

# **Attain Food Security through Subsistence and Sustainable Agriculture**

**Mitigating Climate Change Impact and Achieving Sustainable Livelihoods**



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## About this course

This course is one of six related but independent courses that are included in the Strengthening Communities to Attain Resiliency and Food Security (SCARF) project. The SCARF project focuses on transformative learning for climate action through developing and digitising learning resources and fostering social and ecological awareness that helps learners move from practising individual behavioural changes to achieving wider social change by targeting the root causes of climate vulnerability and risk.

Addressing climate change and promoting environmentally sustainable livelihoods is imperative if we are to protect the world's poor and their rights to food and decent livelihoods. The SCARF project aims to:

- change the attitudes and behaviour of communities to mitigate against and adapt to the impact of climate change;
- provide solutions and responses not only to tackle the climate crisis but also to transform societies for a better future;
- provide new insights and opportunities to put into practice the new knowledge and skills gained for mitigating climate change and conserving the environment; and
- enhance the reach to marginalised communities, facilitating lifelong learning among learners and providing them with knowledge, attitudes and skills that will prepare them for the present and future context.

The six courses will enable participants — grassroots-level volunteers, community leaders, field workers and economically disadvantaged women and girls with varying levels of literacy — to:

- use the knowledge they gain in their everyday lives,
- develop a sense of strong personal connection to the issues of climate change,
- understand the value of solutions grounded in human rights,
- critically question the actions and responses of leaders, and
- take appropriate action to respond to climate-related issues.

The six courses and their objectives are:

- **Course 1: Climate Change and Taking Action.** Explains climate change, its impact in the local context, its anticipated impact on human lives and how to mitigate its negative impacts through actions and policy advocacy.
- **Course 2: Attain Food Security through Subsistence and Sustainable Agriculture: Mitigating Climate Change Impact and Achieving Sustainable Livelihoods.** Explains how to mitigate the impacts of climate change and achieve sustainable livelihoods. Discusses food and nutrition, local best practices and how to adapt such practices to attain family and community resiliency.

- **Course 3: Gender Equality in the Context of Climate Change and Food Security.** Discusses why women and children suffer most from the impacts of climate change, and the role of women as food growers and providers for better community resiliency and sustainable livelihoods.
- **Course 4: Creating Gender-Sensitive, Climate-Responsive, Sustainable Livelihoods to Build Self-Reliant, Resilient Local Economies.** Explains the importance of climate-responsive and gender-sensitive livelihoods for building a self-reliant, resilient local economy.
- **Course 5: Using Innovations and Climate-Responsive Actions to Build Community Resilience.** Explains the role of innovation in livelihood design and local conservation efforts.
- **Course 6: Respecting Indigenous Rights and Practices: Ways to a Better Planet.** Discusses Indigenous practices and the integration of natural habitat conservation through such practices. Describes Indigenous rights and their importance in mitigating the impacts of climate change.

Each of these six courses can be done independently from <https://opentextbooks.colvee.org/foodsecuritysustainableagriculture/> as a downloadable PDF or online in Moodle.

*Attain Food Security through Subsistence and Sustainable Agriculture: Mitigating Climate Change Impact and Achieving Sustainable Livelihoods* was produced by the Commonwealth of Learning (COL). All modules produced by COL are structured in the same way, as outlined below.

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## How this course is structured

### The course overview

The course overview gives a general introduction to the course. The information it contains will help you determine:

- if the course is suitable for you,
- what you need to know before you begin,
- what you can expect from the course, and
- how much time you will need to complete the course.

The overview also provides guidance on:

- study skills,

- where to get help,
- course assessments,
- icons used in the course, and
- the content of units.

We strongly recommend that you read the overview *carefully* before starting your study.

## The course content

The course is broken down into units. Each unit comprises:

- an introduction to the unit content,
- unit outcomes,
- new terminology,
- core content of the unit with a variety of learning activities,
- a unit summary, and
- assessments, as applicable.

## Resources

Resources for further reading — for example, books, articles or websites — are provided throughout this course.

