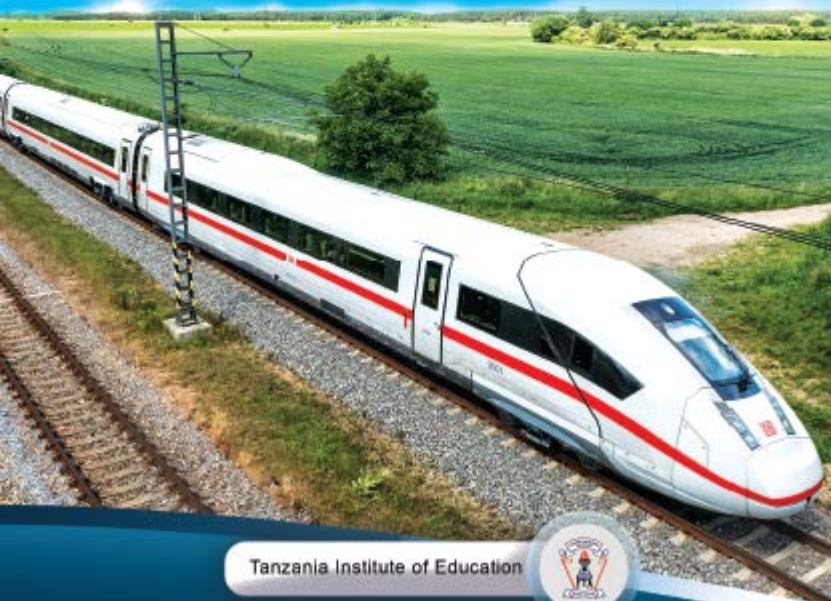


Geography

for Secondary Schools

**Student's Book
Form Two**



Tanzania Institute of Education



Geography

for Secondary Schools

Student's Book

Form Two

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Preface

This book, *Geography for Secondary Schools* is written specifically for Form Two students in the United Republic of Tanzania. The book is prepared according to the 2005 Geography Syllabus for Secondary Schools, Form I-IV issued by the Ministry of Education and Vocational Training.

The book is divided into nine chapters, which are: Human activities, Agriculture, Water management for economic development, Sustainable use of forest resources, Mining industry, Tourism, Manufacturing industry, Sustainable use of power and energy resources, and Transport.

Besides the content, each chapter includes activities and exercises. Learners are encouraged to do all activities and answer all questions. These activities and questions will enhance the learners' acquisition of the intended knowledge, skills and competencies for the Form Two level.

Tanzania Institute of Education

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Dr Aneth A. Komba

Director General

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Chapter One

Human activities

Introduction

Human activities refer to things that people do or cause to happen. Human beings do such activities for social, economic, and political purposes. In this chapter, you will learn about human activities, types of human activities, and the importance of such activities.

The concept of human activities

Human activities are functions, tasks or works that human beings perform to earn a living. Different individuals or groups of people carry out different activities in different places. For example, the Maasai of Tanzania and Kenya practise nomadic pastoralism because of seasonal availability of pasture and water in an area. People in urban areas, on the other hand, engage in activities in industries and offices. Some people engage in providing services in education, administration, planning and health.

Types of human activities

There are three major categories of human activities. These are primary, secondary and tertiary activities.

Primary activities: Primary activities are done by people when they interact directly with the natural environment to obtain their essential needs. These activities include agriculture, forestry, mining and fishing.

Agriculture: Agriculture is an activity which involves crop cultivation and livestock-keeping. It is the oldest human activity which has been practised by all societies in the world. It provides food for households and raw materials for industries. The type of agriculture practised in a given place is determined by various conditions of the area including climate, water availability, soil characteristics and terrain. It is also influenced by financial resources, infrastructure, technology and conditions of the market.

Agriculture can be done by individual farmers, companies or co-operative societies. Crop farming is the type of agriculture that involves the cultivation of land to produce crops. Crop farming can be practised to produce food crops and cash crops.

Food crops include rice, beans, cassava, maize, wheat, bananas, and potatoes whereas cash crops include sisal, coffee, tea and cashew-nuts. Figure 1.1 shows a rice paddy.



Figure 1.1 Rice paddy

Source: Mwakalinga 03 June 2016: ippmedia.com

Besides crop farming, there is also livestock-keeping with animals domesticated or kept for meat, milk, wool, skins and hides. These domesticated animals include cattle, goats and sheep. Livestock-keeping is widely practised in Shinyanga, Mwanza, Mara and Arusha regions. Other regions famous for livestock-keeping include Kagera, Dodoma, Singida and Tabora. Ranching or commercial livestock-keeping is largely carried out by companies in Tanga, Iringa, Njombe, Kilimanjaro, Dodoma, Singida and Tabora. Figure 1.2 shows a herd of Ankole cattle as an example of domestic animals kept in Tanzania.



Figure 1.2 Herd of Ankole cattle found in Kagera

Source: <http://ilovekageratanzania.blogspot.com>

Mining: Mining is the process of extracting minerals from the crust of the Earth. Mining is done on both small and large-scales. Large-scale mining is done by companies using advanced technology and heavy equipment whereas small-scale mining is done by individuals who are known as artisanal miners using simple tools. Some of the minerals found in Tanzania include tanzanite, diamond, gold, coal, uranium, limestone, gemstones, salt, copper and gypsum. Figure 1.3 shows small-scale miners engaged in a mining activity.



Figure 1.3 Small-scale miners using simple tools in Tanzania

Source: <https://www.dailynews.co.tz/news/2019-02-195c6bb0690c91b.aspx>

Fishing: Fishing involves catching fish and other water creatures from oceans, lakes, seas, dams, rivers and ponds for domestic or commercial purposes. In Tanzania, fishing is done in the Indian Ocean and in lakes such as Victoria, Tanganyika, Rukwa and Nyasa. There is also fishing in rivers such as Ruvu, Kilombero and Rufiji. Fishing activities also take place in dams such as Mtera and Nyumba ya Mungu. Major fishing areas in the world are found in Norway, Namibia, Japan and Sweden.

Small-scale fishing relies on traditional methods such as the use of fish-nets or fish lines and hooks. Figure 1.4 shows small-scale fishing in the Indian ocean. Large-scale fishing is conducted in deep waters of the large seas and oceans where modern fishing methods such as fishing trawlers are used.



Figure 1.4 Small-scale fishing in the Indian Ocean

Source: <https://www.worldfishing.net/news101/Comment/ben-yami/speaking-up-for-small-scale-fisheries>

Forestry: Forestry is a set of practises that involve managing forests for ecological, social and economic purposes. There are two types of forests: natural and man-made (planted) forests.

Planted forests: Planted forests are those in which trees are planted by human beings. They are commonly known as grown trees. The trees may be obtained locally or from other countries. In Tanzania, mahogany and teak are examples of local species whereas pines and eucalyptus are species from other countries. Some examples of planted forests in Tanzania include The Sao Hill forest plantation in Mafinga, Iringa Region and The West Kilimanjaro forest plantation in Kilimanjaro Region.

Natural forests: Natural forests are the forests that generated themselves naturally. Examples of natural forests include the Eastern Arc (Usambara) Mountains forests, Mdandu (Njombe and Ludewa), Mitarure (Kilwa, Lindi), Kikongoro and Minziro (Misenyi) and The Duru-Haitemba forest (Babati). Other examples of natural forests include The Congo rain-forest found in the Congo basin of the Democratic Republic of Congo and The Amazon forest in Latin America. Natural forests are also found in other countries such as Finland, Sweden, Canada and Russia. Forests offer many benefits to people living close to forested areas and even beyond. For example, charcoal is one of the largest industries in Tanzania, employing tens of thousands of rural people and supplying energy to millions



Figure 1.5 Forest products in Tanzania

Source: http://wwf.panda.org/wwf_news/?103600

of urban households. Figure 1.5 shows one of the products from forests. The forestry industry provides employment opportunities such as selling of timber, firewood and charcoal. Also some people are employed as forest guards and forest officers. Forests are also a source of employment for timber merchants and carpenters. Furthermore, the forestry industry is also a source of building materials such as wood, pulp and poles. In addition, forests serve as sites for recreation and research.

Secondary activities: Secondary activities are subsidiary as they are performed in addition to primary activities. They involve processing products obtained from primary activities. Occupations which produce finished goods using the products of

primary activities as raw materials are included in secondary activities. These include for example manufacturing of cloth from cotton, production of sugar from sugarcane and steel casting from iron ore.

Tertiary activities: Tertiary activities belong to the service sector. These activities involve the provision of specialised services required for primary and secondary activities. Such activities include transport and communication, trading, administration, banking and insurance.

Transport and communication: Transportation is the action or process of moving people, goods and services from one place to another. This may be done by road, railway, air, pipeline and water.

Likewise, communication is the exchange of information between and among different people. Major means of communication include radio, television, newspapers, telephone and the internet.

Tourism: Tourism is the movement of people within a country or from one country to another for the purpose of leisure, pleasure, studies or trade. Tourism involves travelling to and staying in places outside the usual residence for a certain period. Tourists travel to see the beauty of wildlife, landscape and man-made features. These features include wildlife conservation areas such as national parks and game reserves, beaches, and historic (heritage) and cultural sites. Beaches in Tanzania are found along the coast of the Indian Ocean and on shores of lakes Victoria, Tanganyika and Nyasa.

National parks are areas created and protected by law for the purpose of conservation of wildlife and its associated habitat. Examples of National Parks in Tanzania include Serengeti, Mikumi, Lake Manyara, Ruaha, Gombe, Mahale, Katavi, Kitulo, Saadani, Kilimanjaro, Mkomazi, Saanane Island, Rubondo, Nyerere National Park at Selous (the upper part of Selous), Udzungwa and Tarangire. Game reserves include the lower part of Selous (which is the largest protected area in Tanzania), Rukwa, Ugalla and Maswa. Ngorongoro conservation area is the only protected area in Tanzania where humans, livestock and wildlife live together in the same environment.

Tourism industry creates employment and stimulates the growth of service sectors such as transport, hospitality, insurance, communications and tour guiding. Figure 1.6 shows tourists in a car observing lions, one of the wildlife attractions.



Figure 1.6 Tourists observe lions at Tarangire National Park

Source: <https://www.tanzaniawildcats.com/tanzania-safaris/6-days-african-lions-safari>

Trading: Trading is the process of buying and selling goods and services between people, organisations and countries. It takes place between producers and consumers. Some of the things involved in trading include machinery, clothing, food, medicine, cars and fuel. Trade may take place within a country or between countries. International trade allows countries to expand markets for both goods and services, which are not available in a particular country. Furthermore, international trade allows countries to participate in global economy hence encouraging opportunities for foreign investment.

