mealy bugs with water in

Which you have steeped tobacco or garlic, or with a soap and water mix.

Many natural predators in the plant site help control pests. Spiders, lizards, snakes and frogs are among the many natural helpers that can control pest problems. Before killing any animal, first consider what it eats! If you have to use an insecticide, do not handle it yourself. Read the box carefully for instructions.

- Other animals.

Rats and mice can get through fencing and eat seeds or young seedlings. Place your seedbeds and pots away from stone walls and rubbish heaps, and keep the area around them clean. Don't leave food scraps lying around. Cats can control the rodent population. If you can afford it, build a frame over your seedbed and pots and cover it with mesh. If you need to poison rodents, have an adult handle the poison. Place bait where only rodents can reach it. Birds that don't damage seedlings but eat insects that attack them are useful. But other types of birds may eat the seeds or seedlings.

- Diseases

Seeds infected by pathogens that cause disease—tiny organisms such as bacteria, viruses and fungi produce fewer seedlings. And crop Infected seedlings may not reach the planting-out stage

- Fungi.

Even in dry climates, nurseries provide the warm, moist conditions that fungi like. Symptoms of fungal disease include choleras and stunted growth. Common fungal diseases.

- Damping-off

Which affects germinating seeds and young seedlings in the first 2–3 weeks after germination one type kills the seedling before it has emerged from the soil or the seed. Another type causes the stem of the young seedling to rot just above soil level. Primary school children in Tanzania inspect their seedlings for signs of disease.

• Root and stem rot.

Many fungi attack the fine roots of young seedlings. Damping-off can lead to root rot. Once the rot spreads to the stem, the seedling dies.

- Shoot diseases.

Wet conditions encourage spores to germinate and enter the seedlings. Leaf spot disease causes seedlings to shed leaves. Powdery mildew covers the leaves in powdery, white spores and weakens the plant.

- To avoid and control fungus
- ✓ Do not over water
- ✓ Space seedlings well—crowded seedlings increase dampness and warmth.
- ✓ Give the seedlings no more than 50% shade.
- ✓ Use light, well-drained soil mix.
- ✓ Be careful when transplanting young seedlings. If the stem is even slightly damaged it is more likely to get infected.
- ✓ Remove and burn any diseased seedlings.
- ✓ Controlling diseases
- Here are 3 basic steps:
- ✓ Keep your plant and vegetable sites free of pathogens Prepare clean seeds from reliable sources.
- ✓ Avoid conditions that encourage disease to develop if pathogens are present.
- ✓ Use chemical pesticides.

Sometimes plants may appear infected with a disease when they are in poor health for other reasons:

Long, thin stems and pale leaves (retaliation)—too much shade

Discoloration of leaves (choleras) and leaf deformity—nutrient deficiency or waterlogged soil. Twisted or deformed shoots— nutrient deficiency or careless herbicide spraying

Sunscald (grey blotches)—sudden strong sunshine when shade is removed too quickly

Frost damage—sudden cold weather even if above freezing; plants may recover when temperature rises. Be careful not to overwater your seedlings because this can cause fungal disease.

1.4. Maintaining appropriate stage of maturity in plant

The principles at which stage of maturity a fruit or vegetable should be harvested are crucial to its subsequent storage and marketable life and quality. Post-harvest physiologists distinguish three stages in the life span of fruits and vegetables: maturation, ripening, and senescence. Maturation is indicative of the fruit being ready for harvest. At this point, the edible part of the fruit or vegetable is fully developed in size, although it may not be ready for immediate consumption. Ripening follows or overlaps maturation, rendering the produce edible, as indicated by taste. Senescence is the last stage, characterized by natural degradation of the fruit or vegetable, as in loss of texture, flavor, etc. (senescence ends at the death of the tissue of the fruit). Some

Skin color

This factor is commonly applied to fruits, since skin color changes as fruit ripens or matures. Some fruits exhibit no perceptible cooler change during maturation, depending on the type of fruit or vegetable. Assessment of harvest maturity by skin color depends on the judgment of the harvester, but color charts are available for cultivars, such as apples, tomatoes, peaches, chili peppers, etc.

- Optical visual methods:

Light transmission properties can be used to measure the degree of maturity of fruits. These methods are based on the chlorophyll content of the fruit, which is reduced during maturation. The fruit is exposed to a bright light, which is then switched off so that the fruit is in total darkness. Next, a sensor measures the amount of light emitted from the fruit, which is proportional to its chlorophyll content and thus its maturity.

- Shape

The shape of fruit can change during maturation and can be used as a characteristic to determine harvest maturity. For instance, a banana becomes more rounded in cross-sections and less angular as it develops on the plant. Mangoes also change shape during maturation. As the mango matures on the tree the relationship between the shoulders of the fruit and the point at which the stalk is attached may change. The shoulders of immature mangoes slope away from the fruit stalk; however, on more mature mangoes the shoulders become level with the point of attachment, and with even more maturity the shoulders may be raised above this point.

- Size:

Changes in the size of a crop while growing are normally used to determine the time of harvest. For example, partially mature cobs of are marketed as sweet corn, while even less mature and thus smaller cobs are marketed. For bananas, the width of individual fingers can be used to determine harvest maturity.

Usually a finger is placed midway along the bunch and its maximum width is measured with calipers; this is referred to as the caliper grade's fruits synthesize volatile chemicals as they ripen. Such chemicals give fruit its characteristic smell and can be used to determine whether it is ripe or not. These doors may only be measurable by humans when a fruit is completely ripe, and therefore has limited use in commercial situations.

- Fruit opening:

Some fruits may develop toxic compounds during ripening, such as coke tree fruit, which contains toxic levels of hypoglycemia. The fruit splits when it is fully mature, revealing black seeds on yellow arils. At this stage, it has been shown to contain minimal amounts of hypoglycemia or none at all. This creates a problem in marketing; because the fruit is so mature, it will have a very short post-harvest of maturity, little health hazard, provided the seed and membrane portions are removed.

- Leaf changes:

Leaf quality often determines when fruits and vegetables should be harvested. In root crops, the condition of the leaves can likewise indicate the condition of the crop below ground. For example, if potatoes are to be stored, then the optimum harvest time is soon after the leaves and stems have died. If harvested earlier, the skins will be less resistant to harvesting and handling damage and more prone to storage diseases.

- Firmness:

. Two commonly used pressure testers to measure the firmness of fruits and vegetables. . It is necessary to specify the instrument and all settings used when reporting test pressure values or attempting to set standards. A fruit may change in texture during maturation, especially during ripening when it may become rapidly softer.

Excessive loss of moisture may also affect the texture of crops. These textural changes are detected by touch, and the harvester may simply be able to gently squeeze the fruit and judge whether the crop can be harvested. Today sophisticated devices have been developed to measure texture in fruits and vegetables, for example, texture analyzers and pressure testers; they are currently available for fruits and vegetables in various forms. A force is applied to the surface of the fruit, allowing the probe of the penetrate meter or texture meter to penetrate the fruit flesh, which then gives a reading on firmness. Hand held pressure testers could give variable results because the basis on which they are used to measure firmness is affected by the angle at which the force is applied

1.4.1. Proper feed and feeding

In animals management like the quantity and quality of the feed and water provided to animals largely determine the health and productivity of animals that are to produce safe and quality milk, meat and egg. With this end, this part of the module details a set of good farming practice, and covering the key aspects of animal nutrition, health care, welfare, milk hygiene, and the environment for sustainable farming of animal production mainstream to promote agricultural sensitive nutrition.

Secure Feed and Water Supplies from Sustainable Sources Plan ahead to ensure that the herd's feed and water requirements are met. Budgeting the herd's feed and water requirements in advance reduces risk and may help the dairy farmer identify less expensive sources of feed.

1.4.2. Ensure Animal Feed and Water is of Suitable Quantity and Quality

Dairy animals should be provided with sufficient feed and water daily, according to their physiological needs. The quality and quantity of the feed, including appropriate fiber, should reflect the animal's age, body weight, stage of lactation, production level, growth, pregnancy, activity and climate. Sufficient space and time needs to be given for each animal to get access to feed and water. Good feeding management will reduce competitive pressure and diminish aggressive behaviors between individual animals.

1.4.3 Control Storage Conditions of Feed

Separate feeds intended for different species. National regulations must be observed such that no prohibited animal material is included in animal feed rations. Ensure appropriate storage conditions to avoid feed spoilage or contamination. Ensure animals are not come into contact with contaminants in areas where these products are stored and mixed

1.5. Ensure the Traceability of Feedstuffs Brought on to the Farm

Where possible, source animal feed from suppliers having an approved quality assurance program in place. If you buy in feed, ensure the feed supplier has an assurance program in place, can monitor appropriate residues and diseases and can trace the ingredients used back to their source. Ask for a relevant vendor declaration

1.5.1 Health Care of Food Animal

Under this section we will discuss about good farming practices to ensure that animals produce milk, meat, and eggs, are healthy and there is an effective health care program in place. However, not all of the practices are applicable in all circumstances and may

be superseded by national, international or market demands. The suggested good dairy farming practices for animal health are set out under the following headings:

- Establish the herd with resistance to disease.
- Prevent entry of disease onto the farm.
- Have an effective herd health management program in place.
- Use all chemicals and veterinary medicines as directed.

1.5.2. Ensure Animals can engage in Relatively Normal Patterns of Animal Behavior

Have herd management and husbandry procedures that do not unnecessarily compromise the animals' resting and social behaviors*:* Most dairy species are gregarious animals. Use herd management and husbandry procedures that do not unnecessarily compromise their natural behaviors, for example herding, feeding, reproductive and resting behaviors. This also means sufficient space should be provided for these activities.

During the daily inspection(s) of animals, check for any abnormal behavior. Ensure each animal has adequate space to feed appropriately and actually is feeding. Failure by an animal to feed may be an early indication of illness. Mature and intact males should be managed and handled in a manner that promotes good temperament. Resting the animals to be destined to the sites of slaughter. Animals on arrival at the slaughter house, should be adequately rested, fed, and watered. Meat animal must be provided with adequate resting while they are on the journey, for the following purpose:

- To enable animals to regain the depleted glycogen
- To improve the keeping quality of meat
- To prolong the shelf-life of meat by producing large quantity of lactic-acid

Without providing the animal with the period of resting, the keeping quality of meat may become lowered due to incomplete lactic-acid development in the muscle. The presence of lactic-acid in the carcass in adequate amount helps to prolong the shelf-life (keeping stability) of meat without nutritional deterioration. Proper animals resting being after their arrival to the site of slaughter (abattoir) will help to:

- good bleeding,

- reduce an entry of bacteria to the carcass (muscle),
- replenish the depleted glycogen,
- lowers the rate of contamination,

Hand washing facilities

Chilling and freezing room (shall have proper insulation of wall and ceiling, fitted with a tune control device, and its doors shall be closed immediately with overhead rails present, Personnel facilities, toilets, hand-washing facilities, urinals, showers, wardrobe, cafeteria, first-aid clinic, personal protective equipment (PPEs),

personnel should wash their hands frequently; keep their gloves always clean, avoid bad behavior (smoking, eating, sneezing, cover cut wounds, undergo medical check-up every year to find-out any communicable diseases they harbor. Equipment should have impervious surfaces and smooth, resistance to corrosion, free from pits and carcasses, not affected by disinfectants.

Vehicles: internal furnishes are made out of corrosion resistant materials, smooth impervious, and easy to clean.

Cleaning and disinfection:

Cleaning is effected at frequent internals during and/or between periods of work and at the end of the work, and assign responsible person, take precautions that meat doesn't come in-contact with disinfectant

Pest control:

- Apply the practices mentioned above as good farming practices.
- Make sure that chemicals used to do not contaminate meat,
- Use only those pesticides approved by controlling authorities,
- Apply pesticides only when there are no other options,

1.6.2 Nutritional quality

In its broadest definition the nutritional value of a foodstuff should also include consideration of the sensory properties of the product and the inherent biological or health value of produce including the ratio of beneficial to harmful substances, taste, and

fragrance. Nutritive value as part of food quality is the measure of a well-balanced ratio of the essential nutrients carbohydrates, fat, protein, minerals, and vitamins in items of food or diet concerning the nutrient requirements of their consumer. **Wikipedia**

Figuer1: Basics of Human Nutrition

Food - Any product obtained from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues. Includes all foods and drinks acceptable to be ingested by a certain society.

Diet- is defined as the sequence of meals in a day. It is concerned with the eating patterns of individuals or a group. Egg: breakfast and dinner; breakfast, lunch, and dinner; and other may add snack

Balanced Diet: is a diet that contains all the nutrients in the proportion that is optimal for long-term health and survival. Chemical substances that is essential to life which must be supplied by food to yield energy and nutrients for the maintenance of life and the growth and repair of tissues.

Nutrients. Chemical substances those are essential to life which must be supplied by food to yield energy and nutrients for the maintenance of life and the growth and repair of tissues. Its functions, actions, interactions and balance in relation to health and disease.

Nutritional requirement: refers to the different nutrients required by the body for energy, growth and repair, as well as protection from disease. It differs according to age, gender, physical activity, height, weight, and health status of the individual.

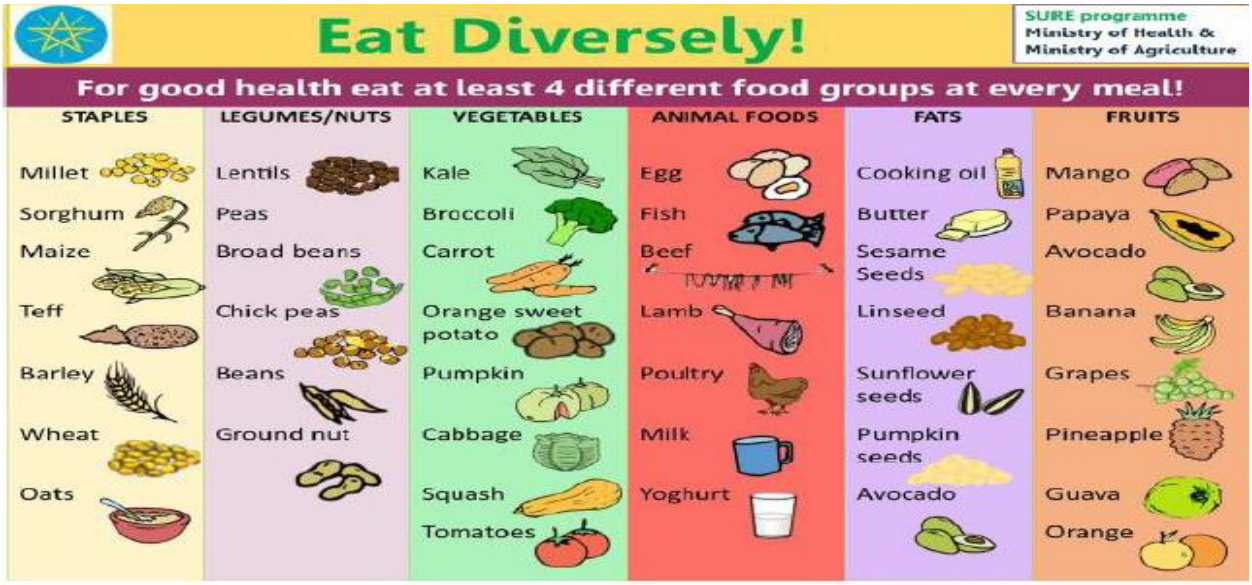


Figure 2: Food Groups and their Sources

For good health eat at list 4 different food gropes at every meal. Those are Staples, Legumes, Vegetable, fat, animal food and fruit.

Difference between food security and nutrition security (World Food Summit, 1996).

Food security		Nutritional security
Availability		Consumption of balanced diet to attain adequate nutritional status for
Access		
Utilization		
Sustainability		
FS - Can be achieved by narrowing the gap b/n current & potential production yields	NS – can be achieved by narrowing ‘nutrient gap’ - current food intake pattern and optimal intake in terms of macro & micro nutrient content ‘nutrient gap’ - current food intake pattern and optimal intake in terms	

	of macro & micro nutrient content	
F & N availability	F & N Access	F& N Utilization
Food production Storage Processing Transport Nutrition Sensitive interventions	Intra-household distribution Income Market Impact on gender Entitlements etc	Food Preparation Nutrition Knowledge Cultural tradition Gender role Child care Health care and WASH

- benefit of nutrition Sensitive Interventions. Agriculture and food security
  - ✓ Social safety nets
  - ✓ Early child development; maternal mental health
  - ✓ Women's empowerment; child protection; schooling
  - ✓ Water, sanitation, and hygiene
  - ✓ Health and family planning services

- Based on function and source there are six different types of nutrients
  - ✓ Carbohydrates are what our body burns most often for fuel, much like firewood: Cereal, grains, legumes, fruits and vegetables are the main source of carbohydrates.
  - ✓ Proteins - are the building blocks of the body tissue, and can also serve as a fuel source: meat, egg, poultry, milk, fish and legumes are main source of protein
  - ✓ Fats - are also burned for energy and they give more fuel and are easy for our bodies to store for later use: Fish, butter, beef, egg, pork, milk, fruits such as avocado, nuts and soybeans are good source of fat
  - ✓ Vitamins – are essential for normal growth and health: most vegetables and fruits are goo
  - ✓ **Minerals –** are nutrients that are important for normal body growth and health. Iron (Fe), Iodine (I), Zinc (Zn), Calcium (Ca) and Prosperous (P) are some examples of minerals

- ✓ Water - is needed for most body functions, including maintenance of health and integrity of every cell in the body.

Poor food quality and safety conditions In most cases, this is a challenge that farmers could ignore from earlier on in the production process. It comes in many ways, including pesticide use, contaminants, pathogenic infections, nutritional deficiencies among others. Some of these issues despite being avoidable, some producers and farmers ignore them only to realize a loss when their produce is in the market or ready for export and get rejected. Some of them like contaminants like biological toxins can occur in storage facilities and during food handling processes. This problem could result in a huge economic waste although the right measures can prevent it. for foods of agriculture in general and those of animal origin in particular, is required to satisfy the consumers interest in terms of nutritional safety and to extend its shelf-life and storage stability. For instance; milk quality attributes include: (1) compositional quality (nutrients density such as milk sugar/lactose, casein protein, fat, vitamins & minerals, and water); (2) organ elliptic or sensory quality (flavor, color, appearance, consistency and texture); (3) physic-chemical quality “amount of the milk specific gravity or specific density, butter fat and fatty acids in milk, pH value and nutritional quality that seeks to ensure the production of a variety of nutritious, affordable

Levels of individual nutrient in the diet culturally appropriate and safe foods in adequate quantity and quality to meet the dietary requirements of populations in a sustainable manner. By;

- Diversified food production
- Integrated farming systems
- Home gardening
- Bio-fortification and food safety
- Women empowerment and Income generation
- Agricultural market linkages
- Nutrition education and behavior change communication
- Appropriate levels of individual nutrient in the diet,

Bio availability of nutrient

Is defined as the fraction of a nutrient in a food cellulose helped increase nutritional value of dietary grains in animals the proportion of the nutrient that is digested, absorbed and metabolized through normal pathways. Consequently, it is not enough to know how much of a nutrient is present in a dietary supplement; the more important issue is how much of that present is bio available. A common belief regarding bioavailability of dietary supplements is that they have to be in solution to be absorbed in the body Requirement for identity, strength, quality, purity and potency.

It is important that the nutrient or bioactive ingredient contained in a dietary supplement is present in an absorbable form. Whether it is metabolized depends on an individual condition. is the proportion of a nutrient capable of being absorbed and available for use or storage" (Fair-weather) To meet this dietary supplement must undergo in vitro test requirements for disintegration and dissolution absorbability alone, can be measured by various *in vitro* methods. Advantages in that they are less expensive. In the case of iron, for example, cellular synthesis of ferreting, an iron storage protein, has been used. Similar applications of this *in vitro* technique are now Dietary Intake and have been identified to affect vitamin C requirement. These include bioavailability, nutrient-to-nutrient interactions, and gender. There are various dietary guidelines available from diverse professional bodies pertaining to vitamin C intake recommendation. An iron storage protein has been used. Similar applications of this in *vitro* technique are now Dietary Intake and have been identified to affect vitamin C requirement. These include bioavailability, nutrient-to-nutrient interactions, and gender.

Age group	Gender	
	Male (mg day^{-1})	Female (mg day^{-1})
0–6 months	40	50
7-12 months	50	50
1-3	15	15

4-8	25	25
9-13	45	45
14-18	75	65
>19	90	75
Pregnancy/lactases 14-18 year and >19	80/115	80/120
Smoker	Additional 35mg/day	

Table 3. Dietary reference intake for vitamin C

For age group of 0-12 months, DRI was calculated based on adequate intake (AI) while the rest of the age groups based on dietary recommendation allowance (DRA)

- ✓ Food digestion

Is the process which releases many nutrients in the forms in which the body can use by breaking up food in the intestinal tract? Digestion is the chemical breakdown of the ingested food into absorbable molecules Occurs when food is moved through the digestive system. It begins in the mouth and ends in the small intestine. The final products of digestion are absorbed from the digestive tract, primarily in the small intestine

- ✓ Food absorption

Is the process which carries these nutrients into the circulation system and delivers them to the cells? Utilization – cell is the important unit of life and the movement of nutrients, water and electrolytes from the lumen of the small intestine into the cell, then into the blood.

- ✓ Food utilization

Is defined by USAID as: “[f]food is properly used; proper food processing and storage techniques are employed; adequate knowledge of nutrition and child care techniques exists and is applied; and adequate health and sanitation services exist.”[1] Utilization is often used interchangeably with nutrition, yet while utilization focuses on nutrition; it also includes also food storage, processing, health and sanitation as they relate to nutrition.

Food safety problems can occur in all types’ foods along the food value chain. A safe and nutritious food supply is a vital component of food security. By good agricultural Practices to ensure environmental, economic and social sustainability for on farm production (and post-production processes) resulting safe and quality food (FAO

Are estimated at $20-30 billion per year [3], caused primarily by lowered productivity and cognitive capacity and increased health care costs. There is ample evidence that although economic and agricultural growth is necessary to achieve sustained reductions in malnutrition, they do not fully address malnutrition.[4] There is more evidence that they can generate improvements in caloric intake than dietary diversity[5] Some value chain programs have attempted to improve food utilization and achieve nutritional gains, mostly by targeting agriculture value chains and agricultural productivity is a fundamental factor towards food security, and for the farmer, it also dictates profitability

Poor food quality and safety conditions

In most cases, this is a challenge that farmers could ignore from earlier on in the production process. It comes in many ways, including pesticide use, contaminants, pathogenic infections, nutritional deficiencies among others. Some of these issues despite being avoidable, some producers and farmers ignore them only to realize a loss when their produce is in the market or ready for export and get rejected. Some of them like contaminants like biological toxins can occur in storage facilities and during food handling processes. This problem could result in a huge economic waste although the right measures can prevent.

Fguer4: Poor food quality and safety conditions

To maintain the best food quality and assure safety of the production, into the market, farmers should ensure appropriate quality measures by analyzing the soil just before planting to continuously repeated lab analyses during the production process to ensure corrective measure in case of any undesired results. Just before getting the products into the market, the same should be done with the aim of ensuring healthy produce into the market. This is our expertise we invite you to be partners in the process of ensuring the quality of your produce. Feel free to reach out to us at info@tsigroup.org, profit margins for farmers, export conditions and consequences for a country among many others. Ensuring success at this stage of production should be easy if well considered.

Self-check 1	Written test

Test I: Choose the best answer (3 point)

1. From the following one is to identify stage maturity time of fruits?

A. Fruit color B. Sustainability

C. size D A and C

Test II: Short Answer Questions

1. List activities that can affect the postharvest shelf life?
2. What the major cause of loose after harvesting?
3. Define and discuses nutrition sensitive agriculture?

You can ask you teacher for the copy of the correct answers.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Answer Sheet

Score _____

Rating: _____

Name: _____ Date: _____

Information sheet 2. Identifying causes and effects of postharvest nutritional losses

2.1 Causes of Postharvest Nutritional Losses

Postharvest nutritionals losses any change in the quantity or quality of a product after harvest that prevents or alters its intended use or decrease its value. Loss in the agricultural foods is mainly caused by food spoilage, food decomposition, food pollution, and food intoxication as a consequence of the food contaminated with biological, chemical and physical agents. These causes are resulted any change in the quantity or quality of a product after harvest that prevents or alters its intended use or decrease its value by lack/limited, and/or improper postharvest activities or techniques.

Postharvest agricultural activities undertaken to produce safe and quality agricultural foods are generalized as food hygiene practices (WHO, 1987; FAO, 2011). According to the same study, Food hygiene practices employed in an agricultural food production area mainly with objectives to: Prevent and control of food wastage, Prevent and control of food spoilage, protect food from adulteration, protect food from contamination with various contaminants and pathogens, Improve the sensory quality of food, Prevent and control of food-borne diseases, and ensure fair practices in the food trade. Manage from the field and continues until it reaches the final consumer. The nutritional loss resulted by inappropriate:

2.2 Effects of nutritional losses

Food contamination

Food contamination is the practices of making the food impure, unclean, or polluted by making harmful impurities into it or by putting it into contact with something harmful. In food hygiene, contamination is defined as the processes whereby foods become unsafe to use because of food contact with M/Os, chemicals, or other physical contaminants.

It is very important to know which organisms are associated with a particular food in its natural state and which of the organisms are present. Some of the important genera known to occur in foods are:

Bacteria: Acinetobacter, Aeromonas, Alcaligenes, Alteromonas, Enterobacter, Escherchia, Protems, Pseudomonas, Bacillus, Campylobacter, Citrobacter, Clostridium, Corynebacterium, Enterococcus, Lactobacillus, Lactococcus, Leucomostoc, Listeria, Miccrococcus, Salmonella, Shigela, Staphylococcus, Vibrio, and Yersinia.

Molds: Aspergillums, Aureobasidium, Fusarium, Monilia, Penicilium, Rhizopus, Trichothecium, and Keromyces.

Yeasts: Candida, Cryptococcus, Debaryomyces, Saccharomyces, And Trichosporon.

Protozoa: Cryptosporidium, Parvum, Entamoeba histoletica, Giardia lamblia, and Toxoplasma gondii.Some are desirable in certain foods; others bring about spoilage or causes of gastroenteritis. These are the most important normally found in food products. Each genera has its own nutritional requirements and affect in its ways.

2.3 Various sources of food contamination

Various Environmental sources of organisms to foods are:

Soil and water. Organisms may enter the atmosphere by the action of wind and later enter water bodies when it rains.

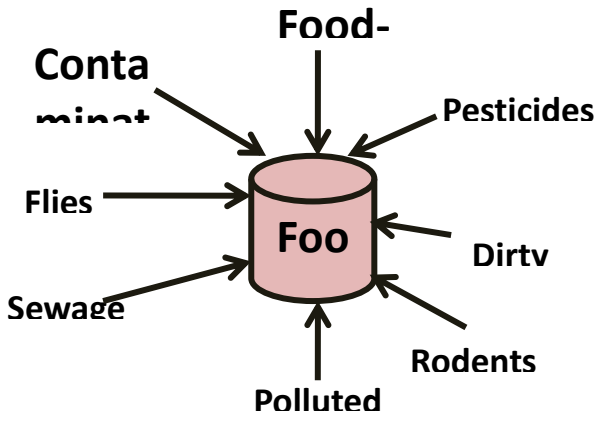
Plant and plant products it is assumed that most soil and water organisms contaminate plants. However, those that persist on plant products by virtue of a capacity to adhere to plant surfaces and they are not easily washed away to obtain their nutritional requirements. Notably, among these are the lactic acid bacteria and some yeast.