Importance of human activities

Human activities are important in many ways. People are employed in different sectors depending on the kind of activities they can do. For example, in mining there are multi-national companies such as Williamson Diamonds and Barrick Gold (now known as Acacia), which employ many people. The companies also pay tax to the government. Moreover, employment in different human activities generate income which improves people's standards of living.

Exercise

Answer the following questions:

1. Define the following terms:
 - (a) Human activity
 - (b) Mining
 - (c) Forestry
2. Mention human activities which are influenced by the weather of a particular area.
3. List four benefits of human activities in Tanzania.
4. Describe one activity that is done at home for increasing family income.
5. Write **True** or **False** for each of the following statements:
 - (a) Tertiary activities provide services whereas secondary activities are done for processing and manufacturing goods.
 - (b) Primary activities are associated with land degradation unlike secondary activities, which are associated with environmental pollution.
 - (c) The distribution of different types of human activities is related to the types of human settlements.
 - (d) Secondary activities are carried out without depending on primary and tertiary activities.
 - (e) Types of human activities is related to the types of human settlements.

Chapter Two

Agriculture

Introduction

In this chapter, you will learn about the meaning and types of agriculture, the effects of rapid population growth on small-scale agriculture, characteristics of small-scale agriculture, advantages and disadvantages of small-scale agriculture, and ways of improving small-scale agriculture. You will also learn about types of large-scale agriculture in the world, major crops grown in each type of large-scale agriculture, characteristics of large-scale agriculture and problems facing large-scale agriculture in Tanzania and the USA. Finally, you will learn about the various types of livestock keeping practises as well as their benefits and constraints by focusing on Tanzania and Australia.

The concept of agriculture

Agriculture is a science which deals with crop cultivation and livestock keeping. It is the oldest human activity which has been practised by many societies in the world. Through agriculture, human beings grow crops for use by households and supply to industries. Factors influencing agriculture include climate, water availability, soil characteristics and terrain. Agriculture is also influenced by availability of financial resources, infrastructure, technology and markets.

Crop cultivation

Crop cultivation can be categorised into different types basing on factors such as size of farms, type of crops, motive of production and level of mechanisation. Based on size, crop cultivation is divided into two types: small-scale and large-scale crop cultivation.

Small-scale crop cultivation:

Small-scale crop cultivation is the growing of crops on a small piece of land. It is also called subsistence farming. It aims to produce enough food for the wellbeing of families. In some instances, when the production is high, the surplus is sold. Individuals engaging in small-scale crop cultivation are known as peasants. They are also called subsistence farmers as they grow food crops to feed themselves and their families with little or no surplus for sale.

As noted earlier, the agricultural system at subsistence level falls under this category. A farmer owns a small piece of land for food crops cultivation. The produce is enough only for the family. It is hand to mouth existence which may lead to famine if the harvest is bad. In years with good harvest the farmer

may have surplus to sell to the local markets. The farms are small, about one to five hectares owned by the family. Application of machines is difficult as farms are small.

Small-scale crop cultivation is done by using different methods such as shifting cultivation, crop rotation and bush fallowing.

Shifting cultivation: This is a traditional system of cultivation used in tropical rainforest and miombo wooded savanna. It operates where population is sparse. People farm and move to another fresh area when the yields are low. The cultivator or farmer burns the forest and sows seeds in the intermixed ash and soil. Little attention is given to the crops until they ripen. If the harvest declines, the land is abandoned and a fresh area is cleared. The yields decline after three to five years. The cultivator may return to the original land after some years. The constant moves ensure fresh land with high yields, as the land is fertile. There is no serious soil erosion since only a small area is exposed which support many crops and therefore little bare earth is seen. Any soil washed is trapped by dense plant roots and at the forest edge. The system is less risky of diseases.

The methods used in shifting cultivation differ with people's culture and the varieties of crops they grow. Some use fire to clear the land. Such system results to wastage of valuable timber, which took over a hundred years to grow but

destroyed in a few days. Green manure is ruined and soil profile is altered by the destruction of bacteria and humus. Areas practising this system include Malawi, Zambia, Liberia and Uganda. In Zambia this system is called 'slash and burn' agriculture or the 'Chitemene.' Shifting cultivation in Tanzania is commonly known in Kiswahili language as 'kilimo cha kuhamahama' (shifting agriculture), but also unofficially known as 'mahame' (shifted land) or 'malale' (fallow land). Regions practising shifting cultivation include Morogoro, Lindi, Rukwa, Mbeya, Iringa, Tabora, Dodoma and Tanga. In Tabora, for example, tobacco farming relies heavily on shifting cultivation.

Crop rotation: Crop rotation involves growing different crops on the same land at different times.

Bush fallowing: Bush fallowing is not different from shifting cultivation in that in bush fallowing people have permanent settlements. They clear the bush, burn the vegetation and sow seeds. Yield declines after three to five years. The farm is left to regain its fertility for nearly ten years. Another bush is cleared and cultivated. No movement is involved in bush fallowing. This is possible in areas with dense population.

Small-scale crop cultivation is advantageous to farmers. It allows them to grow varieties of food crops. Different crops grown in small farms make it easy to control pests and diseases.

Elementary tools such as pangas, hand hoes and axes lead to low cost of running the farms, hence low capital involved. Farmers depend on rainfall only which is unreliable hence, during droughts the farmers suffer from famine.

Characteristics of small-scale crop

cultivation: Small-scale crop cultivation is characterised by the following features:

- (a) The harvest from the farm is used for family consumption.
- (b) It is practised on small pieces of land, often less than five acres in size.
- (c) Peasants use simple tools such as hand-hoes and machetes for cultivation. In some cases, ox driven ploughs are used.
- (d) Farmers often grow different types of crops on the same field. This technique is known as intercropping. The crops grown may include grains such as beans, maize and millet.
- (e) It is associated with the use of organic manure to improve soil fertility.
- (f) Farming activities are mainly done by family members.

Relationship between population growth and small-scale crop production

Population growth is an increase in the number of people in a particular area. Rapid population growth could be due to natural increase or in-migration. The rapid

population growth puts more pressure on small-scale farmers. Yet, subsistence farmers are not likely to raise their output to feed the growing numbers because of lack of capital. Subsequently, land becomes overpopulated and resources overused. Also high population growth is associated with smaller farms and lower farm wages. As a result households in densely populated areas increasingly rely on off-farm income.

Effects of rapid population growth on small-scale crop cultivation

Overpopulation does not depend merely on the total number of people living in an area, or on the population density. It depends much on the available resources in a given area. When an area has more people than it can support to give them a reasonable standard of living, the area will suffer from *overpopulation* or *population pressure*. If the area has inhabitants who are too few to develop the resources available to improve living conditions, then the area suffers from under-population.

Population pressure is caused by rapid increase of population. In Third World countries, population is growing rapidly and food demand is high whereas food production is low. As the population increases, shortage of land in the productive areas becomes a source of serious concern. In some parts of regions such as Kilimanjaro, Mara, Kigoma, Shinyanga, Mbeya, Manyara and Morogoro, where a high population increase has occurred, land shortage has

become a serious problem. In fact, the land available has been over cultivated and exhausted, hence paving way to soil erosion. Over the years, many people have been migrating from their homelands to other regions in search of fertile land for cultivation.

The resulting population growth affects land use patterns. This may cause shortage of food and poor living standards. The solution to this problem is to improve small-scale crop cultivation. The government and other organisations should help farmers by providing them with education and capital to make subsistence agriculture more intensive and more productive. Moreover, the government, non-governmental organisations (NGOs) and co-operative societies should help the farmers to select better seeds, use proper insecticides, pesticides, and apply fertilisers properly. In addition, they should help in providing transport to make sure the products reach proper storage places and markets. Furthermore, the government should emphasise and support the opening of joint agriculture ventures, finding of markets for surplus products and establishing good storage facilities. Additionally, deliberate efforts should be made to provide education on good farming practises, for example, the use of simple but improved farming technology.

Advantages of small-scale crop cultivation: Small-scale crop production is cheap to operate since it involves the use of simple farming tools such as hand hoes and machetes. It is also cheap because the sources of labour are family members and, hence, easy to manage. In addition, small-scale agriculture needs small capital since it operates on small pieces of land.

This type of agriculture when intergrated with livestock-keeping provides biomass which is useful in the production of biogas energy. This energy is commonly used for cooking. Another advantage of small-scale crop cultivation is that farmers get fresh food such as vegetables and fruits. Therefore, small-scale agriculture contributes to the development of local communities.

Disadvantages of small-scale crop cultivation: Small-scale crop cultivation is associated with loss of soil fertility due to overuse of the same plots of land. Moreover, the practise of burning vegetation during farm preparation tends to destroy soil nutrients, hence lower its fertility. As a result, subsistence or peasant farmers' yields tend to fall. Such low yields are also contributed by low use of fertilisers and pesticides. Therefore, various ways are needed to reduce the challenges of small-scale crop cultivation.

Ways of improving small-scale crop

cultivation: Small-scale farmers need training on the best cultivation practises such as the application of manure and proper use of chemical fertilisers. Farmers should also be educated on the use of hybrid seeds and irrigation schemes. Furthermore, the establishment of co-operative unions can help small-scale farmers to get soft loans, access markets, undergo training and benefit from extension services.

Exercise 2.1**Answer the following questions:**

1. Define agriculture.
2. Name two types of agriculture.
3. Explain any four characteristics of small-scale crop cultivation.
 - (a) List any three advantages of small-scale crop cultivation.
 - (b) List any three disadvantages of small-scale crop cultivation.
4. Mention the effects of rapid population growth on small-scale crop cultivation.

Large-scale crop cultivation: Large-scale crop cultivation is a farming system that covers a large area of land to produce one type of crop for commercial purposes. This type of large-scale farming is also known as commercial agriculture.

In large-scale crop cultivation, the type of farming practise is mostly monoculture, in which a single crop is produced in large quantities. In developing countries monoculture is associated with tropical and sub-tropical plantation which were established through European colonisation. After independence of individual countries, the plantations were owned by government and others were allocated to individuals as small holders and peasant farmers. These plantations also known as estates are large and found in sparsely populated areas.