Food utensil. The cutting block in a meat market along with knives and grinders are contaminated from initial samples, and this processes leads to build-up organisms, thus ensuring a fairly constant level of contamination of meat-borne organism’s Intestinal tract of human & animals. These floras become a water source when

Intestinal tract of human & animal. These floras become a water source when polluted water is used to wash raw food products. These are consisting of many organisms that do not persist as long in waters as do others, and notably these are pathogens such as Salmonella food handlers. Micro-flora on the hands and outer garments of the handlers generally reflects the environments and habits of individuals, and the organisms may be those from soils, waters, dusts, and other environmental sources. Other important sources that are common in the nasal cavity, mouth and on the skin; and those from the gastro-intestinal tract may enter into foods through poor personal hygienic practices.

Animal feeds. This continues to be important sources of salmonella to poultry and other farm animals. In the case of some silage (feed), it is a known source of Istria mono cytogeneses to dairy and meat animals.

Animal hides. The type of organisms found in raw milk can be a reflection of flora of the udder when proper milking procedures not followed, and of the general environments of animals. Organisms from both the udder and hide can contaminate the milk containers, environment and hands of the handlers. Air and dust. Most of organisms above at times found in air, dust and in a food processing operation, which can persist include most of the bacteria. Among fungi a number of molds may be expected to occur in air and dust along with some yeast



Figur4. The different sources of food contamination

Types of contamination

Primary type of contamination: the food is contaminated as the results of infection of the food animal itself e.g. Anthrax

Secondary contamination: contamination of food products from contact surfaces or through other factors other than the animal from which the food has been derived.

Tertiary contamination: contamination of sterilized food products. To maintain the food quality and also extend its shelf-life we need to keep food away from primary contamination of food animals and from cross-contamination. Good animal worn, as husbandry practices and efficient veterinary services at farm and level are expected to prevent contamination. Cross contamination happens when M/Os from raw or unwashed foods get onto foods that are ready to be served as or that will not be cooked again before being eaten to prevent cross-contamination:

Always store raw meats below other foods, with the meats requiring the highest cooking temperature on the lowest shelves,

Never store ready-to- eat foods in containers that have held meat,

Store unwanted foods below clean cooked foods or ready-to-eat foods,

Wash hands immediately after handling raw meat or unwashed foods. This avoids contaminating other foods or equipments like refrigerator door handles or ovens,

Use a separate cutting board to prepare raw meats. Wash, rinse, and sanitize cutting boards and utensils (knives etc.) immediately after you are done preparing raw meat. Use cutting boards with hard surfaces and replace them when the surfaces become hard to clean and sanitize,

Always wash and sanitize the food preparation sink before each use. Be sure to use a sink with an air gap in the drain line (floor sink) to prevent sewage from backing up into the sink and contaminating food.

Keep utensils serving in with the handle sticking out of the food tensile also be kept in an ice water bath, cold running water bath, or water that is maintained at $140^{O}F$ or above.

Use ice scoops with handles or use tongs to place ice in cups. Keep handle out of the ice. Don't use a cup or glass to scoop ice as the sides may become dirty from handling or the glass may shatter or chip into the ice.

Do not use absorbent shelf liners such as paper towels, napkins, newspaper, and cardboard.

Do not wrap food with absorbent. Use plastic wrap, wax paper or aluminum foil. Do not use paper towels.

Discard the food contaminated. Example: if raw meat juice dripped onto lettuce for salads, do not try to wiped or wash away the meat juice. Just throw away the lettuce.

2.3 Micro-organisms in foods and their effects

Food Adulteration

Protection of the consumers against fraud that is to ensure the genuine quality of food provided for sale is usually covered in rules and regulations dealing with food trade in a country. This try to ensure that food exhibited for sale should contain what the buyers and eater believe it should by customs, by seller's statement and by legal definition for food

Milking Hygiene

Milking is the defining activity of dairy farming. Consumers demand high standards of milk quality, so milking management aims to minimize microbial, chemical and physical contamination. Milking management covers all aspects of the process of obtaining milk. Consistency in the day-to-day implementation of milking procedures is an important part of good dairy farming practice for milking. This Fact sheet describes practices that ensure milk is harvested and stored under hygienic conditions, and that the equipment used to harvest and store milk is well maintained. The suggested good dairy farming practices for milking hygiene are set out under the following headings:

Ensure milking routines do not injure the animals or introduce contaminants12 into milk.

Ensure milking is carried out under hygienic conditions.

Ensure milk is handled properly after milking.

Milking Routines do not injure the Animals or Introduce Contaminants into Milk Identify individual animals that require special milking management. Individual animals should be easily identifiable by all people who come in contact with them. The system used should be permanent, allowing individual animals to be identified from birth to death. Additional temporary identification systems should be in place on farms to manage animals that require special handling at milking, such as treated or diseased animals, or animals producing milk that is not suitable for human consumption.

Ensure appropriate udder preparation for milking. Wash and dry dirty teats before milking only milk animals with clean, dry teats. Check the udder and teats for any abnormalities which may indicate clinical mastitis. The foremilk may be extracted and checked for abnormalities before each animal is milked. This may be a regulatory or contractual requirement for dairy animals in some countries. Milk animals regularly using consistent milking techniques. Institute regular milking times and routines. Ensure good milking technique is consistently applied. Incorrect or variable milking techniques can result in a higher mastitis risk and injury to the animal. The correct technique for machine milking is to:

Prepare animals properly before milking; attack the cups to clean, dry teats;
Avoid unnecessary air ingress at cup attachment; avoid over milking; and remove cups gently; and when necessary, apply teat disinfectant to each teat after milking according to the recommendation.

- The correct technique for hand-milking is to:

Restrain the animal to be milked using a method that does not cause pain or injury;
Ensure the miller's hands are clean and dry;
prepare the teats for milking, ensuring they are clean and dry; only use appropriate teat lubricants according to national recommendations and regulations; handle the teats gently, ideally using the 'fist-grip' method, avoiding any discomfort, pain or injury to the animal; use buckets that are non-corrosive, easy to clean and disinfect, and do not taint the milk; avoid contaminating the collected milk with foreign material such as dust, dirt, soil, urine, manure (farces) and protect it from flies; and when necessary, apply teat

disinfectant to each teat after milking according to national recommendations and regulations. Segregate milk harvested from sick or treated animals for appropriate disposal.

Animals whose milk is unfit for human consumption should be milked last or with a separate bucket or system. Store or discard abnormal milk in a manner appropriate to the risk posed to people, animals and the environment.

Ensure milking equipment is correctly installed and maintained. Manufacturers' and local, regional or national recommendations should be followed for construction, installation, performance and maintenance of the equipment used for milking. Inspect and replace perishable components if evidence of wear is found. Materials used for milking equipment that come into contact with milk and with cleaning and disinfecting fluids should be made from adequately resistant materials and should not impart a taint to milk.

Follow the manufacturers' instructions when using cleaning and disinfecting agents on milking equipment, including any requirements to rinse following application. Only use cleaning and disinfecting agents approved for use by the relevant authority. These chemicals should be used in a way that ensures they do not have an adverse effect on the milk or milking equipment. Store all chemicals, other than those in routine use, in a lockable area away from the milk storage area.

Ensure a sufficient supply of clean water. A sufficient supply of clean water should be available for milking operations, for cleaning the equipment that comes into contact with milk and for cleaning the milking area. The quality of the water should be suitable for its intended use. Standards regarding the quality of water used in milk production are mandated in many countries, including the use of potable water in cleaning surfaces that come into contact with milk.

Ensure milking is carried out under hygienic conditions

Ensure housing environment is clean at all times. A high standard of cleanliness should be maintained at all times in housing areas to decrease soiling of the udder and so protect udder health. The housing area should:

Be designed to provide good drainage and ventilation and to avoid animal injury;

Be of suitable size and designed to cater for the size of the animal and the herd; and have adequate loose bedding which is maintained in a hygienic condition. All stalls and beds should be kept clean and dry (e.g. by replacing the bedding frequently). Regularly clean or scrape passageways to remove manure.

- Ensure milking area is kept clean. The milking area should be designed to allow it to be kept clean and tidy. It should: be easy to clean; have a clean water supply; have waste handling facilities; and have sufficient temperature regulation, ventilation and light; and construct holding yards to enable a high standard of cleanliness to be maintained.
- Ensure the millers follow basic hygiene rules.
- The milkier should: wear suitable and clean working clothes;
- Keep hands and arms clean especially when milking;
- Cover cuts or wounds; and not have any infectious disease transmissible via milk.

Ensure milking equipment is cleaned and when necessary, disinfected after each milking: Establish a routine to ensure milking equipment is clean before each use. If mobile milking equipment is used, this may mean cleaning between each use.

Use chemicals approved for the cleaning and/or disinfecting of milking equipment. Use water of suitable quality heated to the required temperature. Milk contact surfaces should be disinfected as required and in accordance with national recommendations and regulations.

2.2.4.. Ensure milk is handled properly after milking

Ensure milk is cooled or delivered for processing within the specified time: Cool milk as soon as possible after milking to the required storage temperature and within the specified time. Cooling times and storage temperatures should conform to limits set by the relevant authority. Limits on the time taken between milking and delivery to the milk collection centre may exist in developing countries where the cooling or processing of milk is undertaken off the farm.

Ensure milk storage area is clean and tidy/neat. Milk should be stored away from the milking area. The milk storage area should:

Be clean and clear of accumulated rubbish, any products or chemical substances not in constant use and any feedstuffs;

Have hand washing and drying facilities; and

Be easy to clean and have pest control practices in place.

Ensure milk storage equipment is adequate to hold milk at the specified temperature. The storage equipment should be capable of holding milk at the required temperature until collection, and be constructed of materials that do not taint the milk. Bulk tanks should be built to recognized standards and milk refrigeration systems should have a regular maintenance and service program to prevent breakdowns. The bulk tank should be equipped with a thermometer to check the temperature of the milk and appropriate records kept of storage temperatures. Ensure that all of the equipment is working properly.

Ensure milk storage equipment is cleaned and when necessary, sanitized after each milk collection. To ensure milk storage equipment is clean before use, clean and, when necessary, sanitize it after each milk collection. Milk contact surfaces should be sanitized as required in accordance with national recommendations and regulations.

Ensure unobstructed access for bulk milk collection. Provide unobstructed access to the milk storage area to enable the safe collection of milk. Access to the milk collection areas should be free of animal pathways, mud and other potential contaminants.

Meat Hygiene -Under this section we will learn about meat hygiene. A thorough discussion will be made on issues related with the production of safe and wholesome meat, ablators and its activities with due emphasis on anti-mortem and postmortem examination of meat animals to identify the health problems endangering the consumers.

Objectives

- Upon successful completion of this section the students will be able to:

- Protect consumers against meat borne infection, intoxication and residues;
- Protect food handlers against occupational diseases;
- Reduce losses from meat spoilage provide the consumers with safe, wholesome meat and meat products;
- Combat adulteration and fraud; and promote best practices in hygiene operation, and

Promote nutrition and export in meat and meat products.

Meat refers to the flesh of an animal that is edible, especially that of mammals or birds. The animals which furnish food for human are drawn mainly from those which consume plant, such as grass/hay, straw, roots, or grains, e.g. cattle, buffalos, musk oxen, yak, sheep, goat, pigs, etc. In addition, poultry species have become major meat producing animals. Fish and mollusks have also been an important parts of man's diet since earliest times. However, this being the global picture about sources of meat, in most parts of Ethiopia ruminants (including camel), chicken and occasionally pigs are the major source of meat.

2.3.1. Safe and Wholesome Meat Production

Postharvest activities of meat production should ensure for the production of safe and high quality meat, which can satisfy the consumers. Criterion recommended for meat to be safe and quality includes: Is free from obvious contamination;

- Does not cause food-borne infection and intoxication;
- Has been produced under adequate hygienic control;
- Has not been treated with illegal substances; and
- Doesn't contain residues in excess beyond the limit established in the CODEX

Hygienic meat production. The condition under which animals are raised should be conducive for the meat to be safe and wholesome. Meat animals should be raised in good environment, be properly transported to the site of slaughter; be free of residues and sound and healthy; be raised in area which is free from parasites, insects, soil-born and other pathogenic agents and free from industrial contaminants (residues).

Hygienic meat production begins at the farm. Dirty animals tend to contaminate large, abattoir, equipment and finally meat. Excessive dirt on animal's surface reduces the value of hide. Sources of contamination with dirt include absence of good bedding, not paved stall, poor drainage, high stocking density, and untimely removal of manure and other animal wastes.

Meat Inspection, The reasons for veterinary examination of all livestock destined for slaughter may be summarized as:

Selection of normal rested animals and poultry which will produce high quality meat for human consumption;

Isolation of diseased or suspected animals for further detailed examination;

Prevention of contamination of premises, equipments, and personnel by animals suffering from a communicable disease;

Prevention of contamination of meat, premises, equipments and personnel by excessively dirty animals;

Collection of information necessary for accurate post-mortem examination and judgment and for disease control program on farms of origin; and Prevention of inhuman andling of animals.

An effective reporting system should operate from the anti-mortem area giving details of normal stock released for slaughter as well as those affected with a localized condition or one not advanced enough to render them unfit for slaughter. Animals showing signs of systemic disturbance and an elevated temperature should not be slaughtered but retained for treatment, preferably outside the meat plant.

In a properly designed area or slaughter house meat inspection is carried out before and after the animal is slaughtered, to make sure that the meat is high quality and safe for human consumption.

2.3.2 Anti-mortem inspection

It is inspection of live animals destined the slaughter house or area before kill. AMI is of special importance in the handling and examination of casualty and emergency laughter stock.

Animals intended to slaughter are kept in a lair age for a period of 6 to 24 hours for animals to be adequately rested, and are too closely observed and examined for any

abnormalities in physical appearance and behaviors. In line with this animal should be inspected while at rest and in motion. In the case of sick or possibly diseased animals, and those in poor condition, the species, class, age, condition, color, and markings are recorded. The general behavior of the animal, their level nutrition, cleanliness, obvious signs of diseases, and any abnormal should be observed. In addition to the segregation of diseased and suspected stock, females in estrus, aggressive animals, and horned and polled stock should be isolated.

Stocks unfit for slaughter will include: animals of Severely emaciated and anemic; those affected by certain diseases such as tetanus, or a communicable disease, e.g. rabies, and those known to carrying toxic residues, though these are may be held the residues, are excreted. Immature, weak and obviously diseased calves are also come into this category.

Animals showing evidences of localized conditions such as injuries, fracture, abscesses, benign tumors, (e.g. papilla mate), or conditions which will show-up lesions on post mortem inspection (inspection before slaughter) need to be segregated and given a detailed examination. Such animals are passed forward for slaughter as part of the regular kill if the conditions prove to be a minor one or slaughtered separately and given a thorough postmortem examination.

2.2.4. Postmortem inspection

Postmortem inspection or the after slaughter inspection is carried-out on the whole carcass and on all the different organs of the animals. The main purpose of postmortem examination is to detect and eliminate any abnormalities including contamination, thus ensuring that only meat fit for human consumption is only passed for food.

Routine postmortem examination must be carried-out with care, in a hygienic manner and avoiding unnecessary cuts, always bearing in mind the value of high quality food. It determines the character and extent of disease lesions, differentiating between localized and generalized conditions (the formers being less important) and between acute, sub-acute, and chronic conditions. The general disposition of the carcass, its organs, state of

nutrition, any anti-mortem report and the results of any necessary laboratory tests are all taken into consideration in making a final judgment. The color of the blood, its coagulation properties and the possible presence of foreign bodies in it must be determined. Responsibility to the consumer must be uppermost in the inspector's mind. At the same time there must be no unnecessary wasting of the valuable meat. Some of the organs and areas inspected include: The various lymphatic glands of the head, trunk, and extremities. Such organs as the lungs, heart, kidneys, and liver etc.

The entire carcass. Postmortem inspection procedures

In addition to visual examination, post-mortem inspection involves palpation of tissues and organs, incision where necessary, use of the inspectors sense of smell and, if indicated laboratory tests. It should always be carried out in a systematic and hygienic manner, care being taken to avoid contamination, especially of septic nature. Incision must be made in such a way as to show a clean, undistorted surface. A knife contaminated in any way must be discarded for sterilization and a clean knife used. Carcass incision of abscesses can cause widespread contamination of a carcass requiring unnecessary trimming and even local condemnation.

Indication of unfitness for human consumption

The following conditions warrant total seizure of the carcass and its offal and blood: Generalized actinob acillosis, generalized actinomycoosis, advanced anemia, anthrax, blackleg, extensive and sever bruising, caseous lymphadenitis with emaciation; generalized cysticecus bovis; cysticercus cellulosae; generalized decomposition, pathological emaciation, fever; foot and mouth disease; acute septic mastitis; abnormal odor associated with disease or other conditions; etc.

2.2.5. Hygienic handling and transportation of meat

Hygienic transportation of meat. Meat should only be transported:

- In clean and disinfected vehicles,
- It is forbidden to transport other goods with meat,

- The transportation of tripe with meat should be discouraged.
- The meat shall not be come in contact with the floor and the wall of the vehicle,
- The vehicle shall be fitted with chiller.

Butcher's shop hygiene

Butcher's shop are the lines between the inspected and the approved safe meat and meat products and consumer. Therefore, the hygienic procedures and practices of handling meat in these shops are determinants to the health of the meat consumer. For this reason, butcher's shop normally needs licenses to operate. In addition to this, a butcher's shop must be able to meet all the handling specifications that are listed for insuring the safety of the meat and its products. Some of these essential specifications include:

- The premises should be licensed and must have adequate space for the work to be done,
- The walls and floor should be constructed of durable material, smooth, impermeable, and easily cleanable.
- There should be adequate ventilation and natural light
- It should be furnished with the necessary fittings to facilitate handling of meat and its products.
- The shop/room should not adjoin sleeping, living, recreation room or toilets
- The meat exhibited for sale should be kept in fly and dust proof boxes with the front made of glass or a transparent material
- Only meat bearing the approved stamp should be sold or exhibited
- Equipment and surfaces that will be in contact with the meat such as chopping, blocks, knives, slicers, scales etc should be kept scrupulously clean
- The meat should be wrapped with the approved type of wrapping papers, or other packaging materials.
- Approved means for the disposal of meat should be provided.

2.5.1 Post-harvest nutritional loss.

The post-harvest nutritional loss resulted by inappropriate, Food hygiene practices employed in an agricultural food production area mainly include limited availability of suitable varieties, and lack of appropriate processing ,harvesting, transportation and standardization of agricultural commodities and of technologies, inadequate commercialization of new technologies and lack of basic infrastructure, inadequate facilities, infrastructure, and insufficient promotion of processed ... objectives to: Prevent and control of food wastage, and Protect food from contamination

- Harvesting

The operation of gathering the useful parts of the plant and is carried out at the time when all the nutrients have developed and the edible parts have reached the appropriate degree of maturity. In general, the harvest takes place 10 or 15 days after the grain has reached physiological maturity. Of gathering ripe crops, or animals and fish, to eat this machine does three things at once: cutting and gathering the crop; separating the edible parts of a crop, the grain, from the inedible, stalks; and moving the unwanted stalks and husks away from the grains.

- Transportation

Is important in agricultural marketing and influence each other. On one hand, transportation is the movement of agricultural commodities from where they are produced to various consumption centers. It plays an important role in market development, expansion and competition. Transportation is the key link in the agricultural marketing system connecting geographically specialized farmers and an urbanized consumer population. It contributes to the creation and preservation of place utility for consumers. The key questions to be considered in transportation of agricultural commodities are what the features of the commodity being transported are and how such features affect choice of transport mode. The choice of the mode of transport will be guided by considerations of merits and demerits of alternative transportation modes. Owing to special agricultural commodity characteristics agricultural sector has special transportation needs.

Therefore, depending on transportation needs, freight rates, routes and schedules adjust freely On the other hand, standardization refers to measurable quality of agricultural commodities that differentiate them for consumers. Standardized commodity grades can contribute to operational and pricing efficiency as well as increased consumer satisfaction and producer returns.

- Storage Facility

Storage facilities are an elemental part in the post-harvest value chain. It is important in large scale production when the food is typically taken into the market after a few days or weeks. It is done to increase the lifespan of produce, however, if wrongly done could cause a huge loss. Understanding product life span is as important as selecting the appropriate storage mechanism. While some products are fine with the traditional preservation methods like drying some require more specified preservation methods like freezing, refrigeration and even addition of chemicals to increase their lifespan before going bad. The right facilities or food preservation, knowing the ideal conditions for the method is equally important to prevent the food from getting infected by pathogens, going bad before time or getting intoxicated among many other possibilities. For this reason, it is fundamental to understand the necessary methods of food preservation and adequate facilities for each product.

It is also encouraged to store products separately depending on each requirement. profit margins for farmers, export conditions and consequences for a country among many others. Ensuring success at this stage of production should be easy if well considered. Top of Form Bottom of Form. Proper food storage helps to preserve the quality and nutritional value of the foods you purchase, and also helps make the most of your food dollar by preventing spoilage. Additionally, proper food storage can help prevent food borne illnesses caused by harmful bacteria. The quality and nutritional value of the foods you purchase, and also helps make the most of your food dollar by preventing spoilage. Additionally, proper food storage can help prevent food borne illnesses caused by harmful bacteria.

Figure5: proper food storage

Use fresh, perishable foods soon after they are harvested or purchased. Signs of spoilage that make food unpalatable but not a bacterial hazard are the rancid odor and flavor of fats caused by oxidation, slime on the surface of meat, and the fermentation of fruit juices due to yeast growth. Off-odors in foods and a sour taste in bland foods can indicate dangerous bacterial spoilage. However, food can be high in bacteria count even without such signals.

Food Safety Hazards

Any substance that is reasonably likely to cause harm, injury or illness,

When present above an established acceptable level, is food safety hazard.

There are three recognized categories of food safety hazards:

- ✓ biological hazards,
- ✓ chemical hazards, and
- ✓ physical hazards

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

1. Explain the various sources of food contamination takes places in postharvest
2. Identify the different sources of contamination.
3. Explain the effect and cause of post harvest nutrition loss.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating:

Name: _____ Date: _____

Info Information sheet 3	Ap Aplying food quality, safety, supply chain, and basic postharvest handling principles

3.1 Food Quality

Food quality refers to the degree of excellence or superiority of foodstuffs or food, which is attributed to give each food value, in terms of its safety of the intended use. Quality attributes for foods of agriculture in general and those of animal origin in particular, is required to satisfy the consumers interest in terms of nutritional safety and to extend its shelf-life and storage stability. For instance; milk quality attributes include: (1) compositional quality (nutrients density such as milk sugar/lactose, casein protein, fat, vitamins & minerals, and water); (2) organic or sensory quality (flavor, color, appearance, consistency and texture); (3) physic-chemical quality “amount of the milk specific gravity or specific density, butter fat and fatty acids in milk, pH value, cell-count, etc.

These attributes of milk are highly affected by adulteration practice of milk, which results in milk to be impure, contaminated, infected, ruined, polluted, tainted, and spoiled. Whereas important meat quality attributes include: Texture, flavor, tenderness, marble, palatability, and the cut). Appearance, consistency, and shelf-life of the foods produced are important attributes from the point of view of wholesale and retail marketers. Food quality is influenced by several factors as aforementioned (unite one) including pre-and - postharvest farm operations implemented at the farm level and Thus, a total of traits and criteria which characterize food as regards its frictional value products, milk and milk products, egg and its products, and fish. As recommended by the International Convention Codex, WHO (2006) and FAO (2011),

The safety and quality criteria of foods produced from both plants and animals are that foods should be:

- Healthy and palatable,

- Should not showing any sign of spoilage, decomposition, and adulteration,
- Should not contain substances other than indicated in the label,
- Must be nutritious,
- Physiologically acceptable both by the consumers and vender

Postharvest nutritional loss is deterioration and/or loss of safety, wholesomeness, and soundness of foodstuffs (food). Postharvest nutritional loss is depletion of the nutrients, and pollution and intoxication of the food that it is to be deterred in its safety, quality and good keeping quality for consumption because of biological, chemical and environmental factors attributed to lack/inadequate or improper postharvest management activities.,

Food quality is comprised of a series of consumers' attributes that collectively also determine a total of traits and criteria which characterize food as regards its: nutritional consume value, sensory value, safety for's health

Figuer5. Food sensory value and safety for health

- Problems in Food

Problems in milk that may observe in milk include:

- Blood (mastitis animals),
- An increased number of leucocytes,
- Milk taint from certain medicines feeds, illness (mastitis), uncovered milk, near smell, milk at the end of lactation, sunlight, and contact with metal like copper, phenols from the footbath,

- Milk-stone: phosphate and albumen deposits when milk heated over 72 ^{O}C. this can cause problems with cleaning and harbors bacteria.
- Food poisoning due to raw milk reflects inherently unsafe nature of production.
- Food poisoning following pasteurization results from failure of control which can be related poor plant design and maintenance and inadequate training.
- The increasing variety of milk brings about more complex plant design and there are risks of cross-contamination from raw to pasteurize.

3.1.2. Food quality control

Milk quality could be assessed by testes made upon reception and laboratory as follows:

- **Platform testing (reception test**). This deals with organoleptic test: smell of flavor, taste, visual observation of appearance and consistency and temperature of milk. This is always being the first screening test, since it is cheaper, quick and doesn't require any equipment.

- **Test performed in the laboratory**:

✓ Adulteration test. Lactometer reading. It reads the specific gravity of milk ranges from 1.028 to 1.033g/ml. if milk is adulterated by water or it's skimmed, specific gravity reads lower, and higher, respectively.

✓ Freshness determination.

- **Clot-on-boiling test**.-It is simple, quick and cheap. If the milk is sour or if it is abnormal (colostrums or mastitis milk) the milk will not pass this test. Place test tubes with 5ml milk for up to 4 minutes in boiling water or in a flam; examine the tubes and reject the milk if you can see the milk clotting. Note that milk of high altitude boils at a lower temperature.
- **Alcohol test.** If the milk is sour or if it is abnormal (colostrums or mastitis milk) the milk will not pass alcohol test. You carry out the test by taking equal amount (2 ml) of milk and 60% ethanol solution (made by mixing 68 ml of 90% alcohol with 28 ml distilled water) milk that contains more than 0.21% acid will coagulate

when alcohol added. Acidity test, ethylene blue test, pH determination test antimicrobial development as the result of higher water nutrient densities contents.

Food Safety Factors: A number of factors threaten the safety of agricultural food products in particular to foods of animal origin e.g. milk and meat that are highly perishable in nature (create conducive environment for faster rate of

This refers to the concept that diseases like pathogenic microorganisms, misuse of food additives and contaminants such as chemical or biological toxins and adulteration are prevented, whereas food quality is comprised of a series of consumers' attributes that collectively influence them to put different values. Food safety refers to the concept that diseases like pathogenic microorganisms, misuse of food additives and contaminants such as chemical or biological toxins and adulteration are prevented, whereas food quality is comprised of a series of consumers' attributes that collectively influence them to put different values ...Mar 25, 2016 It is a component of quality and an assurance that food will not cause adverse harm to the consume.

Figure 6. food safety

Some of these safety factors include: (1) naturally occurring contaminants such as biological agents: zoon sis & pathogens like bacteria, molds, protozoan; Chemicals agents: Toxicants (toxins and heavy metals); environmental pollutants, (2) physical and environmental factors (pesticide, insecticides, drug residues) responsible for animal products contamination; and any foreign substances added (water, alcohol, acetone,

yeasts) into milk is known as milk adulteration are often regarded as the most important postharvest safety concerns.