Crops from the plantations for example sisal and tobacco are processed before leaving the plantation and further processed right after harvesting to raise the value of the product per unit weight, and reduce its weight for long distance transferring. Mechanisation and irrigation are applicable on this kind of agriculture, hence weather change is not a problem. Poor people cannot manage this type of farming because it needs very big capital.

Characteristics of large-scale crop

cultivation: Large-scale crop cultivation is characterised by cultivation of a large area with the application of high level of technology. The technology involves the use of tractors, combine harvesters, and processing machines. As large-scale farming is highly mechanised, it employs few skilled people because machines carry out agricultural activities that otherwise could have been done manually by humans.

In addition, such commercial farming is capital-intensive to support the production. Also, it is often based on a single crop, a practise known as monoculture. Chemical fertilisers are highly used to maximise yields. Large-scale agriculture is basically a source of raw materials for different manufacturing industries.

Types of large-scale crop cultivation:

Large-scale crop cultivation can be divided into two types: plantation agriculture and extensive food cultivation. Plantation agriculture involves cultivation of cash crops on estates. The cultivation is highly mechanised. Major crops grown on plantations include coffee, cotton, tea, rubber, oil palms, cocoa, sisal and sugar cane. Plantation agriculture is dominant in some regions of Africa, Asia, North and South America where there are favourable climatic conditions. Extensive food cultivation deals with large-scale food crop production. Machines are highly used in ploughing, sowing, harvesting, processing, packaging and transportation of farm produce. Crops grown under extensive agriculture are cereals which include beans, maize and wheat. A description of some of the crops under large-scale crop production is provided in the following sub-sections.

Coffee: Coffee is a crop which produces coffee beans that are processed to make a beverage (Figure 2.1).



Figure 2.1 Coffee plant berries

source: <https://www.gettyimages.com/photo/coffee-plant>

It forms an important cash crop for export. In Tanzania, coffee is grown in Kagera, Kilimanjaro, Arusha, Mbeya, Katavi, Iringa, Mara, Njombe, Tanga, Morogoro, Kigoma and Ruvuma regions (Figure 2.2). Coffee is also grown in Kenya, Uganda, Democratic Republic of Congo, Zambia, Rwanda and Ethiopia. Other countries include Cameroon, Brazil, Columbia, Indonesia, Honduras, India, Vietnam, The Philippines and Mexico. There are over 60 varieties of coffee yet, only two of them have commercial importance; these are Arabica and Robusta.

Conditions necessary for growing coffee: There are four essential growth conditions required for the cultivation of coffee:

Climate

Coffee is a tropical plant, which is also grown in semi-tropical climate. It requires heat, humidity and abundant rainfall. The plant grows in warm to hot temperature ranging between 16°-21°C. Coffee needs abundant rainfall ranging from 1100 mm to 1780 mm annually and a relatively dry season for picking. Growth is most rapid during the hot rainy season, and during the cool dry season

berries ripen and are ready for picking. Bright sunshine and warm weather are necessary for the harvesting. Hill slopes, which receive orographic rainfall, are thus best for coffee cultivation.

Shade

Direct sunlight is harmful for coffee plants; therefore, these are planted under shade of taller trees such as bananas.

An ideal shade tree should belong to the leguminous type, because these not only provide shade but also enrich soil with nitrogen. Traditionally, most of the varieties of coffee plants were shade grown, as they were naturally intolerant of direct sunlight, hence they preferred a canopy of sun-filtering shade trees. The trees in coffee plantations play several roles including the following:

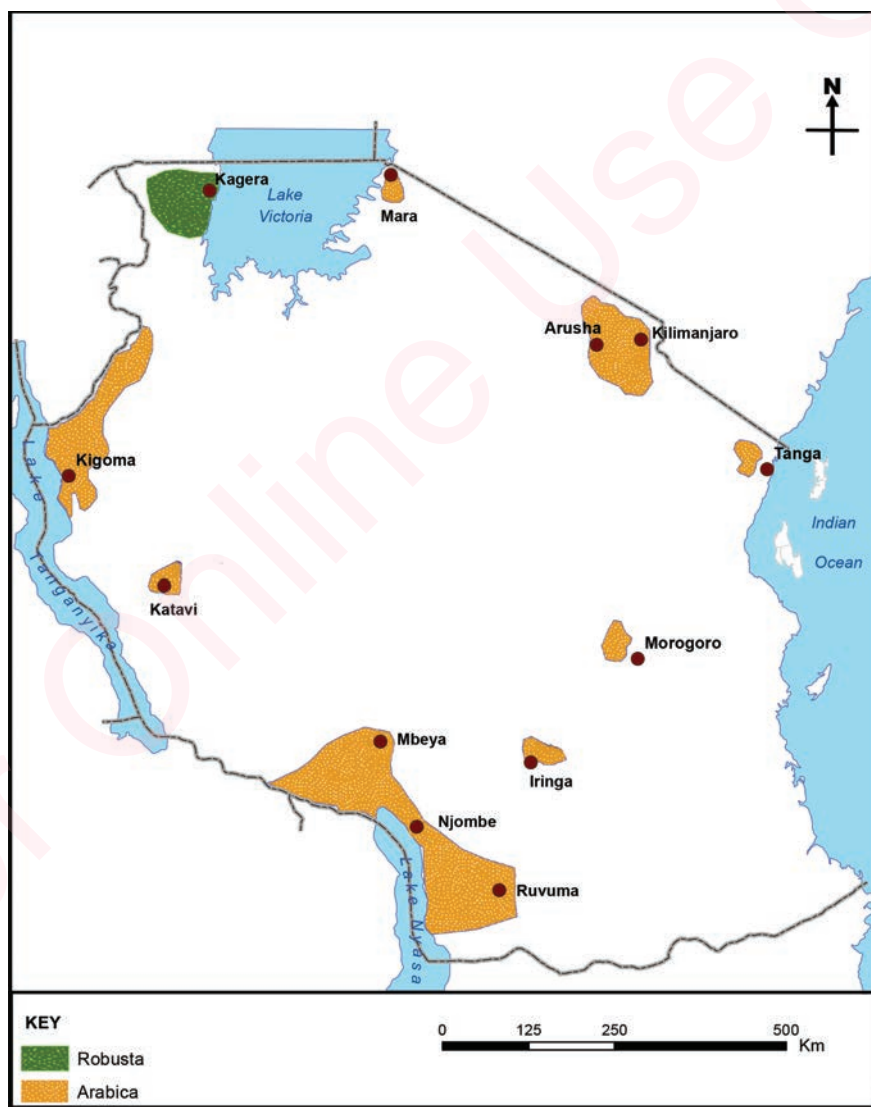


Figure 2.2 Coffee-producing regions in Tanzania

source: Coffeeboard.or.tz/news_Publications2009

- i. Protecting coffee from direct sunlight. Trees reduce the amount of heat reaching the coffee plant during the daytime.
- ii. Acting as physical barrier by protecting coffee plants from destruction by winds.
- iii. Mulching the soil with their fallen leaves which helps to protect the soil from excessive temperature and retain soil moisture thereof reducing evaporation.
- iv. Minimizing the erosive power of rainfall by acting as a physical barrier in reducing the amount of the rain reaching the ground.
- v. Maintaining the organic matter content in the soil which creates a conducive environment for many beneficial microorganisms like nitrogen fixers; hence trees contribute to soil fertility.
- vi. Providing a lively habitat, which is able to harbour different bird species. The birds help to facilitate pollination and serve as a biological insect control. Due to increasing demand of coffee, a scientific way of productivity which involve growing coffee plants in the open sun, was developed for coffee farming. This approach is accompanied with the continued application of chemical fertilisers and pesticides which, among other things, make up for the loss of nutrients.

Topography

Generally, coffee is grown on slopes having a height between 600 to 1,800 meters. Water stagnation is very harmful for coffee plants; therefore, hill slopes are best suitable for growing coffee.

Soils

Soil is the guiding factor in coffee plantation. Coffee plantation requires deep well drained soils which are rich in humus, minerals nutrients and of good texture to allow free air circulation.

Farm preparation, planting and

care of coffee: Coffee farms need preparation for at least six months. The coffee seedlings are raised on seed-beds and transplanted after six months, with three meters spacing. The coffee trees are pruned annually to ensure maximum yield. Pruning is also done to facilitate the picking of coffee beans. Weeds such as star-grass and couch grass are removed to increase yields. In addition, spraying of coffee plants is done in cases of leaf rusting and Coffee Berry Diseases (CBD). Fertilisers such as nitrogen, phosphates, potassium and magnesium are applied in places where soil fertility is low.

Harvesting, processing, storage and

transportation: Harvesting of coffee berries is done by hand. Only the red ripe berries are picked. Berries are dried in the sun and then are sorted, weighed and transported to the processing mills. Since coffee can easily absorb external odours which can affect its quality, it

must be stored in cool, dark and dry places to ensure freshness.

Uses of coffee: Coffee is mainly used as a beverage at home and in hotels. It also has healthy benefits such as preventing type 2 diabetes, burning fat, and improving body performance. People drink coffee to relieve mental and physical fatigue and to increase mental alertness. Other uses include treatment of headache, low blood pressure and obesity. The coffee pulp is used as fertilisers on farms.

Cotton: Cotton is a flowering plant which is grown for making cotton fabric and threads. It is a soft and fluffy fibre that grows in a boll or protective case around the seeds of a cotton plant. The plant is native to tropical and sub-tropical regions in the world including Africa and the Americas. The major cotton producers are China, USA, India, Pakistan, Brazil, Egypt, Benin, Mali, Cameroon, Uzbekistan, Vietnam, Australia, Turkey, Sudan, and Russia. In Tanzania, cotton is mainly grown in Mwanza, Tabora, Mara, Shinyanga, Geita and Simiyu regions. It is the second largest export crop after coffee and the fourth largest produced cash crop in Africa. Figure 2.3 shows a cotton farm.



Figure 2.3 Cotton farm

Source: worldwildlife.org/industries/cotton

Conditions necessary for growing cotton: Cotton grows in warm temperatures of about 25°C. It requires moderate rainfall of about 550 mm to 1,000 mm. However, in areas with less rainfall cotton can grow under irrigation. For example, the Gezira Irrigation Scheme in Sudan supports cotton growth. It also requires well-drained fertile soil. Moreover, cotton requires at least 200 frost-free days as the crop is sensitive to frost.