The best farming practices, to achieve the safety, and overall quality of food products of animal origin in advance of the consumers' satisfaction of health, discussed in detail in section .

Careful and appropriate food hygiene operations such as hygienic food products handling and processing are strongly recommended to limit the risk of food-borne infections and intoxication as a results of microbial contamination at the food service, retail, and consumer levels. Safety and Quality Management Systems applying by.1 Good Agricultural Practice (GAP) and Good Animal Husbandry (GAH) or Good Veterinary Practice (GVP) (2) Good Hygiene Practices (GHP) (3)Good Manufacturing Practices (GMP) (4)Hazard Analysis & Critical Control Point (HACCP

3.2 Impacts of food safety factors

Those are biological, chemical and physical food hazards

Biological hazards include harmful bacteria, viruses or parasites (e.g., salmonella, hepatitis). Chemical hazards include compounds that can cause illness or injury due to immediate or long-term exposure. biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect. Food safety hazards include bacteria, viruses, parasites, hazardous chemicals, and foreign materials that can cause an adverse health effect to a consumer. have impacts on: Food and nutrition security, Health, Economic, Social, Environmental, Political Chemical residues and microbial contamination continue to pose public health risks and lead to: trade disruptions with substantial economic and social cost Health .Aflatoxins are strongly associated with liver cancer stunting and immune suppression.

it is increasingly affecting domestic markets Recent E coli in Europe caused outbreaks of illness with more than 3900 reported cases and hundreds millions of USD lost in the EU vegetable market. E.g. Can I become sick with corona virus (COVID-19) from food

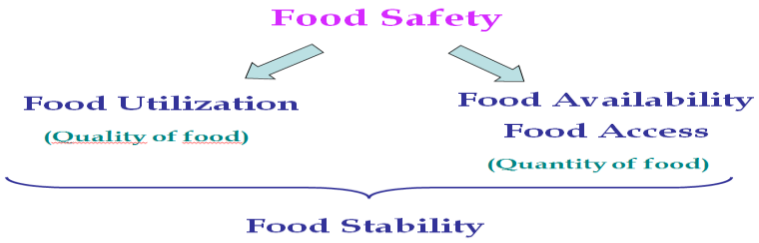


Figure7. Food safety and food nutrition security linkage

3.2.1 Food Supply Chains

Food supply chain is the channel through which food products from production reach to consumers. It involves harvesting techniques, temporary storage at the field, and transportation to home/storage site, processing and preservation techniques, and transportation to markets. The local food supply chain determines the availability, affordability, diversity of foods and affects the nutritional quality of foods. Postharvest loss can be mitigated by appropriate handling and management of the product along the chain to minimize the effect of biological and environmental factors on product deterioration and avoid product contamination. Safe handlings of products throughout a chain can improve the nutrient content of the local foods. The local food supply chain therefore shapes consumer choices, dietary patterns and determines nutritional outcomes of the community Maintaining food security has become unconditional when it comes to food trade and customer demand. The food put on the market has to be of good quality and safe for consumption, as well as not be a source of disease and infection. For this reason, securing food safety and quality is a matter of international significance and a responsibility of food producers and governments.

During the process of distribution food products go through all stages of supply chain, i.e. all processes which describe how food travels from a farm to the consumer's tables. The aim of this strategy, called "from the field to the table", is to achieve full supervision of food safety in the modern world, because the journey leading from food production to the consumer is very time-and space consuming. Along this journey, there are many dangers of food contamination, be it in the very production, during the transport, food storage, or food preparation. In order to enable food quality and sanitary safety of food

products, companies have to follow legislations, standards and norms at every stage of supply chain is to show how food safety and quality is legally regulated during the distribution in the supply chain, and the ways in which companies ensure a certain high level of hygiene and temperature levels that different kinds of food products require.

Types of supply chain

There are four kinds of participants in every supply chain. They perform the activities that make a supply chain work and provide a reason for it to exist. Some participants are producers; some are distributors or wholesalers; while others are retailers**.** And some participants are customers or consumers. Supplying customer demand for products or services is the reason for any supply chain to exist. Supply in its simplest form, a supply chain is composed of a company and its suppliers and customers. Combinations of these three suppliers, company, and customer create a simple chain. Extended supply chains contain an additional kind of organization called a service provider (as illustrated below).

Producers

Producers (manufacturers or service providers) are organizations that make products or services. This includes companies that are producers of raw materials and companies that are producers of finished goods. Producers of raw materials are organizations that mine for minerals, drill for oil and gas, and cut timber. It also includes organizations that farm the land, raise animals, or catch seafood. Producers of finished goods use the raw materials and sub-assemblies made by other producers to create their products. Service providers are producers of services, and manufacturers are producers of products. Some producers are also consumers or customers of products made by other producers. Producers supply the products and services used by other supply chain participants.

Distributors

Distributors (or wholesalers) are companies that take inventory in bulk from producers and deliver a bundle of related product lines to customers. Distributors are also known

as wholesalers. They typically sell to other businesses and they sell products in larger quantities than an individual consumer would normally buy. Distributors buffer the producers from fluctuations in product demand by stocking inventory purchased from producers, and doing much of the sales work to find and service customer needs.

In addition to product promotion and sales, distributors also perform activities such as inventory management, warehouse operations, product movement, customer support and post sales service. A distributor can also be an organization that only brokers a product between the producer and the customer and never takes ownership of the product. As the needs of customers evolve, and the mix of available products changes, distributors continually track customer needs and match them with products to meet those needs.

Retailers

Retailers stock inventory and sell in smaller quantities to customers in the general public. Retailers closely track the preferences and demands of their customers. They advertise to their customers and use combinations of price, product selection, service, and convenience as their primary draw to attract customers. Discount stores attract customers using low price and wide product selection. Upscale stores offer a unique line of products and high levels of service. Retailers offer products and services to meet the demand of individual customers who buy in smaller quantities.

Customers

Customers (or consumers) are individuals or organizations that purchase and use a product or service. A customer may be an organization (a producer or distributor) that purchases a product in order to incorporate it into another product that they in turn sell to their customers (ultimate customers). Customers depend on producers, distributors, and retailers to meet their needs for products and services.

Self-check 1	Written test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

1. Explain the methods for milk quality test for quality.
2. Define feed quality and its attribute on the health.
3. Explain and concept of *food Supply Chains and food safety.*

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Rating: _____

Score_____

Name: _____ Date:_____

Information sheet	Identifying postharvest handling, processing and preservation

4 .1 Post Harvest Handling

Post-harvest management practices that reduce product loss to spoilage or shrinkage will reduce microbial risks— Packing & Processing – Storage. – Transportation Distribution Post-Harvest Handling. Also includes Cleaning Good Manufacturing Practices (GMPs): – Packing facility sanitation Building. Equipment - Storage – Water quality – Worker hygiene

- Packing House Sanitation
- Proper sorting and culling of product.
- Maintaining detectable free chlorine in wash waters.
- Enforcing good worker hygiene.
- Cleaning and sanitizing equipment
- Packing Facility

Should be arranged so that product moves to a cleaner area during each step of processing.

- ✓ Good sanitation & housekeeping should be practiced in the area – SOPs (Standard Operating Procedures).
- ✓ Cleaning supplies should be stored in a separate area.
- ✓ Rest rooms should not open directly into processing and
- ✓ Should have adequate lighting and shielded to protect product if breakage occurs.
- ✓ Processing equipment food contact surfaces should be cleaned & sanitized and done as frequently as necessary.
- ✓ Use only food grade machinery lubricants.
- ✓ Exposed overhead piping & ducts should be minimized and kept clean Work tables/product preparation surfaces – food contact surfaces: – Smooth surfaces allow easy cleaning.

- ✓ Rough surfaces harbor dirt and microorganisms. Important to clean and sanitize AS needed.
- ✓ Wash, Rinse, and Sanitize with approved food contact agents.
- ✓ Store packing containers away from contamination sources.
- ✓ Close doors at night.

4.2 The best useful postharvest principles are listed here under:

Food Animals, to produce safe and quality products (milk, meat and egg), should be kept healthy, fed and watered with products of suitable safety and quality. To do so good farming practices should be undertaken.

Animals intended for milk, meat, and egg production should be kept according to the 'five freedoms' of animal welfare.

Milk should be harvested, handled, and stored under the food hygiene guidelines. Equipment used to harvest and store milk should be suitable and well maintained.

Milk, meat, and poultry (egg) production should be managed in balance with the local environment surrounding the farm.

Follow the procedures and guidelines of marketing, transportation of animals intended to be slaughtered for meat.

Dairy farming provides economic and social benefits to farmers and their wider communities. Good dairy farming practice can also help to manage the social and economic risks to the enterprise.

An effective reporting system should operate from the anti-mortem area giving details of normal stock released for slaughter as well as those affected with a localized condition or one not advanced enough to render them unfit for slaughter. Animals showing signs of systemic disturbance and an elevated temperature should not be slaughtered but retained for treatment, preferably outside the meat plant.

Farmers and producers, suppliers to farmers, milk meat and egg carriers and haulers, dairy product and food manufacturers, distributors, retailers and consumers - should be part of an integrated food safety and quality assurance management system.

Food processing and preservation is branch of manufacturing that transforms raw animal, vegetables, and marine food materials into tasty, nutritious, and safe food products. The industry has its roots in ancient times, as humans have always needed to obtain food and store a portion for later use.

Most kinds of foods are readily decomposed by M/Os unless special methods are used for their preservation. Because food is so important to survival, food preservation is one of the oldest technologies used by human beings. The basic idea behind all forms of food preservation is either to slow down the activity of disease causing bacteria or to kill the bacteria altogether. In certain cases, preservation technique may also destroy enzymes naturally found in a food that cause it to spoil or discolor quickly. An enzyme is a special protein that acts as a catalyst for a chemical reaction, and enzymes are fairly fragile. By increasing the temperature of food to about 66 ^{O}C, enzymes are destroyed. A food that is sterile contains no bacteria. Unless sterilized and sealed, all food contains bacteria. For example, bacteria naturally living in milk will spoil the milk in 2 or 3 hours, if the milk is left out on the kitchen counter at room temperature. By putting the milk into the refrigerator you do not eliminate the perishable food products bacteria already there, but you do slow down the bacteria enough that the milk will stay fresh for a week or two.
Some of the reasons why milk is highly and an important transmitter of diseases to human being are:
Milk relatively good medium for micro-organisms to grow since it is enriched with nutrients in sufficient proportion & water, and other factors to grow such organisms,
Milk most likely to be contaminated easily during its production,
Milk is delicate and easily spoiled if not handled and maintained under hygienic conditions,
Milk is most likely to be consumed raw or without treatment,

Milk is usually part of the normal diet of the most vulnerable groups of the population – infants, the elderly, convalescents,

Milk processing and preservation technique

To reduce the deterioration of quality in the tropics, milk has to be moved to the customer within two to three hours of milking, or milk products have to be made which will keep without refrigeration, or preservatives added to the fresh milk, or it has to be cooled as soon as possible on the farm or at a collection centre. Well-organized milk schemes collect milk from widely-scattered suppliers, chill it in bulk, and transport it to processors with minimal delay.

The processing (pasteurization, cooling, souring [acidification], and creaming) technique employed will determine the storage stability of milk and dairy products.

The following rules should be followed during the production, storage and processing of milk.

Make sure that all equipment used for processing is properly cleaned and disinfected if needed.

Take care that no dirt particles or insects enter into the milk;

Prevent use of copper coated utensils, which may give off flavors in milk and its

Pasteurization: It is a milk preservation mechanism by applying heat to destroy microorganisms. Milk contains certain micro-organisms that can spoil it. These bacteria grow best at temperatures between 10°C and 40°C. It is therefore important to cool milk as quickly as possible. This is usually difficult in the tropics where cold water and refrigerators are not easily accessible. Heating will be an alternative. Most bacteria will be destroyed during heating. The most effective temperature depends on the heating time. Heating for a longer period at a lower temperature can be as effective as heating for a shorter period but at a higher temperature. Pasteurization improves the safety and storage life of a product, while the taste hardly changes and the loss of vitamins is minimal. Pasteurized milk can be kept for about one week at 4-6°C if no re-infection takes place.

Cooling: Storing milk at a low temperature will greatly reduce the growth of bacteria. Bacteria develop much slower in cold milk. The best storage temperature fresh milk is 4°C. Properly pasteurized or boiled milk can be kept for about one week if stored at 4°C. Without cooling, raw milk will spoil within a day

Fermentation/acidification: Another way of increasing the shelf-life of milk is to ferment the milk into soured milk products. During fermentation, part of the milk sugar is converted into lactic acid by bacteria, for example by the yoghurt bacteria, Streptococcus thermopiles and Lactobacillus or the bacteria that grows at room temperature Streptococcus lactic. Fresh raw milk can be left to sour spontaneously, but then one cannot control which bacteria are growing. It is better to sour the milk with the help of specific lactic acid bacteria as a starter culture after the milk has been pasteurized. Quality and taste are influenced by the products that the different lactic acid bacteria produce.

Creaming: is the process of separating cream form the whole milk. Cream is, a layer of fat made from fat suspended to the milk surface after milk has been left to stand for at least half an hour. The simplest way of collecting it is by skimming it off the top of milk. 10 liters of whole milk usually produces 1-2 liters of cream. Skimmed milk remains after the cream is removal, and it is still very nutritious, due to its contents of nearly all the protein portion of milk. One can either drink it or use for sour milk or cheese production. Sour (fermented) cream and milk are produced by incubation of inoculated fresh cream or fresh milk. A culture of lactic acid bacteria is used for inoculation of the fresh milk or the fresh cream. Butter (80% fat) and buttermilk are made by churning cream or milk. 100 liters of whole milk with a 4% fat content produces 20-30 liters of cream, which yields about 24 kg of butter.