Farm preparation, planting and

care of cotton: Cotton farms are prepared before the rainy season. The planting of cotton seeds takes place during the rainy season. Cotton flowering occurs between two and three months after planting. To maintain healthy cotton plants, there is a need for regular spraying of cotton plants with pesticides. This measure is necessary because a number of pests and diseases attack cotton plants. The common pests which usually attack cotton plants include cotton aphids, stink bugs and boll weevils. In addition, diseases such as cotton leaf curl, cotton blue and root rot attack cotton plants.

Harvesting, processing, storage and

transportation of cotton: Cotton is usually ready for harvesting between five and seven months after planting. In most tropical countries including Tanzania, harvesting is done by hand. Large-scale cotton producers, on the other hand, use machines such as combine harvesters. Figure 2.4 shows a combine harvester at work.



Figure 2.4 Cotton combine harvester

Source: <https://www.pinterest.com/pin>

After picking cotton, dirty or spoilt cotton is removed. Clean cotton is packed into sacks and transported to ginneries for removing seeds from lint. The lint is compressed into large bales and transported to textile industries or exported.

Uses of cotton: Cotton is used in different ways. Primarily, cotton fibres are used for making clothes and thread. The seeds from cotton are used to make oil which is used for cooking, making soap and margarine. Cotton by-products are also used for feeding animals. Besides, cotton wool is used for sanitary purposes. The cotton lint is used in making mattresses and pillows.

Oil palm: Oil palm is a plant grown in tropical areas specifically for producing palm oil. It is grown on both small-scale on farm lots and large-scale on plantations. In Tanzania palm oil is grown in Kigoma and Mbeya regions. Other palm oil growing countries in the world are Malaysia, Nigeria, Indonesia and the Democratic Republic of the Congo.

Conditions necessary for growing oil palm: Oil palm grows well in areas with high temperatures throughout the year with mean monthly temperature of over 21°C, heavy rainfall throughout the year (about 1,500 mm to 2,040 mm), and needs a well-drained soil to enable water to pass through.

Farm preparation, planting and care of oil palm: Farm preparation takes place before transplanting. Palm oil seeds are sown in nurseries which are later transplanted to a farm when they are 12-14 months old. Palm oil plants begin bearing fruits when they are five years old and reach maximum production after 8-10 years. After ten years, yields start to decline. Palm fruits usually grow in large bunches. Each oil palm plant has a capacity of bearing between two and ten bunches annually. Figure 2.5 shows a palm oil tree.



Figure 2.5 Palm oil tree

Source: inews.co.uk/news/world/palm-oil-industry-curb-deforestation-flaws-falling-prices/

Harvesting, processing, storage and transportation of oil palm: The fruits of the palm oil trees turn red, when they are ripe and ready for harvesting. Each fruit consists of a fleshy pericarp surrounding a nut. Fruits are boiled in pots or drums at high temperature. The processing continues to the point where the pericarp is compressed to obtain palm oil. Inside the pericarp there is a kernel which is also a source of oil. Oil from the kernel is obtained by crushing the nuts in a grinder and compressing them. The extracted palm oil is packed in containers ready for domestic use and export.

Uses of palm oil: Palm oil is used as vegetable oil for cooking, and making soap and candles. Residue from processed kernels can be used as animal fodder and manure.

Tea: Tea is a plant whose leaves are used for making a beverage. In Tanzania, tea is mainly grown in Mbeya, Iringa, Njombe, Kagera, Kilimanjaro and Tanga regions. Other major tea growing countries in the world are Kenya, Uganda, Malawi, China, Sri-Lanka, India, Indonesia and Argentina.

Conditions for growing tea: Tea grows well in warm to hot temperatures ranging from 15°C to 29°C. However, the temperature should not be below 21°C during the growing period. In addition, it needs high and well-distributed rainfall of about 1,400 mm to 1,750 mm. It also needs frost-free conditions during the growing periods and fertile, deep, well-drained soil able to retain moisture. The soil should also be slightly acidic with little calcium.

Farm preparation, planting and caring of tea: Farms for tea growing are prepared by clearing land. The ideal row spacing for tea plantation is 100 – 110 cm with the plant spacing of 65 – 75 cm. This spacing makes it possible to plant 15,000 plants in an acre.

Tea also needs full shade and protection from other previously planted trees. The trees protect the plants from being affected by wind. In other words, they act as a wind breaker. Tea production is a labour-intensive activity because planting, weeding, picking and processing largely depend on human labour.

Harvesting, processing, storage and transportation of tea: It takes two years for tea plants to be ready for harvesting. Picking of tea leaves requires experience because if it is done poorly, it may result in low quality tea. Tea plants are normally plucked for 3-4 years after which all old branches are pruned for new shoots to grow. The plucked tea leaves undergo fermentation under regulated moisture to ensure quality tea product. Thereafter, tea leaves are rolled to enhance the breakup of the leaf cells and fibres. The leaves are then dried in temperatures of about 105°C. This process is called roasting or firing. Roasting stops fermentation and reduces moisture. Cool and dried tea is sorted in different sizes and graded. Unwanted particles are removed before packing. At this stage, tea is ready for consumption and export. Figure 2.6 shows the plucking of tea leaves in Iringa.



Figure 2.6 Tea plucking in Mufindi, Iringa

Source: Tea production...ratetea.com

Uses of tea: Tea is primarily used as a beverage. A person with a sore throat and a hoarse voice can get better after taking a few cups of strong tea.

Sisal: Sisal is a tropical plant whose leaves produce strong threads (fibres) which are used for various purposes such as rope and carpet making. Sisal was originally grown in southern Mexico. Subsequently, it has been widely cultivated in many other countries. In fact, it has widely been introduced in the tropics and subtropics. In Tanzania, sisal was introduced in 1893 by Dr Richard Hindorf and the first 62 sisal plants were planted near Pangani in Tanga Region. Until the 1960s, Tanzania was the leading producer of sisal, but since then Brazil has become the major world producer of sisal, followed by Tanzania, Kenya, Madagascar and China. In Tanzania, sisal is grown in Tanga, Kilimanjaro, Arusha, Morogoro, Lindi and Mtwara regions.



Figure 2.7 Sisal farm in Tanga

Source: <https://www.ippmedia.com/en/news/strategising-restore-sisal-cash-crop-day>

Conditions for growing sisal: Sisal growing needs high temperatures ranging between 25°C and 30°C. It also needs slight rainfall ranging from 650 mm to 1,500 mm. It is grown in well drained loamy soil. This type of soil contains a lot of decayed vegetable

matter with little amounts of sand and clay. Rainfall plays an important role as far as fibre production is concerned. On the whole, sisal does not need too much rainfall and cannot tolerate frosty conditions.

Farm preparation, planting and caring of sisal: It is recommended that land should be well-prepared by ploughing to a depth of 30 cm before planting.

Bulbils are initially grown in nurseries before being transplanted in double rows after a year. In the nursery, the bulbils should be planted in beds at 10 cm x 10 cm apart. It is recommended to use sisal waste for their growth. Thereafter, they are shifted to a second bed where they are planted at 30 cm x 30 cm apart. After 12 to 18 months, the young sisal plants are ready to be planted in the field. Unlike many other crops, sisal does not need much care. However, when it is planted on a previously used old land, it is important to use fertiliser. During the first two years it is important to control weeds by hand, machines or chemicals. Although the sisal plant is resistant to pests and diseases, it is important to control pests and diseases such as sisal weevil and bole rot. Growing sisal does not require irrigation as the sisal plant is drought-resistant and cultivated as a rain-fed crop.

Harvesting, processing and transportation of sisal: Harvesting of sisal begins when the colour of thorns at the tips changes from dark brown to light-brown. The processing of leaves should take place 48 hours after being harvested. Through processing, sisal fibres are obtained whereby the leaves are crushed between rollers and then mechanically scraped. Then the fibres are washed and dried. Drying of fibres is done in the sun or by using drying machines. This is followed by brushing of the dried fibres for straightening as well as polishing. Thereafter, the fibres are graded depending on their length and colour. It is important to ensure cleanliness of the bale. Graded fibres are then packed into bales either manually or by using machines.

Uses of sisal: Sisal is used to make ropes, buffing cloth, mattresses, carpets, handicraft mats, and baskets. Sisal is commonly used in the shipping industry for mooring small craft, lashing, and handling cargo. It is also used in the automobile industry with fiber glass in composite materials. Other products developed from sisal fibre include lumbar support belts, rugs, slippers, clothes and disc buffers. Farmers also use sisal fibre for tomato plant support and ropes for reinforcement of ceiling corners. Waste from sisal extraction can be used for making biogas, pharmaceutical ingredients and building materials. Fibres can also be used as fertiliser or animal feed.

Clove: Clove is an evergreen tree of humid tropical climate (Figure 2.8). Its flower buds are spices used in food, drinks and medicine. The clove was introduced in Zanzibar in the United Republic of Tanzania in the first half of the 19th century from Indonesia. Clove growing in Zanzibar started with plantations but it has progressively been fragmented into smaller holdings of about 3 acres. The prominent clove growing countries in the world are Indonesia, India and Madagascar. Indonesia is the biggest grower, importer and consumer of cloves.

Conditions for growing cloves: Cloves require a humid tropical climate with annual average temperatures of between 20°C and 30°C. They prefer well distributed rainfall, which is ideal for flowering. In this regard, the annual rainfall should range from 1,500 mm – 2,500 mm. In addition, cloves require deep loamy soils with high humus content and well-drained black loam soils of semi-forest regions. Cloves need good drainage and prefer partial shade and a cooler climate.



Figure 2.8 Clove plants in Zanzibar

Source: <https://www.alamcom/stock-photo/clove-plant.html>

Farm preparation, planting and care of cloves: Clove seeds are sown at 2 cm to 3 cm spacing with a depth of about 2 cm. The germinated seedlings are transplanted in bags. The seed-beds have to be protected from direct sunlight. The young plants are left for almost 2 years. Then the seedlings are transplanted in the field at the spacing of 6 to 7 meters apart.

Harvesting, processing and transportation of cloves: Clove trees can grow up to 15 meters high. Therefore, harvesting involves picking of flower buds which is done by climbing or scaling. Harvesting is done by hand by skilled climbers. In Zanzibar, the harvesting occurs from September to November. Sorting is necessary to separate leaves from the buds. The buds and flowers are left to dry in the sun for 3 - 7 days. To ensure quality, the dirty and unwanted particles are removed from the dried cloves. The Zanzibar State Trading Corporation (ZSTC) is an organ responsible for buying and exporting cloves from the Isles in Tanzania to major importers such as Taiwan, India, the United Arab Emirates and the United Kingdom.

Uses of cloves: Cloves can be used in the production of oil which is used in dentistry, sanitary applications and as medicine. They also serve as a spice in food. Moreover, cloves add flavour in tea and cigarettes. Cloves are a cash crop that is sold to earn foreign currency.

Table 2.1 shows major cash crops grown in Tanzania.

Table 2.1 Major cash crops grown in Tanzania

Crop	Areas
Coffee	Kagera, Kilimanjaro, Arusha, Mbeya, Ruvuma, Kigoma and Mara
Cotton	Mwanza, Tabora, Mara, Tanga, Shinyanga, Geita and Simiyu
Palm oil trees	Kigoma
Tea	Mbeya, Iringa, Njombe, Tanga, Kilimanjaro and Kagera
Sisal	Tanga, Kilimanjaro, Arusha, Morogoro, Lindi and Mtwara
Cloves	Unguja and Pemba

Activity

- Visit a nearby plantation and mention the type of crop grown. Describe the conditions for growing that crop.
- Mention the uses of the crops listed in Table 2.1.
 - Describe their contribution to individual and national economy.

Cereal crops

This section describes the cereal crops which are cultivated under extensive large crop cultivation for food and commercial purposes. The major cereals in the world are maize, rice, wheat, barley and sorghum. The following section provides descriptions on maize, beans, wheat and rice. Figure 2.9 shows major cereal crops growing regions in Tanzania.

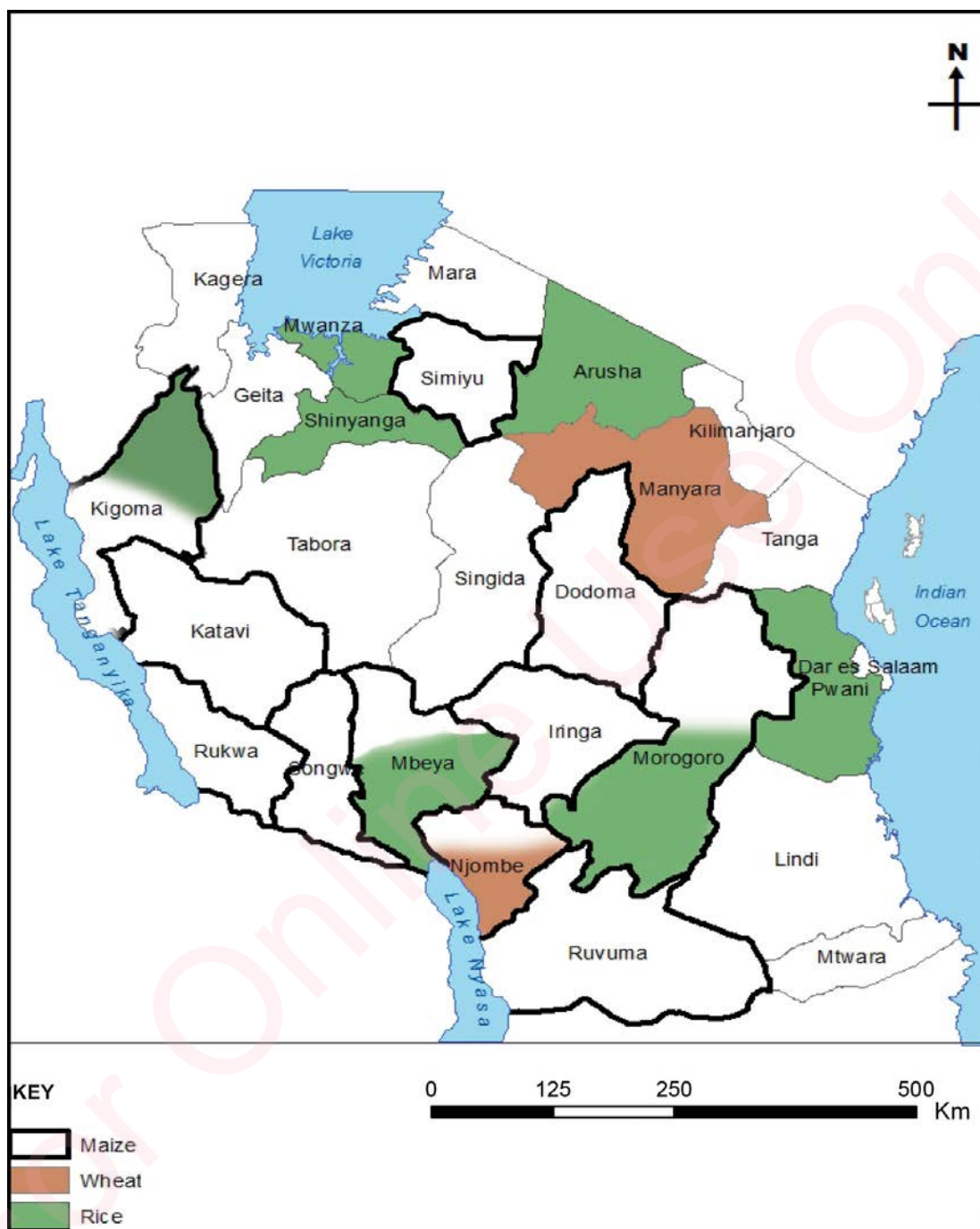


Figure 2.9 Major cereal crops growing regions in Tanzania

Maize

Maize is a cereal crop whose origin is South America. It is one of the most widely cultivated cereals grown in both tropical and warm temperate latitudes. In Tanzania, maize is widely grown as a staple food. Major maize producing regions are Rukwa, Katavi, Mbeya, Songwe, Njombe, Morogoro, Iringa and Ruvuma. Countries that are major maize growers in the world are United States of America, China, Brazil, South Africa, Russia, Yugoslavia and Romania.

Conditions for growing maize: Maize grows well in areas that experience summer temperatures of between 18°C and 27°C. It also needs a period of 140 frost-free days and annual precipitation ranging from 635 mm – 1,145 mm. Maize grows in a wide range of soil types. However, it grows better in deep rich soils of the sub-tropics with abundant nitrogen. In the tropics, maize can grow at altitudes ranging from sea level to 2,900 m above sea level. A dry sunny season is important for maize to grow, to enable cobs to ripen and the seeds to dry.

Farm preparation, planting and caring of maize: Maize requires deep tillage which is done by a hand-hoe and ox-drawn plough in small-scale or subsistence farming, and by using tractors in large-scale or commercial agriculture. Planting is done by burying seeds directly in the soil in a depth of at least 10 cm with spacing of 75 cm

between the rows and 30 cm between the plants. Germination usually takes place under warm, moist conditions. Seedlings emerge after about 6 - 10 days. However, under cool or dry conditions this may take two weeks or more. The optimum temperature range for germination is between 20°C and 30°C.

Maize needs good care which includes weeding, thinning and pest and disease management.

Weeds compete with maize plants for water, nutrients, space and light which reduce plant yield. The early stage of a maize plant (first three weeks) is very sensitive to weed competition. Weeding in a maize farm can be done using the hand-hoe, machine or through chemical weed control (herbicides).

Harvesting, processing and transportation of maize: Maize can be harvested after 3 - 6 months depending on variations in temperature and seed types. Harvesting methods include manual hand cut and machines (combine harvesters). The mechanised system removes not only the ear or husk from the plant but also the grain from the cob whereas hand harvesting requires initial removal of the ear or husk, which is shelled at a later stage. The grain is winnowed to remove unwanted materials and low quality grains. Then the product is stored in bags ready for transportation to homesteads, and some to silos and to the market.

Uses of maize: Maize is a staple food in Africa and Asia. It is also used to feed domestic animals such as cattle, pigs and chicken. Maize is also used to make industrial products such as vegetable oil, starch and alcohol. Domestically, maize stocks and cobs are burned to produce heat energy for cooking mainly in rural areas. Maize stalks are also used to make manure.

Wheat

Wheat is one of cereal crops which grows well in temperate regions. Wheat in Tanzania is grown almost exclusively as a commercial crop on a large-scale basis in the northern highlands (Manyara) and by small and medium scale farmers in the southern highlands (Njombe). It is also grown in Angola, Burundi, Democratic Republic of Congo, Ethiopia, Kenya, Madagascar, Mozambique, Rwanda, Uganda, Zambia and Zimbabwe. It is also grown in Greenland and distributed from Scandinavia to South America and across Asia.

Conditions for growing wheat: Wheat grows well in warm temperatures ranging from 21°C to 24°C. Wheat also needs a lot of sunshine, especially when the grains are filling. Areas with low humidity are better since many wheat diseases thrive in damp weather. The amount of rainfall required for wheat cultivation varies between 300 mm and 1,000 mm. The major wheat lands of the temperate regions have an annual rainfall of 380 mm - 800 mm.

Farm preparation, planting and caring of wheat:

If the field has been previously used for farming purposes, it is recommended to smoothen the soil with a rake. A shovel is attached to a tractor to plough the field and dig long narrow furrows. Moderate quantities of natural manure is used to fertilise the soil and ensure proper growth of the wheat stalks. Wheat seeds are spread in the furrows using a semicircular movement of the wrist or a grain drill attached to a tractor. Immediately after planting the wheat seeds, watering is important. This is also done once each month during the growing season. If an area gets a lot of rain, it might not need to be watered at all. Fertiliser is used twice during the growing season. Although it may look primitive, several plastic flags or streamers are placed throughout the wheat patch. The noise made by the plastic blowing in the breeze deters birds from landing and scares off any birds that are already in the field. This prevents birds from eating the wheat seeds before they can sprout.

Harvesting, processing and transportation of wheat:

In the process of harvesting, there is a need to test the crop. In this regard, fingers are used to rub the wheat head and pieces of grain are chewed. If the grains crack in the mouth and become soft as they are chewed, then they are ready for harvesting. Clean places are prepared for keeping the harvested wheat. When using a sickle for harvesting, it should be checked to make sure it is sharp enough for making

clean cuts. In commercial farming, the combine harvester is adjusted to harvest the wheat. Harvesting is done when the crop reaches maturity (at least 100 days). The part that is harvested is called kernels. Freshly harvested wheat is taken to a local grain elevator as soon as possible after harvest.

As wheat arrives in the mill, it passes through a cleaning process to remove coarse impurities, and to separate the grain by size, shape and weight. The finished product, that is, the whole pure wheat then goes through conditioning bins before milling to produce a uniform moisture content to prevent break-up of the bran (hard outer layer) during milling. After conditioning, different batches of wheat are blended together to make a mix capable of producing the required quality. Wheat is sold raw to manufacturers. From here it is milled into finished consumable products. On large farms, harvesting is done by combine harvesters whereas on small farms, it is done by hand using sickles. It is normally transported by road in lorries from the farm to the market and silos.