Butter milk is the whitish, flavor, more acidic fluid left over after churning butter for the preparation of ghee in the unorganized, traditional, household sector. It is directly consumed, with or without any salt added. Ghee, the butter-fat prepared chiefly from cow milk, is the most common milk product. It is used as a cooking or frying medium, and is also consumed directly apart from being used in confectionery and in traditional medicines.

Self-Check -1	Written test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

Explain the best useful principles of post harvest

Explain Post-harvest management practices that reduce product loss

Explain the milk preservation techniques.

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LG # 110	LO2. Promote nutrition through behavior change communication

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: –

- Identifying basic concepts of nutrition behaviour change communication
- Identifying nutrition behaviour change communication strategies and tools
- Identifying contextual and cultural situation of the community nutrition practice
- Identifying existing food taboos that affect maternal, child and adolescent nutrition
- Developing and communicating appropriate messages for a targeted audience
- .Describing code of ethics and statement of professional conduct in relation to nutrition

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to: -

- Identify basic concepts of nutrition behaviour change communication
- Identify nutrition behaviour change communication strategies and tools
- Identify contextual and cultural situation of the community nutrition practice
- Identify existing food taboos that affect maternal, child and adolescent nutrition
- Develop and communicate appropriate messages for a targeted audience
- Describe code of ethics and statement of professional conduct in relation to nutrition

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet3”.
4. Accomplish the “Self-check 1, Self-check 2,and Self-check 3”respectively.

Info Information sheet 1	Identifying basic concepts of nutrition behaviour change communication

Communicators understand that channels tend to fall into three main categories. There has been a complete revision of the concepts, strategies and methods of nutrition education in the 1 980's.

Typically, nutrition education consisted of little more than "talks" given at health centers. Today, this approach is considered largely ineffective unless it is fully integrated into a broader program of nutrition education with well-defined strategies for communication.

The reasons for failure of "conventional" nutrition education have been the subject of numerous in-depth analyses. The "conventional" approach is limited because it excludes analysis of the causes of malnutrition; it makes use of only one isolated channel of communication (an interpersonal channel between the health worker and the population) and ineffective educational methods. It is based on weak unsupported theories of "behavioral psychology".

During the last two decades, interdisciplinary teams in collaboration with persons involved in nutrition education field activities have developed new approaches to nutrition education. The approach presented in this manual is based on work carried out by RENA, a network for nutrition education in Africa. The approach makes use of certain elements of a theoretical framework from the literature.

First, it is necessary to clarify the frame of reference for the approach to be presented.

In nutrition education, there are two distinct situations, namely, patient education and public education.

Patient education occurs during personal contact between the health worker and his patient. This is person-to-person communication during which the health worker communicates with an individual in order to improve the parents' or their child's nutritional status. This approach fails outside the domain of this guide.

Public education consists of interventions for improving the health of the general public. Nutrition education is concerned with modifying social communication to bring about middle or long-term changes in the common behavior of the population. When interpersonal communication forms part of the proposed strategy, it has a complementary role, reinforcing other activities aimed at changing the behavior of an entire social group.

A global approach to nutrition education

What is social communication?

It is defined here as that set of norms which determines how individuals of the same culture interact.

The modification of these norms is the ultimate aim of nutrition education directed at the general public. Nutrition education consists of interventions into the realm of social communication with the aim of changing undesirable nutrition-related habits.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

Explain how communication rather than talks improve the nutritional needs of humans..

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Name: _____ Date: _____

Info Information sheet 2	I identifying nutrition behavior change communication strategies and tools

Communicators understand that channels tend to fall into three main categories

• Mass media. These channels have broad reach and include television, radio, newspapers, magazines, outdoor and transit advertising, direct mail and websites. Placement through these channels may be free through PSAs or may incur a cost if placement on certain platforms or at specific times is important.

• Organization and community. These channels reach specific groups of individuals based on geography (for example, a specific village) or a common interest, such as occupational status. Channels may include community-based media, such as local radio talk shows, organization newsletters; community-based activities, such as health fairs; and meetings at schools, workplaces and houses of worship.

• Interpersonal. People seeking advice or sharing information about health risks often turn to family, friends, health care practitioners, co-workers, teachers, counselors, and faith leaders. These one-on-one discussions are often the most trusted channels for health information.

Inter sectarian and interdisciplinary considerations

Nutrition education is an activity which requires the involvement of specialists from different areas: Education, Communication, Agriculture, Horticulture, Public Health and Nutrition. The analysis of the causes of malnutrition reveals that a multiplicity of factors conditions malnutrition. Even at the levels of the village community, interdict slippery Communicators understand that channels tend to fall into three main categories.

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Inter sectarian and interdisciplinary considerations

Nutrition education is an activity which requires the involvement of specialists from different areas: Education, Communication, Agriculture, Horticulture, Public Health and Nutrition. The analysis of the causes of malnutrition reveals that a multiplicity of factors conditions malnutrition. Even at the levels of the village community, an interdisciplinary effort is needed (for example, collaboration between the teacher, agricultural and the health worker). Interdisciplinary work requires intersect oral collaboration because it is rare to find specialists in all the disciplines needed in any one ministry. The multimedia approach in itself requires intersect oral action as the use of several channels of communication generally implies the participation of several ministerial departments. Interconnect spoken and interdisciplinary considerations

The adoption of a rational course of planning

Many interventions in the fields of agriculture, health or nutrition aimed at changing habits, have failed because of inappropriate planning. More development agents now insist on planning by objectives for their projects. Nutrition education is effective only when it is based on an in-depth analysis of nutritional problems and a clear concise definition of objectives and the methods of communication. Continuous evaluation is essential and beneficial as a basis for redefining strategies and actions during the course of the project.

Self-Check -2	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

1. Explain the three communication channel through which information about nutrition can reach the community.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Name:_____ Date: _____

Information sheet 3	**Identifying contextual and cultural situation of the community nutrition practice**

Culture is the complex set of beliefs of human societies; their roles, behavior, values, customs, and traditions. Cultural factors greatly contribute for the effectiveness and success of community based nutrition interventions particularly of nutrition education and behavior change communication activities. In addition to the way people dress and interact each other, cultural factors also exert the broadest and deepest influence on food production, handling and preserving, marketing strategies, consumer behavior, and feeding practices in a certain community. Culture influences food consumption through the norms and values established by the society in which they live

Feeding and dietary practices of a community are closely linked to the culture of that community. Culture influences what and how people eat. It has a broad influence on their buying and utilization behavior of food products and services, and the extent of their satisfaction. Cultural beliefs and food taboos of the community will affect the way families practice child and maternal feeding and care. The nutritional status of children, adolescents and mothers in general and that of the community members in general is highly dependent of cultural beliefs and food taboos.

The cultural factors, and the way they interact, need to be identified in order to understand the dynamics behind success. The development workers and nutrition intervention implementing partners need to consider and clearly understand the contextual and cultural factors in the community. In promoting and assisting diversified foods production and consumption development extension workers should work in line with the contextual and cultural factors. Useful traditional feeding practices should be identified, acknowledge and promoted. Harmful feeding practices and food taboos that hinder optimal child and maternal nutrition should also be identified and addresses through behavior change communication

Self-Check -3	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

1. Explain the culture changes the nutritional needs of individuals.
2. Explain what is mode of communication.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Name_____

Score = _____

Rating: _____

Date: _____

Information sheet 4	Identifying existing food taboos that affect maternal, child and adolescent nutrition

4.1. Women's nutrition

Some evidence in developing countries indicate that malnourished individuals, that is, women with a body mass index (BMI) below 18.5, show a progressive increase in mortality rates as well as increased risk of illness. For social and biological reasons, women of the reproductive age are amongst the most vulnerable to malnutrition. Increased prenatal and neonatal mortality, a higher risk of low birth weight babies, stillbirths, and miscarriage are some of the consequences of malnutrition in women. Some of the socioeconomic and demographic factors explaining women's nutrition according to studies done in different places are reviewed below.

Household economic status

The economic status of a household is an indicator of access to adequate food supplies, use of health services, availability of improved water sources, and sanitation facilities, which are prime determinants of child and maternal nutritional status. Women from low economic status households were the most affected by malnutrition.

Education status of women

Women who receive even a minimal education are generally more aware than those who have no education of how to utilize available resources for the improvement of their own nutritional status and that of their families. Education may enable women to make independent decisions, to be accepted by other household members, and to have greater access to household resources that are important to nutritional status. Place of residence

A comparative study on maternal nutritional status in 16 of the 18 DHS conducted countries (Laos, 1997) and a study in the SNNPR of Ethiopia (Teller and Yimar, 2000) showed that rural women are more likely to suffer from chronic energy deficiency than

women in urban areas. These higher rates of rural malnutrition were also reported by local studies in Ethiopia

Women's employment and control over income

Women's employment increases household income, with consequent benefit to household nutrition in general and the woman's nutritional status in particular. Employment may increase women's status and power, and may bolster a woman's preference to spend her earnings on health and nutrition. Though employed, women without control over their income and decision making authority within the household are deprived of economic and social power and the ability to take actions that will benefit their own well-being.

Age of women

Women's age and parity are important factors that affect maternal depletion, especially in high fertility countries.

A local study in Ethiopia also showed that women in the youngest age group (15-19) and women in the oldest age group surveyed (45-49) is the most affected by under nutrition.

Marital status of women

Marital status of the women is associated with household headship and other social & economic status of the women that affects their nutritional status. Nutritional and social security's could be endangered by a negative change in marital status.

4.2 Child nutrition

Approximately 10 percent of children born in Ethiopia will die before their first birthday and 17 percent will die before their fifth birthday (CSA and ORC Macro, 2001). According to formulas developed by Pelletier et al. (1994), 57 percent of under-five mortality in Ethiopia is related to severe and mild to moderate malnutrition.

The consequences of malnutrition in children also include poor physical development and limited intellectual abilities that diminish their working capacity during adulthood.

Household economic status

As in the case of women, the economic status of a household is also one of the most important determinants of child nutritional status. Comparative studies on child nutrition for more than 15 countries and some local studies in Ethiopia showed that the higher the level of economic status of the household, the lower the level of child stunting.

Education of mother

Education is one of the most important resources that enable women to provide appropriate care for their children, which is an important determinant of children's growth and development.

Employment status of mothers

Although women's employment enhances the household's accessibility to income, it may also have negative effects on the nutritional status of children, as it reduces a mother's time for childcare.

Source of water and availability of toilet facility

UN favorable health environment caused by inadequate water and sanitation can increase the probability of infectious diseases and indirectly cause certain types of malnutrition.

Child morbidity

Diarrhea and other infectious diseases manifested in the form of fever affect both dietary intake and utilization, which may have a negative effect on improved child nutritional status.

Age of child

Children's nutritional status is also more sensitive to factors such as feeding/weaning practices, care, and exposure to infection at specific ages. A cumulative indicator of growth retardation (height-for-age) in children is positively associated with age

Birth order

It is expected that parents give less attention to older children when they give birth to a new child who needs much attention and care.

Birth interval of the child

Closely spaced pregnancies are often associated with the mother having little time to regain lost fat and nutrient stores. Higher birth spacing is also likely to improve child nutrition, since the mother gets enough time for proper childcare and feeding. Interrelationship between maternal and child nutrition

Birth weight, child growth, and adolescent growth determine nutritional status before and during pregnancy (maternal nutrition). Maternal nutrition also influences fetal growth and birth weight. The presence of an intergenerational link between maternal and child nutrition means a small mother will have small babies who in turn grow to become small mothers.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

Explain how the taboos influence the nutritional needs of women's and children's..

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Name----------

Score = _____

Rating: _____

Date: _____

Information shee 5	Developing and communicating appropriate messages for a targeted audience

5.1. Guidance for Developing Key Messages

What are key messages and why are they important?

- Key messages are the main points of information you want your audience to hear, understand, and remember. They are bite-sized summations that articulate what you do, why you do it, how you are different, and what value you bring to stakeholders.
- Key messages clarify meaning and provide the takeaway headline of the issue you want to communicate.
- Key messages are important because they serve as the foundation of an organization's branding and marketing efforts and should be reflected in all written and spoken communications.
- Communications cannot always be controlled, but key messages can. They help you to:
  Prioritize and define information
  Ensure consistency, continuity and accuracy
  Measure and track success; and
  Stay focused when speaking with the media or stakeholders.
  What are the attributes of good key messages?
  Effective key messages are:
- Concise: Focus on three to five key messages per topic; write one to three sentences for each key message; should be read or spoken in 30 seconds or less.
- Strategic: Define, (separate) differentiate, and address benefits.
- Relevant: Balance what you need to communicate with what your audience needs to know.
- Compelling: Design meaningful information to stimulate action.

- Simple: Use easy-to-understand language; avoid jargon and acronyms.
- Memorable: Ensure that messages are easy to recall and repeat; avoid long, run-on sentences.
- Real: Use active voice, not passive; do not use advertising slogans.
- Tailored: Communicate effectively with different target audiences by adapting language and depth of information.

How do you create key messages?

Ideally, developing key messages should be done through a three-phase process:

Phase 1: Brainstorm key message concepts with internal stakeholders.

Whenever possible, work with your organization's communication staff to hold a key message development brainstorm session. Include internal stakeholders who ultimately need to approve the key messages.

Make sure the person facilitating the brainstorm has access to flip charts, white boards, or smart boards to capture essential words, phrases, and explanations that can be used in the key messages.

As you begin the brainstorm, gather core information that will help guide the message development process: Identify your communication goals.

The key messages should support these goals.

Identify your messaging needs, and consider whether they are long-term or support a specific offering, issue, situation. or combination of topics.

Consider the people in your target audience. What do they need and want to hear from you? Do you have multiple target audiences? If so, tailor key messages to each group.

After you identify your communication goals, message needs, and target audience, then you can develop key messages by answering the following questions. Try to keep your answers concise and avoid using technical jargon.

What overarching message do you want to tell the target audience about your issue, product, service, organization, or research finding? Why is this overarching message important to them?