Uses of wheat: Wheat serves as food for human beings and animals. Human beings use wheat to make bread, cakes and, sometimes, stiff porridge. The remains of wheat are used to feed animals. Wheat starch is used in the manufacturing of paper. For example, in the United States wheat is used to strengthen paper.

Rice

Rice is an edible seed from one of the grass species. As a cereal crop, it is the most widely consumed staple food for a large part of the world's human population, especially in Asia. It is an agricultural commodity with the third-highest worldwide production. Rice is grown in most regions of Tanzania including Coast, Morogoro, Tabora, Mbeya, Mwanza, Shinyanga, Simiyu, and Geita. Globally, it is grown in China, India, Indonesia, Bangladesh, Brazil, Thailand, Japan and Kenya.

Conditions for growing rice: Rice is a tropical crop which grows well where the average temperature during the growing season is between 20°C and 27°C. Abundant sunshine is also essential during its four months of growth. The minimum temperature should not go below 15°C as germination cannot take place below that temperature. Rice requires more water than any other crop. As a result, paddy cultivation is done only in those areas where minimum rainfall is 1,150 mm. Paddy also needs flooded conditions with the depth of water varying over 25 mm at the time of transplanting to as much as 150 mm for 10 weeks of the growing period.

Farm preparation, planting and care of rice: Planting work begins with land preparation as well as the nursery bed for obtaining the seedlings. The seedlings should be planted as young as possible, usually at 20 days. Seeds are planted by removing them from the nursery to the

paddy fields. Good rice planting should use the pull to the right and to the left with a distance of 20 cm x 20 cm. This is to enable maintenance, either weeding or fertilising in addition to allowing each plant to receive enough sunlight and nutrients evenly. Seedlings are planted with just one seed in one planting hole. Farmers are required to maintain water and water discharge on paddy fields and weeding (weed control). Irrigating rice crops in rice fields should consider the depth of water in accordance with the age of the plant. Weeds are herbs that live with cultivated plants and are generally very harmful to rice crops. As such, weeding is very important. Fertilisation is done to add nutrients needed by plants in the soil. As the grain begins to mature, the farmers 'lock up' the water on the bays. This means no water leaves the paddock as it is fully utilised by the rice plant. The soil then dries out in time for harvest to begin.

Harvesting, processing and transportation of rice: Rice is processed in the following ways. Step one involves removal of the hard protective husk. The rice husk is the protective layer surrounding the grain. Once removed, the rice grain is packaged as brown rice. Brown rice is healthy because it still contains the rice germ and outer bran layers which is important for healthy body functions. Step two involves removal of the germ and brown layers. Gentle milling removes the germ and bran layers from the grain to expose a white starch center. The polished white

starch center is what we know as white rice. Large-scale farmers use large conventional grain harvesters whereas small-scale farmers use sharp sickles for harvesting. Farmers use tractors, power tillers and lorries to transport paddy from the farm to grain storage facilities at the farm or home or silos for large-scale grain storage. Rice in Tanzania and in most parts of the world is mostly sold to consumers as polished milled rice. From the farmers it is sold directly to the millers or middlemen.

Uses of rice: Rice is used in many ways for food and other purposes. The bran is used to make oil. Straws (grass) from the leaves and stems are used for weaving roof tops, baskets, hats, bedding and for feeding animals. Husks are used as a source of energy in bricks making. Table 2.2 shows some major cereal crops grown in Tanzania.

Table 2.2 Some major cereal crops grown in Tanzania.

Crop	Regions
Maize	Rukwa, Katavi, Mbeya, Songwe, Njombe, Morogoro, Kigoma, Iringa and Ruvuma
Wheat	Manyara and Njombe
Rice	Coast, Morogoro, Mbeya, Mwanza, Shinyanga, Arusha, Kigoma, Simiyu and Geita

Contribution of crop production to the economy of Tanzania

The majority of Tanzanians heavily depend on agriculture. It is estimated that 75% of the population is engaged in agriculture. It has played a significant role in improving people's lives. It has stimulated the development of industries especially those related to the processing of tea, fruits, sisal and sugar-cane, among others. The sector has also led to the creation of employment opportunities in the country as many people are employed in agro-related industries whereas others are self-employed. Furthermore, the sector has contributed to the generation of government revenue and capital development in form of tax and duty payment as well as exports. It has also stimulated external trade and international relations through the exportation of cash crops to earn foreign currency. It has contributed to the development of transport and communication system from the farm to the market and from the market to the farm. Additionally, it has encouraged the raising of the standard of living for the people in the country because of what individuals and families earn from farm produce.

Challenges facing large-scale crop cultivation in Tanzania: Some of the challenges facing large-scale crop cultivation in Tanzania are high cost of production. Large-scale farming requires a large capital investment to buy machinery and farm inputs, prepare land and pay farm labourers.

It also relies on seasonal rainfall. Climatic changes have largely affected the amount of rainfall in many areas of Tanzania. Since the majority of large-scale farmers in Tanzania rely on rain-fed agriculture, whenever there is a shortage of rainfall, agricultural production falls. Agricultural products from large-scale crop cultivation in Tanzania such as tea, sisal and coffee face stiff competition from other countries that produce the same crops. As a result, prices of such products tend to be low. In addition, large-scale crop cultivation in Tanzania has to contend with pests and diseases. Pests such as army worms and quelea quelea tend to destroy crops faster than measures aimed to control them can cope. Inadequate management of pest invasion leads to heavy loss of crop production. Similarly, the outbreak of diseases such as Coffee Berry Diseases (CBD) and army worms affect crops before they are ready for harvesting, which leads to low production.

Ways to improve large-scale crop

cultivation in Tanzania: There are several ways to improve large-scale crop cultivation in Tanzania. Improvement of the transport network and communication systems will facilitate the transportation of farm inputs to the farm and agricultural products to industrial centers and markets. The government should also render the necessary support to prop up large-scale farming by providing subsidies in addition to creating a conducive investment climate by reducing the heavy and number of taxes

on agricultural facilities. Moreover, there is also a need to establish and expand irrigation schemes through public and private partnerships. Furthermore, farmers should be empowered through the establishment of co-operative banks for loan provision and sustainable markets. There is also a need to enforce a mechanism aimed to ensure extension officers work in the field with farmers where they can provide technical assistance on the selection of seeds, use of fertilisers and pesticides, and processing and packaging of crops. Also provision of real-time weather related information to farmers is necessary.

Contribution of crop production to the economy of the United States of America

The United States of America (USA) has a diverse climate and the ability to grow a wide variety of crops across the vast country with 50 states. Agriculture is a major industry in the USA, which is a net exporter of food. Although agricultural activity occurs in every state, it is particularly concentrated in the Great Plains, a vast expanse of flat, arable land at the center of the nation in the region around the Great Lakes known as the Corn Belt. Corn is another name for maize which is a chief cereal crop. The economy of the USA heavily depends on manufacturing industries. However, it is so diversified and characterised with a variety of sectors including services, entertainment, telecommunications and agriculture.

Agriculture, which is highly mechanised, operates on a large-scale and makes a significant contribution to the USA economy through provision of employment opportunities to about 11% of the Americans. Through agriculture the country also earns foreign currency, which helps to increase the National Domestic Product (NDP) through the export of beverages and other processed foods. Improvement of standards of living of the people who live near plantations such as the Cotton and Corn belts is another contribution of large-scale agriculture in the USA. Furthermore, the country has benefited significantly from development and growth of beef and dairy farming industries, which employ the largest percentage, followed by bakery, fruit and vegetable plants. The agricultural sector also plays a role in stimulating the development and growth of towns and cities such as Chicago and St. Louis.

Challenges facing large-scale

agriculture in USA: There are several challenges facing large-scale agriculture in the USA. Some of them are high cost of production as agriculture in the USA is highly mechanised. Automatic irrigation and agricultural machinery require fossil fuels and other sources of energy to run them. The increase in the price of fossil fuel, therefore, increases the cost of production. At times, there is a shortage of water as irrigation requires a lot of water. The amount of underground water drawn for irrigation is

increasing whereas the amount of water to refill is decreasing; which results in shortage of water for agricultural use. Another problem has to do with loss of soil fertility as the soil is eroded faster than it can be replenished due to over-cultivation. Also, over-irrigation causes leaching of soil nutrients.

Other challenges include the high cost of land management in large-scale agriculture where monoculture is a common practise. Monoculture exhausts nutrients from the soil that requires constant application of fertilisers. Natural disasters such as drought, hurricanes, floods and tornadoes also pose severe challenges to agricultural production. Crops are damaged by periodic drought, floods, tornadoes and hurricanes. This damage leads to low production which, ultimately, affects the economy. The natural disasters also affect transportation network which finally hinders the movement of agricultural products from the field to storage and market centers.

Exercise 2.2

A. For this section, do the following:

1. Give the meaning of the term small-scale agriculture.
2. State the disadvantages of large-scale agriculture.
3. Differentiate between plantation agriculture and extensive cereal cultivation.
4. List four characteristics of large-scale agriculture and give three examples of plantation agriculture in Africa.
5. Mention five crops grown in large-scale farms in Tanzania and outline their uses.
6. Explain why large-scale agriculture is not practised in many areas in Tanzania.
7. Mention three conditions necessary for successful growing of coffee.
8. Outline the contribution of crop production to Tanzania's economy.
9. Mention five major challenges facing large-scale agriculture in the USA.
10. Mention four ways to improve large-scale agriculture in Tanzania.

B. Write True or False for each of the following statements:

1. Brazil is a major coffee producer in the world.
2. In Tanzania, cotton is produced in Kilimanjaro and Arusha.
3. The Gezira Scheme in Sudan is an example of an irrigation project.
4. Palm oil tree is a tropical plant that originated from South Africa.
5. Europe is the major producer of maize in the world.

C. Fill the gaps in the following table with appropriate crop or country:

Crop	Major producing country in the world
(a) Cotton	_____
(b) _____	USA
(c) Palm oil trees	_____
(d) _____	Brazil
(e) _____	Tanzania

Livestock-keeping

Livestock-keeping is the rearing of animals and poultry for food and commercial purposes. The word 'livestock' applies primarily to cattle or dairy cows, goats, pigs, camels, horses, mules, poultry and sheep. Poultry includes ducks, chicken, turkey and geese. The population growth and ever increasing demand for food supply lead to the growth of livestock-keeping. Livestock-keeping contributes to the economic development of a country

since it is a source of food as well as raw materials for industries. It is also a source of income as well as employment opportunities. Besides, it is a source of foreign currency.

Livestock-keeping is categorised into traditional or subsistence and modern or commercial livestock-keeping. Categories of traditional livestock-keeping are nomadic, semi-nomadic, transhumance and sedentary. Traditional

or subsistence livestock-keeping is practised in arid areas that receive less rainfall per annum. These places do not support crop production. Ethnic groups that engage in traditional livestock-keeping are the Maasai, Sukuma and Barbaig of Tanzania. In Uganda, it is mostly practised by the Karamajong. In Kenya, it is practised by the Maasai, the Turkana and the Samburu.

Nomadic pastoralism/True pastoralism

Nomadic pastoralism involves continual movement of pastoralists with large numbers of animals from place to place in search of pasture and water. People involved in this practise are called nomads or pastoralists. Tribes which practise nomadic pastoralism include the Maasai, Barbaig, Kwavi and Karamajong. Nomadic pastoralism is mostly practised in sparsely populated areas where the natural vegetation is mainly grass and bushes and, sometimes, scattered trees. In these areas, rainfall is very low and unreliable. The pastoralists follow specific routes in their movements. Figure 2.10 shows a large herd of cattle. The animals kept by pastoralists are a source of food and income through the selling of animals and their products. Major products from animals are meat and milk. The pastoralists spend the money they earn to meet family needs such as buying cereals, paying school fees and meeting health expenses. In addition, the cattle raised are used for paying bride price and giving gifts as well as slaughtering during cultural

festivals. To the nomads, animals are a symbol of wealth and prestige.



Figure 2.10 A large herd of cattle

Source: <http://learn.e-limu.org/topic/view/?c=48&t=276>

Characteristics of nomadic

pastoralism: The nomads normally move in groups. These groups are formed through the integration of families or members of a given ethnic group. A group involves a chief or elders who make decisions for the entire group.

Indeed, large herd tend to cause overgrazing. Overgrazing is a situation where the number of cattle is greater than the carrying capacity of the grazing land. As a result, overgrazing causes soil erosion, land degradation and loss of valuable species.

Another feature of the nomadic pastoralists is the breeding process, which is uncontrolled. This situation may lead to the spread and outbreak of animal diseases, hence low animal quality and deaths.

In addition, there is poor control of pests and other diseases, which result to poor quality of animal products. Furthermore, nomadic pastoralism takes place where the population is scarce as the animals are grazed in open range, which needs a lot of space.

Advantages of nomadic pastoralism:

Generally, managing livestock using traditional methods under nomadic pastoralism is cheap. It also ensures the availability of food to the family. In addition, indigenous species of cattle such as Zebu, Boran and Ankole are resistant to diseases. Furthermore, the animals can tolerate walking over long distances and withstanding other environmental hardships such as high temperatures. They can also stay for a long time without water. Likewise, the cattle are cheap to manage in terms of shelter.

Disadvantages of nomadic pastoralism:

Nomadic pastoralism suffers from lack of processing and storage facilities, hence causing a significant loss of the products. Also, over-grazing under nomadic pastoralism leads to soil erosion. Moreover, the control of diseases is difficult since animals are always on the move, which can affect the health of the animals and lower productivity in the process. For example, there have been cases of loss of large numbers of livestock due to lack of water and pasture. This situation affects the economy of the pastoralists. Furthermore, the practise of nomadic

pastoralism tends to cause conflicts as they interfere with crop cultivators' land. Because of their nomadic nature, many of the pastoralists' children fail to attend formal education. As such, their periodic movements result in many of these children being denied their right to education and associated opportunities.

Semi-nomadism: Semi-nomadism is a transition between total nomadism and sedentary animal keeping. It involves keeping a large number of animals especially cattle. Tribes which practise semi-nomadism include the Turkana of northern Kenya. The people involved in semi-nomadism usually travel away from their home for long periods during the dry season in search of pasture and water. This season is associated with scarcity of grass and water. Also, the semi-nomads' movements contribute to the spread of diseases among their livestock. Semi-nomads usually cultivate crops during the rainy season to sustain their lives.

Transhumance: Transhumance is a seasonal movement of livestock from one grazing ground to another, specifically to lowlands in winter and highlands in summer. It is a form of semi-nomadic pastoralism in which domestic animals play a predominant but not an exclusive role in shaping the economic and cultural life of the people who depend on them.

Under transhumance, pastoralism is a predominant economic activity with varying emphasis on agriculture as a supplementary activity. Countries

that practise transhumance include Switzerland, Morocco, Kosovo and the Sudan-Sahelian zone of Mali.

Advantages of transhumance:

Transhumance has several advantages including an attempt to maximise productivity by exploiting annual grazing imbalances. This ensures the availability of pasture to feed the animals throughout the year. It also enhances income earning from the sale of pastoral products. In addition, it stimulates considerable national, regional and international trade. Transhumance provides raw materials such as dairy and non-wood forest products for local industries. Moreover, it provides services to other sectors of the economy, thus serving as a complementary resource for the country's overall economy. It also offers many jobs for pastoral communities and a diversity of actors involved in the livestock marketing circuit and value chain for other products.

Disadvantages of transhumance:

Transhumance has disadvantages as it accelerates deforestation (as the case of southern regions of Mali), causes damage to crops, increases conflicts and contributes to natural resource degradation.

Sedentary livestock-keeping: Sedentary livestock-keeping involves keeping animals in a permanent place. In fact, this type of keeping animals is called sedentary when livestock are permanently held in an area. Sedentary

livestock-keeping is also known as zero grazing. This type livestock-keeping is characterised by a small number of animals that are kept in sheds.

Advantages of sedentary livestock-keeping:

The size of the livestock makes it easy to control diseases since livestock-keepers use modern methods of treatment. Sedentary livestock-keeping also takes place in places where the population prevents the movement of animals from one place to another in search of food and water. Keeping animals in barns also enables the keepers to engage in other economic activities such as trade. Sedentary livestock-keeping can either be for food or commercial purposes.

Disadvantages of sedentary livestock-keeping:

Despite the advantages sedentary livestock-keeping presents, it is labour-intensive and can be time-consuming. It is also expensive in terms of building barns, feeding and taking care of the animals. In fact, livestock-keepers under the sedentary system sometimes have to deal with scarcity of animal feeds. This shortage may lower productivity particularly due to change of weather conditions such as prolonged drought.

In Tanzania, sedentary livestock-keeping is commonly practised among the Chagga of Kilimanjaro, Meru of Arusha and the Bena of Njombe. In Kenya, sedentary livestock keeping is commonly practised by the Kikuyu and to some extent the Kamba. Figure 2.11 exemplifies sedentary livestock-keeping.



Figure 2.11 Sedentary livestock-keeping

Source: flickr.com/photos/ilri/16563813546

Commercial livestock-keeping

Commercial livestock-keeping involves rearing of animals for the purpose of selling their products such as meat, milk, wool and hides. Ranching, as part of commercial livestock-keeping, is mostly practised in more remote areas where land is extensive and population density is low. Extensive land provides sufficient grass to support a large number of animals. Commercial livestock-keeping is determined by factors such as capital, level of technology, market, availability of pasture and climatic conditions. In temperate regions, supplementary food such as hay and root crops are used to feed them during winter. Animals are kept for meat (beef cattle), for milk (dairy cattle and camel) and for wool (sheep).

For such commercial livestock-keeping, land is managed to control soil erosion. Pasture for grazing and supplementary food also exist. In the meantime, water holes are created to ensure the availability of water for livestock and dips for pest control. Grazing is controlled by dividing the ranch into fenced-off sections known as paddocks.

Under this system, cattle move from one paddock to another to ensure that once a paddock has been grazed it has time to recover fully before being used again. Examples of ranches in Tanzania include Ruvu and Kongwa. There are many countries in the world with ranching systems. These countries include Argentina, USA, Northern Australia, Iran, India, China and New Zealand.

Dairy cattle keeping is common in areas where pasture is rich and where animals are fed with high quality fodder during winter. Moist and mild climates favour the growth of good pasture. Dairy farming deals with milk production for sale either in liquid form or as butter and cheese. Moreover, milk is condensed into powder especially in areas which are far from dairy farms. Dairy farming is a common practise in countries such as the USA, Germany, China, Netherlands, Brazil, India, Britain, Argentina and Australia. In Africa, dairy cattle-keeping countries include Tanzania and Namibia.

Characteristics of commercial livestock-keeping

Commercial livestock-keeping takes place on a large area with low population density. More space is needed for the construction of ranches and growing grass for feeding livestock. Generally, commercial livestock-keeping is practised in more remote areas where other forms of land use are limited. Usually, one type of animal is kept for quality control of products. In addition, commercial livestock-keeping is capital-intensive as it demands money for buying land, paying for labour, fencing and buying machines and equipment. Furthermore, cross breeding in commercial livestock-keeping is an important management practise.

Advantages of commercial livestock-keeping: Commercial livestock-keeping acts as a source of raw materials for industries such as food processing, shoe and cloth making. In addition, it is one of the sectors which employs people. It also serves as a source of government revenue. Commercial livestock-keeping provides food products such as meat and milk consumed by households and industries. Moreover, it contributes to the production of goods such as shoes, bags and animal foods. The benefits of commercial livestock keeping include the ability to utilise breeds that can enhance the reproductive performance. This practise also stimulates the development of transport and communication. Commercial livestock-keeping also facilitates the control of diseases and

pests because it limits animal movement. It also uses high technology and scientific methods in management.

Disadvantages of commercial livestock-keeping: Despite the advantages, commercial livestock-keeping is costly in establishing, operation and maintenance. Moreover, it uses much of the resources mainly human and physical in the production process. Furthermore, commercial livestock-keeping needs large sparsely populated areas. If animal wastes and discards are not properly treated they can cause water, land and air pollution, and diseases.

Benefits of livestock-keeping: Livestock-keeping stimulates the growth of industries that process different animal-related products such as hides, horns and hooves as raw materials. Also it is a source of income by selling animals and their products. In addition, livestock-keeping provides employment to people, which helps to improve their living conditions. Moreover, livestock keeping contributes to government revenue.

Challenges facing livestock-keeping: Livestock keeping faces a number of challenges. Climatic changes resulting in prolonged drought may lead to shortage of water and pasture which may cause animal deaths. In tropical conditions, animals are infected by tsetse flies, causing nagana disease. There are also diseases such as East Coast Fever, Rift Valley Fever (RVF), Foot and Mouth Disease

(FMD). Inadequate financial capital for investing in commercial livestock farming is another challenge.