Why is it unique or different?

Why would the target audience care to know this information?

What are the benefits and value proposition? Think about the WIFM (what's in it for me) for the target audience.

What are the barriers or challenges? Develop the messages around these issues.

As you answer the questions, prove your points with supporting information to substantiate, distinguish, and add credibility. Presenting facts, figures, and statistics; quoting authorities; telling stories; and using visuals can be effective.

Conclude the message brainstorm session by achieving no more than five key messages and have supporting points for each of them. Phase 2: Refine draft key messages. Phase 3: Test, finalize, and routinely update key messages

Self-Check -5	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

1. Explain the attributes of good messages.
2. What are the benefits and value proposition?

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Name_____

Score = _____

Rating: _____

Date: _____

Information sheet 6	Describing code of ethics and statement of professional conduct in relation to nutrition

6.1. Principles and standards

Competence and professional development in practice (Non-Malfeasance)

- Nutrition and dietetics practitioners shall:

✓ Practice using an evidence-based approach within areas of competence, continuously develop and enhance expertise, and recognize limitations.

✓ Demonstrate in depth scientific knowledge of food, human nutrition and behavior.

✓ Assess the validity and applicability of scientific evidence without personal bias.

✓ Interpret, apply, participate in and/or generate research to enhance practice, innovation, and discovery.

✓ Make evidence-based practice decisions, taking into account the unique values and circumstances of the patient/client and community, in combination with the practitioner's expertise and judgment.

✓ Recognize and exercise professional judgment within the limits of individual qualifications and collaborate with others, seek counsel, and make referrals as appropriate.

✓ Act in a caring and respectful manner, mindful of individual differences, cultural, and ethnic diversity.

✓ Practice within the limits of their scope and collaborate with the inter-professional team.

- Integrity in personal and organizational behaviors and practices (Autonomy)

Nutrition and dietetics practitioners shall:

✓ Disclose any conflicts of interest, including any financial interests in products or services that are recommended. Refrain from accepting gifts or services which

potentially influence or which may give the appearance of influencing professional judgment.

- ✓ Comply with all applicable laws and regulations; including obtaining/maintaining a state license or certification if engaged in practice governed by nutrition and dietetics statutes.
- ✓ Maintain and appropriately use credentials.
- ✓ .Respect intellectual property rights, including citation and recognition of the ideas and work of others, regardless of the medium (e.g. written, oral, electronic).
- ✓ .Provide accurate and truthful information in all communications.
- ✓ Report inappropriate behavior or treatment of a patient/ client by another nutrition and dietetics practitioner or other professionals.
- ✓ Document, code and bill to most accurately reflect the character and extent of delivered services.
- ✓ Respect patient/client's autonomy. Safeguard patient/client confidentiality according to current regulations and laws. i. Implement appropriate measures to protect personal health information using appropriate techniques (e.g., encryption).

- Professionalism (Beneficence)

Nutrition and dietetics practitioners shall:

- ✓ Participate in and contribute to decisions that affect the well-being of patients/clients. b. Respect the values, rights, knowledge, and skills of colleagues and other professionals.
- ✓ Demonstrate respect, constructive dialogue, civility and professionalism in all communications, including social media.
- ✓ Refrain from communicating false, fraudulent, deceptive, misleading, disparaging or unfair statements or claims.
- ✓ Uphold professional boundaries and refrain from romantic relationships with any patients/clients, surrogates, supervisees, or students.
- ✓ Refrain from verbal/physical/emotional/sexual harassment.

- ✓ Provide objective evaluations of performance for employees, coworkers, and students and candidates for employment, professional association memberships, awards, or scholarships, making all reasonable efforts to avoid bias in the professional evaluation of others.
- ✓ Communicate at an appropriate level to promote health literacy.
- ✓ Contribute to the advancement and competence of others, including colleagues, students, and the public.
- Social responsibility for local, regional, national, global nutrition and well-being (Justice)

Nutrition and dietetics practitioners shall:

- ✓ Collaborate with others to reduce health disparities and protect human rights.
- ✓ Promote fairness and objectivity with fair and equitable treatment.
- ✓ Contribute time and expertise to activities that promote respect, integrity, and competence of the profession.
- ✓ Promoted. The unique role of nutrition and dietetics practitioners.
- ✓ Engage in service that benefits the community and to enhance the public's trust in the profession.
- ✓ Seek leadership opportunities in professional, community, and service organizations to enhance health and nutritional status while protecting the public

Self-Check -6	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

Explain the Competence and professional development in practice.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Name_____

Score = _____

Rating: _____

Date: _____

LG # 111	LO3 : Apply multispectral collaboration and linkage principles for nutrition

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: –

- Identifying and applying rationale, and advantages of multi-spectral collaboration
- . Identifying and promoting importance of agriculture sector for nutrition and vice versa
- . Applying agriculture, nutrition, and health linkage

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to: -

- Identify and apply rationale, and advantages of multi-spectral collaboration
- Identify and promote importance of agriculture sector for nutrition and vice versa
- Apply agriculture, nutrition, and health linkage.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet 3”.
4. Accomplish the “Self-check 1, Self-check 2, and Self-check 3” respectively.

Information sheet 1	Identifying and applying rationale, and advantages of multi-spectral collaboration

As discussed in the first chapter malnutrition is caused by many different factors at different levels. To improve the nutritional status of a community all these factors at different levels should be addressed. Interventions implemented to address the immediate causes of malnutrition are called direct nutrition interventions or nutrition-specific interventions. While interventions implemented to address the underlying and the basic causes of malnutrition are called indirect nutrition interventions or nutrition-sensitive interventions. Nutrition-specific interventions include exclusive breast feeding, complementary feeding and micronutrient supplementations. Most of the nutrition-specific interventions are implemented by the health sector. Nutrition-sensitive interventions include different nutrition related activities implemented in different sectors such as agriculture, social protection, water and sanitation, industries etc.

Evidence shows that direct actions to address the immediate causes of under nutrition can be further enhanced by action on some of the more distal or underlying determinants. For example, in addition to supporting improved infant and young child feeding practices, addressing gender issues through health, agriculture or education programs can have a powerful impact in preventing under nutrition by reducing women's workloads and allowing them more time for child care. Similarly, in addition to providing micronutrient supplements to address micronutrient deficiencies, improving food security, and enhancing hygiene and environmental issues have been shown to improve nutrition outcomes among children.

1.2. Promoting Importance of Agriculture Sector for Nutrition

Some of the nutrition-sensitive interventions in different sectors are important role for nutrition. Agriculture has a unique and critical role in improving nutrition outcomes,

unique role in food production and consumption makes it indispensable sector for food and nutrition security, improved agricultural productivity and food security are vital for nutrition security.

The following are some of the reasons explaining why agriculture is important sector for nutrition security.

Agriculture food products and affects consumption

Agriculture sector directly affects food production and consumption of nutritious foods needed for healthy and active lives. Physical and economic access to adequate and affordable nutritious food is primarily a function of the agriculture sector through increased production and improved post-harvest storage and processing.

Majority of undernourished people in the world is involved in Agriculture

Agriculture has the most direct influence on the majority of households in the world where undernourished individuals reside. Among the world poor peoples, 75% are rural, and most of those are smallholder farmers. Nutrition is one of the development activities of this population having an enormous potential to impact on factors that constrain human capital and well-being. For example, agriculture extension workers have direct and ongoing contact with smallholder farmers, and therefore have a unique opportunity to strengthen messages regarding consumption of nutritious foods.

Agricultural growth is more pro-poor

Agriculture-led growth and development is more pro-poor than non-agricultural-led growth; thereby increasing agriculture's potential to improve nutrition. Agricultural growth is at least twice as effective in reducing poverty as GDP growth originating outside agriculture and is therefore pro-poor. Agriculture-led growth has led to faster (though still insufficient) declines in under nutrition than non-agricultural growth.

A large percentage of rural women are employed in the formal/informal agriculture

Women contribute over 50% of the agriculture labor force in many developing countries. Agricultural interventions will have a large direct impact on nutrition outcomes for the entire household through increased discretionary income and reduced workloads for women.

Some agriculture projects could cause unintended nutritional harm.

Nutritional status of household members is strongly influenced by clean water, disease occurrence, food quality, and child care practices. Several unintended but related consequences, such as reducing women's available time for child care, have been documented as arising from some agricultural interventions.

1.3 Importance of Nutrition for Agriculture sector

Under-nutrition is intimately linked with both poverty and the well-being of smallholder farmer, and thus, it is a major constraint to rural development among farmers. When farmers are undernourished, they are less productive. Furthermore, undernourished children are less likely to attend school. These children in smallholder families are less likely to transition out of small-scale farming, and thereby fail to get out of the poverty trap. Improving nutrition can benefit agriculture sector performance at least in the following four ways:

Improved nutrition means improved smallholder farmers well-being.

Reducing malnutrition among the world's most vulnerable people is the main objective of poverty reduction programs of different international donor and civil society organizations. Most of these agriculture program and projects have the goal of improving the well-being of farmers and poor people living in rural areas, and this will be possible only when the nutritional status of the community members is improved.

Nutrition investments improve human capital and have a positive impact on agricultural productivity.

Smallholder farmers are often among the populations most likely to be malnourished. Women smallholder farmers, who form a majority of the agricultural labor force in many cases, are disproportionately likely to be malnourished. Under nutrition accounts for the majority of maternal and child deaths and this is naturally reflected in communities with poor agricultural productivity. Evidence shows that when farmers are malnourished, they are less productive. Iron deficiency anemia results in lower work capacity. In an agricultural context, anemia has been shown to reduce productivity by 17 %. Overall, malnutrition diminishes lifetime earnings by 10% or more, and reduces GDP by 2-3% in

the worst affected countries. Investments in human capital, including nutrition, consistently have been shown to increase productivity.

Nutrition knowledge may be an added incentive for transition to a diversified production model

Transition of households to diversified production is an often-cited goal for the agricultural sector to raise household income, minimize risk exposure, and promote ecosystem resilience. Nutrition education and information can be leveraged to improve both supply and demand for high-value vegetables, fruits, legumes, fish, and livestock products. Nutrition knowledge among farmers could be an additional incentive for farmers to diversify their production model to include nutritious, high-value crops, beyond the widely recognized incentives to reduce risk exposure to weather, biotic stress, or price shocks. Additionally, nutrition knowledge among consumers can increase demand for high-value nutritious products substantially, and increase income for farmers who grow them.

Nutrition sensitivity promotes agricultural productivity through better women participation and empowerment

Adopting a nutrition lens is likely to improve women's participation and empowerment, with important effects on income and productivity, in addition to nutrition and gender equity. Approximately half the world's farmers are women. In some countries, the ratio is much higher. In Southeast Asia, women supply up to 90% of the labor required for rice

Self-Check -1	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

Explain the advantages of multi sectarian communication on nutrition

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet	Identifying and promoting importance of agriculture sector for nutrition and vice versa

Understanding the Concepts of Nutrition and Social Protection in the Food and Agriculture Sector

2.1. The multiple causes of malnutrition and the role of agriculture

There are two questions that are central to any intervention that aims to address malnutrition:

Who is most vulnerable to or affected by malnutrition (which individuals and groups)?

b. Why are they vulnerable to or affected by malnutrition?

Regarding the first question, it is important to make a distinction between physiological vulnerability and socio-economic vulnerability.

Those who are usually the most physiologically vulnerable to health and nutrition-related diseases include pregnant and lactating women, children less than five years old, the elderly, people living with human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) and disabled people. Moreover, research has shown that malnutrition during the 1000 days between pregnancy and a child's second birthday has the greatest adverse long-term effects on the individual's educational achievement and earning potential.

Conversely, it is now firmly established that sufficient and adequate nutrition during the same period increases resilience to shocks and stresses not only at the individual level but also at the household, community and national level. This 1000-day period therefore represents a critical window of opportunity to establish a lasting foundation for health through adequate nutrition

In socio-economic terms, those individuals and households most affected by malnutrition tend to be those with the lowest incomes, who are most economically and socially mar-finalized and whose livelihoods are most eroded

It is important to consider both types of vulnerability and the interactions between them.

What is malnutrition?

Malnutrition refers to an abnormal physiological condition caused by deficiencies, excesses or imbalances in energy and/or nutrients necessary for an active, healthy life. The term encompasses under nutrition, over nutrition and micronutrient deficiencies.

Over nutrition is a result of excessive food intake relative to dietary nutrient require-mends.

Under nutrition, too little food intake relative to nutrient requirements, can manifest in the form of acute malnutrition or wasting (low weight-for-height), chronic mal-nutrition or stunting (low height-for-age) and underweight (low weight-for-age). Both over- and under nutrition can be associated with micronutrient deficiencies (shortage of minerals and/or vitamins).

The term micronutrient deficiency, sometimes also called “hidden hunger”, re-fers to an inadequate intake of essential vitamins and minerals. All micronutrients are important for growth, health and development, but the three most significant ones at global level are Vitamin A, iron and iodine.

Vitamin A deficiency causes severe eye disease that can result in blindness. It impairs the immune system and increases the severity and mortality risk of measles and diarrhea.

Lack of iron is the most common nutritional disorder in the world and eventually results in iron-deficiency anemia, reducing the learning and work capacity of individuals.

Io-dine deficiency disorders jeopardize children’s mental development and often their very survival. Other terms which are often used in the context of malnutrition refer to anthropometric measurements of children.

Wasting reflects acute malnutrition, and is generally the result of weight loss associated with a recent period of starvation or disease, characterized by low weight-for-height.

Stunting reflects chronic mal-nutrition and is generally the result of inadequate food intake and/or repeated infections over an extended period of time, characterized by low height-for-age.

Underweight in children refers to a condition of low weight-for-age and is usually the result of acute under nutrition.

Malnutrition undermines economic growth Well-nourished children perform better in school than malnourished children and this can add at least 10 percent to their personal lifetime earnings and contribute to a more productive labour force resulting in a 2–3 percent increase in annual GDP for a country.