Livestock-keeping is affected by poor transportation for animal products from farms to markets because some areas are inaccessible. In some cases, pastoralists suffer because of unreliable markets and poor storage facilities. As a result of poor transportation networking, especially due to poor and inaccessible roads, their animal-based products get spoiled before reaching the market. However, the market is very limited because of the low purchasing power of the people in some areas. This low purchasing power affects the income of livestock-keepers and, as a result, they fail to purchase vaccines for the growth and health of animals. Moreover, insufficient availability of seminars and training on modern livestock-keeping methods lead to low production. In some areas, animals are kept traditionally due to low-level of technology. The changing climate further compromises the availability of water and pasture for the animals.

Ways of solving problems facing pastoralists: There are several measures being taken by the government of Tanzania to solve problems facing pastoralists. These measures include providing education on sustainable livestock-keeping, improving extension services in pastoral areas so as to control pests and diseases and, hence, improve production. In addition, the

government has been striving to improve infrastructure and markets. There should also be partnership between the government and private sector in developing livestock keeping. Due to population pressure, nomads should be encouraged to switch to sedentary livestock-keeping.

Focal studies

Livestock-keeping in Tanzania

Livestock production is one of the major agricultural activities in Tanzania. It contributes to the availability of food and raw materials. The sector also contributes to the country's Gross Domestic Product (GDP). The National Ranching Company (NARCO) is responsible for managing all public ranches in the country. Most of the livestock products are for the domestic market. This sub-sector needs to be developed particularly in dairy farming and its products and meat processing to meet the domestic demands and for export. Overall, livestock-keeping helps to reduce household poverty and ensure food security.

Challenges facing livestock-keeping in Tanzania

Prevalence of pests and diseases affects animals' health and, eventually, causes low or poor production. Also, over-grazing causes shortage of water, pasture and soil erosion. There is also a problem of poor transportation of livestock and livestock products from one place to another. In addition, low level of technology to improve the

animal breeds as well as preserve animal products has been another limitation in the development of livestock-keeping in the country. These challenges lead to low quality and productivity. The low livestock production in turn, lowers the quality of life of livestock-keepers and affects development generally. Lack of reliable markets is a serious threat to the sustainability of the livestock-keeping sector.

In addition, low capital investment limits the development of the livestock-keeping sector in the country. Also, inadequate land for grazing leads to conflicts between farmers and pastoralists. Nomadic pastoralists, for example, always move from one place to another in search of pasture and water. As a result, they sometimes graze on the farms, hence conflicts arise between them and farmers. With nomadic pastoralism, the animals get tired due to long distances over which they move. Sometimes, the animals get sick and die, thus leading to low production in terms of quality and quantity.

Ways of solving challenges facing livestock-keeping in Tanzania:

Challenges to livestock-keeping can be reduced through encouraging and supporting individual livestock keepers and their groups to buy modern accessories such as modern cattle sheds, cattle mats and cool roofs that would improve their livestock-keeping. In this regard, they would need support with

training in modern livestock-keeping coupled with easily accessible extension services. For commercial livestock-keeping, there is a need to attract foreign investment in the sector but such investment should also be geared towards benefiting local people. Availability of domestic and international markets will promote livestock-keeping significantly.

Livestock-keeping in Australia

Australia is made up of mainland Australia, the island of Tasmania and numerous isles. Livestock industries have played a fundamental role in the development of Australia over the past 200 years, first as an essential source of food and later as the principal source of exports which triggered the economic growth of the nation and supported the development of its land and water resources. The livestock export industry supports the livelihood of many people in both rural and urban areas. The sector contributes to about 45% of the gross value of annual production of Australia's agricultural sector.

The Australian government has responsibility in the export of livestock. Its Department of Agriculture and Water Resources, for example, regulates exports in the country's livestock industry. Livestock exporters must meet high animal welfare standards in the areas of production and transportation. The Merino is one of the most prevalent and economically influential breeds of sheep.

The Merino sheep breed produces high quality wool products not only in Australia but also in other parts of the world. The Australian Merino is not a single homogenous breed but a number of 'strains' of sheep of which, regardless of their origins, are uniquely Australian. The Merino originally came from Spain. Australian livestock industries are spread geographically throughout the entire continent. Sheep production is largely located in the southern states whereas beef production is found in every state and territory. Furthermore, pork, dairy and poultry tend to concentrate in regions that are reasonably near the major metropolitan areas or along the coast.

Challenges facing livestock keeping in Australia

Livestock farming is affected by climate change and weather, particularly changes in temperature and water. The increase in temperature affects the quality and quantity of pasture and forage crops.

Diseases may also increase due to changes in weather and climatic conditions. In addition, the establishment of cattle and sheep keeping in most cases have resulted in negative environmental impacts. The livestock industry is also a major source of land degradation, water pollution, in addition to being a driver of deforestation. It also faces a shortage of skilled labour. This type of labour is characterised by higher education and expertise levels obtained through training

and experience. Such expertise also demands higher salaries. The shortage of such highly skilled labour force can hinder operations in the livestock industries, hence reduce productivity and lower the national income. Furthermore, improper transport, processing and shipping infrastructure reduce the quality of the livestock products.

Similarities between livestock -keeping in Tanzania and Australia: Livestock-keeping in Tanzania and Australia has the following similarities:

Both countries keep similar types of livestock, for example, cattle and poultry. Also, both countries have set aside areas for ranching. In Australia, ranching is found at Victoria River, Alexandria Station and Anna Creek. These places are found in Queensland, South Australia, Western Australia and the Northern Territory. Examples of ranches in Tanzania are Kongwa, Ruvu, Kagera, Arusha, Morogoro, Kitulo and Lushoto.

In both countries, dairy farming is practised where there is adequate water supply and plenty of pasture. Overall, the development of the livestock-keeping sector is important in both countries. Moreover, the two countries practise livestock at both the subsistence and commercial levels. The animals and their products can be used to meet family needs and sometimes be sold to raise revenue. In Tanzania, sedentary livestock-keeping is practised in densely populated areas and, hence, with a shortage of land such

as the slopes of Mount Kilimanjaro and the Southern Highlands whereas in Australia it is practised specifically in the South East of the country.

Differences between livestock-keeping in Tanzania and Australia: Livestock-keeping in the two countries has the following differences: The majority of livestock in Australia is kept for commercial purposes. Australian sheep, particularly the Merino, are mainly kept for wool production. More than 60 percent of livestock products from Australia are exported to Europe and other continents.

Livestock-keeping in Tanzania, on the contrary, is mainly for meeting domestic demands with some few animals and animal products being exported, but on a lower scale than in Australia. In Tanzania, sheep and goats are kept for meat and skins. Moreover, the application of science and technology in livestock-keeping is much more advanced in Australia than it is in Tanzania. The main rearing system of livestock-keeping in Tanzania is pastoralism and zero-grazing, whereas in Australia it is primarily the ranching system. In addition, Australia has many industries for processing animal products, whereas in Tanzania efforts are underway to establish such industries on a commercial scale.

Economic importance of livestock-keeping: In Tanzania and Australia livestock-keeping is important because it stimulates other sectors of the economy, for example, the development of transport and communication networks and processing industries such as leather and milk. Moreover, livestock-keeping promotes trade through selling animals and animal products within and outside these two countries. It also promotes employment to different people who work in processing industries. Livestock-keeping provides skins, hides, cheese, butter, milk and meat. These products are sold and enable individual households and the nation to earn money. Furthermore, the sector generates revenue to these countries through tax collection from the industries operating in this livestock sector. It also encourages the use of marginal lands. Livestock-keeping, especially ranching and pastoralism, which need large open areas, make use of land which is otherwise not suitable for other uses. Farmers also apply cattle manure to add nutrients to the soil and improve productivity.

Livestock farming businesses provide direct employment for the Australian people. The livestock and livestock processing industries also generate about \$11.2 billion in export revenue annually. In fact, the value of these exports has increased steadily over recent years generating foreign currency.

Exercise 2.3

A. Circle the letter of the best answer

1. Traditional livestock farming is practised in areas where there is:
 - (a) Very low rainfall
 - (b) Heavy rainfall
 - (c) No rainfall
 - (d) Dry lands
2. Examples of pastoralists include:
 - (a) Maasai, Barbaig and Karamajong
 - (b) Sukuma, Gogo and Nyamwezi
 - (c) Sangu, Kwavi, Ngoni and Hehe
 - (d) Ngoni, Sukuma and Maasai
3. Examples of societies that do not practise sedentary farming are:
 - (a) Sukuma, Gogo and Nyamwezi
 - (b) Chagga, Meru and Bena
 - (c) Sukuma, Meru and Nyamwezi
 - (d) Turkana, Maasai, Karamajong.
4. Three categories of commercial livestock-keeping are:
 - (a) Pastoralism, sedentary and nomadism.
 - (b) Traditional, modern and pure livestock-keeping.
 - (c) Beef livestock-keeping, dairy livestock-keeping and sheep-keeping.
 - (d) Traditional livestock, cattle-keeping and diary livestock-keeping.
5. Large-scale livestock farming is conducted in:
 - (a) Ranches
 - (b) National parks
 - (c) Zero-grazing
 - (d) Urban areas

B. Match each statement in Column A with the correct phrase in Column B:

Column A	Column B
1. A type of agriculture involving growing of cash crops on large areas of land, mostly in tropical regions.	(a) Tanzania, Ethiopia and Ghana
2. Agriculture confined to the production of food crops for consumption by household members.	(b) Commercial livestock-keeping
3. The system of keeping animals alongside cultivation.	(c) Slash and burn
4. Another name for shifting cultivation.	(d) Agriculture
5. Beverage crops produced in plantations.	(e) Mixed farming
6. Labour is provided by the owner of the land and members of the family.	(f) Subsistence agriculture
7. A system of agriculture aimed at making profit through regular sale of farm products.	(g) Coffee and tea
8. Countries practising the ranching system in the tropical savannah of Africa.	(h) Tea, cocoa and coffee
9. It refers to the rearing of livestock with the main aim of producing meat, milk, wool and hides for commercial purposes.	(i) Plantation agriculture
	(j) Small-scale agriculture
	(k) Large-scale agriculture
	(l) Ranching
	(m) Tanzania, Kenya and Uganda
	(n) Coffee, maize and tea