Self-Check -2	Written Test

Test I: Choose the best answer (2 point)

1. From the following one which one is difference the other.

A. nutrition B malnutrition

C. Underweight D. Over weight

1 What is mal nutrition?

2 What The term micronutrient deficiency and macronutrient deficiency?

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Date: _____

Information sheet 3	Applying agriculture, nutrition, and health linkage

3.1 The following are some of the reasons explaining why agriculture is important sector for nutrition security.

Agriculture food products and affects consumption

Agriculture sector directly affects food production and consumption of nutritious foods needed for healthy and active lives. Physical and economic access to adequate and affordable nutritious food is primarily a function of the agriculture sector through increased production and improved post-harvest storage and processing

Majority of undernourished people in the world is involved in Agriculture

Agriculture has the most direct influence on the majority of households in the world where undernourished individuals reside. Among the world poor peoples, 75% are rural, and most of those are smallholder farmers.

Agricultural growth is more pro-poor

Agriculture-led growth and development is more pro-poor than non-agricultural-led growth; thereby increasing agriculture's potential to improve nutrition. Agricultural growth is at least twice as effective in reducing poverty as GDP growth originating outside agriculture and is therefore pro-poor.

A large percentage of rural women are employed in the formal/informal agriculture

Women contribute over 50% of the agriculture labor force in many developing count

Some agriculture projects could cause unintended nutritional harm.

Nutritional status of household members is strongly influenced by clean water, disease occurrence, food quality, and child care practices.

3.2.2. Importance of Nutrition for Agriculture sector

Under-nutrition is intimately linked with both poverty and the well-being of smallholder farmer, and thus, it is a major constraint to rural development among farmers. When farmers are undernourished, they are less productive. Furthermore, undernourished children are less likely to attend school.

Improving nutrition can benefit agriculture sector performance at least in the following four ways:

Improved nutrition means improved smallholder farmers well-being.

Reducing malnutrition among the world's most vulnerable people is the main objective of poverty reduction programs of different international donor and civil society organizations.

Nutrition investments improve human capital and have a positive impact on agricultural productivity.

Smallholder farmers are often among the populations most likely to be malnourished. Women smallholder farmers, who form a majority of the agricultural labor force in many cases, are disproportionately likely to be malnourished.

Nutrition knowledge may be an added incentive for transition to a diversified production model

Transition of households to diversified production is an often-cited goal for the agricultural sector to raise household income, minimize risk exposure, and promote ecosystem resilience. Nutrition education and information can be leveraged to improve both supply and demand for high-value vegetables, fruits, legumes, fish, and livestock products.

Nutrition sensitivity promotes agricultural productivity through better women participation and empowerment

Adopting a nutrition lens is likely to improve women's participation and empowerment, with important effects on income and productivity, in addition to nutrition and gender equity. Approximately half the world's farmers are women. In some countries, the ratio is much higher.

Retaining female participation may improve if agriculture projects adopt nutrition sensitive approaches. Agriculture and health are the two broad sectors that contribute the majority of determinants of nutritional status. Nutrition is the bridge between agriculture and health. Good health outcomes such as reduced child and maternal mortality depend on good nutrition. Good nutrition in turn depends on agriculture for different foods for a balanced diet that meets our needs for energy, protein, vitamins and

minerals. The linkage between agriculture and nutrition has reciprocal benefit. Citizens will not get balanced diet unless nutritious food availability, access, and affordability is ensured through diversified agricultural production. Agricultural growth and productivity will not be achieved with a working force having poor nutritional and health status. Farmers suffering from malaria, TB, HIV/AIDS and anemia for example will not be strong enough to be productive in the farm. Children suffering from hunger and with ill health will not perform better in school. Poor access to safe drinking water, hygiene and sanitation will also influence the nutritional and health status, and agricultural productivity of communities.

3.3.1. Poor nutrition and Health outcomes

The pathway between poor nutrition and health status operates largely through a compromised immune system due to micronutrient deficiencies as well as growth failure. Vitamin A deficiency increases the incidence and risk of dying from measles, respiratory tract infections, and diarrhea.

Other micronutrient deficiencies (zinc, iodine, and iron), also depress the immune system.

Poor maternal nutrition during pregnancy can cause intrauterine growth restriction leading to low birth weight, and increased risk of infections, poor growth, and greater risk of onset of chronic diseases in adulthood

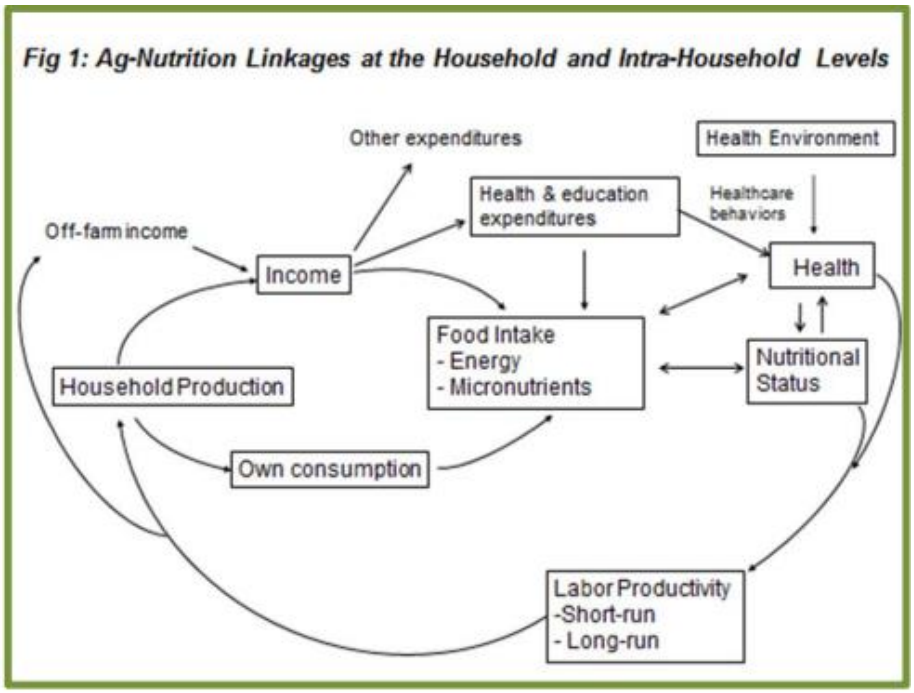

Fig 8: Under nutrition can accelerate the severity of infectious disease, and the progression of HIV/AIDS.

Self-Check -3	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

Explain the importance agriculture in nutritional security.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Name_____

Score = _____

Rating: _____

Date: _____

LG-112	LO 4: Implement nutrition program intervention

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: –

- Identifying basic steps for planning nutrition intervention
- Designing nutrition program Implementation strategies
- Monitoring and evaluating nutrition sensitive interventions based
- using appropriate indicators and measuring nutrition program outcome

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to: -

- Identify basic steps for planning nutrition intervention
- Design nutrition program Implementation strategies
- Monitor and evaluate nutrition sensitive interventions based
- use appropriate indicators and measuring nutrition program outcome

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet 3”.
4. Accomplish the “Self-check 1, Self-check 2,and Self-check 3” in page -4, 6 and 9 respectively.

Information sheet 1	identifying basic steps for planning nutrition intervention

Basic Steps for Planning Nutrition Intervention

Planning appropriate community based nutrition interventions requires the participation of development workers of agriculture, health, water and sanitation, and other related sectors. The agriculture development workers should actively participate in the community based nutrition interventions planning, and implement and monitor these programs. Before starting to plan nutrition programs, the planners should clearly understand the contemporary evidence based on nutrition interventions. Clearly understand the basic steps for planning, such as:

Step 1- Analyzing the situation: Identifying the main nutritional problems, and Reviewing existing nutrition interventions

The planning of nutrition or any other type of development intervention starts with an analysis of the situation. The purpose of situational analysis is to identify the needs, interests, priorities and resources in the community of interest. The analysis begins with general nutrition related situations in the community and identification of stakeholders. Using appropriate data sources, the planning team involving relevant stakeholders should analyze the nutritional status of the different segments of the target community with particular emphasis on children and women. The planning team should identify the nature of the prevailing nutrition problems (energy and protein deficiency, micronutrient deficiency or overweight and obesity in the community. The population groups which most from these problems should also be identified, e.g., smallholder farm families, landless laborers, women-headed families, Orphan and vulnerable children etc.

Child nutritional status can be assessed using stunting, wasting and underweight rates, and number of severely acute malnourished children in the targeted community. Data from Growth Monitoring and Promotion (GMP) can be used to assess child malnutrition status. Anthropometric data may also be used. The nutritional status of women can be

assessed using data on the percentage of undernourished and anaemic reproductive age groups. The vitamin A, iron and iodine deficiency status of the community should also be assessed. At the conclusion of this step the most important nutritional problems are identified

Step 2- Cause Analysis

In order to address the identified nutritional problems, the causes of these problems should be identified. Identifying the household food security status, child and maternal feeding practices, community and health-facility based nutrition service provision will help to identify the immediate and underlying causes of the nutritional status of the target community.

Step 3- Setting Objectives and Targets

Based on the identified causes of the prevailing nutritional status of the target community, the planning group will propose solutions which will be translated in to objectives. The nutritional problems identified as negative situations in step one will be changed in to positive situation and this positive situation will be set as objectives to be achieved through interventions to be implemented.

Step 4- Reviewing existing nutrition interventions

The nutrition interventions and approaches implemented in the community, and the responsible sectors and organizations should be identified. The planning team should review and identify the nutrition specific and nutrition sensitive interventions (services) both at health facility and community levels including the targeted groups. The planning team should also be well aware of the national nutrition strategy and program directions. This will help the decision whether to strengthen or modify the existing interventions or to plan for new ones. This will help the planning team to map the existing capacity of local nutrition services at the community and facility level to inform subsequent decision making on appropriate nutrition approaches.

Step5. Selecting interventions and setting implantation strategies (Approaches)

Based on the objectives to be achieved, and the national/regional nutrition policy directions the planning team will select appropriate direct nutrition specific and indirect nutrition sensitive interventions and design implementation approaches. This step will result in list of all potential preventative and curative approaches that could be considered based on an analysis of the needs and resources in the target area.

Self-Check -1	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (10 pts each)

1 Explain the basic steps in nutritional planning

.

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Name_____ Date: _____

1

Information sheet 2	Designing nutrition program Implementation strategies

2.1 Nutrition Interventions Implementation Approaches

The appropriate nutrition implementation support groups will help for program effectiveness. After the priority nutrition actions and services are identified, the planning team should select the appropriate community based nutrition support group that will promote and facilitate the implementation of the interventions. Tasks and responsibilities has be defined and assigned to each support group. To insure the effectiveness and sustainability of the interventions, the planning team should ensure the active participation of community level social and political leaders and women's groups. The involvement and participation of other groups such as mothers group, farmers' cooperatives, schools, and water and sanitation committees will play significant role for the successful implementation of the community based nutrition intervention. An effective strategy should be designed to foster responsibility, commitment, and accountability and communication among the key partners such as health facilities, community institutions, and external organizations.

Self-Check -2	Written Test

Test I: Choose the best answer (5 point)

1. From the following which one is the planning team should ensure the active participation .

A. of community level B. social and political leaders

B. Women's groups. D. Water and sanitation

E. all

1 Explain the meaning of nutritional intervention.

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Name_____

Name: _____ Date: _____

Information sheet 3	Monitoring and evaluating nutrition sensitive interventions based

Monitoring is the systematic and continuous assessment of the progress of a piece of work over time…It is a basic and universal management tool for identifying the strengths and weaknesses in a program. Its purpose is to help all the people involved make appropriate and timely decisions that will improve the quality of the work. It is conducted to check whether the implantation progress is on the right truck or not. The information obtained from monitoring is usually used to take corrective measures such as activity revisions and verifies targeting criteria. The implementation of the program/project will be modified based on the existing contextual situations. Monitoring is conducted to direct the implantation towards achieving the desired objectives.

Evaluation is defined as the systematic and objective assessment of an ongoing or completed intervention, program or policy, its design, implementation and results. The aim is to determine relevance and fulfillment of objectives, as well as efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned for future decision making. Evaluation attempts to link a particular output or outcome directly to an intervention after a period of time has passed.

The evaluation is usually carried out at some significant stage in the project's development, at the middle of the project life and at the end of programs.

Self-Check -3	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

1. Explain the difference between monitoring and evaluation in nutrition.

.

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet 4	Appropriate indicators and measuring nutrition program outcome

4.1 Measuring the nutritional outputs and outcomes of agricultural interventions.

In order to monitor and evaluate effectively, the activities should be participatory. All stakeholders including the direct program targets must be involved in the monitoring and evaluation processes. Stakeholders should be well aware of the indicators and targets against which monitoring and evaluation data will be collected. Indicators are variable that can be measured to assess the nutritional status of individuals/ households directly or indirectly.

Measuring nutritional outputs and outcomes of the agricultural programs will help to ensure the nutrition sensitivity of the agriculture programs. Explicit nutrition objectives and interventions should be accompanied by indicators to measure progress at the output, outcome, or impact levels. Monitoring and evaluation of the nutritional impact of agricultural programs is usually considered difficult, and even some times impossible. But it is quite possible if appropriate nutrition related indicators are incorporated during the planning phase. Nutritional status at the community level is measured with anthropometric or biochemical indicators. The impact of nutrition interventions at the community level can most directly be measured by using anthropometric or biochemical indicators. Collecting anthropometric or biochemical indicators, however, would require additional training and resources, such as medical equipment. It also requires large sample size and long term implementation period to observe a difference in these indicators.

Self-Check -4	Written Test

Directions*:* Answer all the questions listed below. Use the Answer sheet provided in the next page. (5 pts each)

1. Explain measuring nutrition program outcome.

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name_____ Date_____

Score = _____

Rating: _____

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