## Your comments

After you complete this course, we would appreciate it if you would take a few moments to email [womenandgirls@col.org](mailto:womenandgirls@col.org) with your feedback on any aspect of it. Your feedback could include comments on:

- content and structure,
- reading materials and resources,
- assessments,
- duration, and
- support (assigned tutors, technical help, etc.).

Your constructive feedback will help us to improve this course for future users.



## Course overview

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### **Welcome to Attain food security through subsistence and sustainable agriculture: Mitigate climate change impact and achieve sustainable livelihoods**

This course looks at some of the causes of climate change and its effects on food security and food justice in particular. It discusses food and nutrition in relation to the geography of community spaces and presents various food insecurity scenarios at individual and community levels.

It also looks at:

- coping mechanisms that have helped people and communities to become resilient — for example, innovations in sustainable agriculture and subsistence food production to counter threats to livelihoods
- traditional best practices and the alignment with location-specific conservation of natural resources
- small-scale and traditional food processing techniques for preserving food for sustenance and survival

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### **Attain food security through subsistence and sustainable agriculture: Mitigating climate change impact and achieving sustainable livelihoods —Is this course for you?**

This course is intended for community members, people who work in the field, especially in the agriculture sector, and individuals who work at a grassroots level to mitigate the impacts of climate change — for example, volunteers, community leaders, community health workers and others in

positions to support women and children at the community level. Such individuals could use it for themselves, or teachers/facilitators can use it for working with NGOs, communities and others in positions to support women and girls in their community.

There are no prerequisites for this course.

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## Course outcomes

On completion of *Attain food security through subsistence and sustainable agriculture: Mitigate climate change impact and achieve sustainable livelihoods* you will be able to:



### Outcomes

- *describe* the impact of climate change on food security and food justice by linking increasingly severe weather in the local context to food security concerns.
- *discuss* the similarities and differences between concepts such as subsistence and sustainable agriculture, community farming and other similar concepts associated with building community resilience.
- *identify* best practices within their geographical contexts such as soil-less farming, backyard gardening and soil moisture conservation.
- *describe* small-scale food processing at the household and community levels and recognise innovations in tools and techniques for food processing and preservation.
- *explain* geographical and locale-specific best practices used in traditional communities.

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## Timeframe



### Time

You will need approximately 7.5 hours to complete this course.

This course contains five units. Each unit will need approximately 1.5 hours of learning time.

If you use this -course for working with your community, you could spread it over a number of training sessions.

An additional two hours of self-study time may be required.

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## Study skills



### Study skills

As an adult learner you will take a different approach to learning than you did when you were a schoolchild. You will choose what you want to study, you will have a professional or personal motivation for learning and you will most likely be fitting your study activities around other professional or domestic responsibilities.

Essentially you will be taking control of your learning environment. You will therefore need to think about how issues such as time management, goal setting and stress management will affect your performance. You may need to review skills such as essay planning, coping with exams and using the Web as a learning resource.

Your most significant considerations will be time and space — that is, the time you dedicate to your learning and the environment in which you engage in that learning.

We recommend that you take time now — that is, before you begin your self-study — to familiarise yourself with these issues. There are a number of excellent resources on the Web that can help you. For example:

- <http://www.how-to-study.com/>

This website has a list of resources about study skills, including taking notes, strategies for reading textbooks, using reference sources and dealing with test anxiety.

- <http://www.howtostudy.org/resources.php>

This website has useful links to resources on time management; efficient reading; questioning, listening and observing skills; “hands-

on” learning; memory building; staying motivated; and developing a learning plan.

These two websites can get you started on your learning journey. At the time of writing, the links to them were active. To find more options, go to [www.google.com](http://www.google.com) and type in phrases such as “self-study basics,” “self-study tips” or “self-study skills.”

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## Need help?



Help

At the learning centre you will receive the same support as you would from any classroom teacher, or you might find a more experienced tutor to support you during a contact session.

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## Assessments



Assessment

There is one assessment at the end of each unit. All assessments are self-assessments in the form of multiple choice questions (MCQs) and consist of between three to five questions.

















You will have between five and ten minutes to read and complete each assessment.

## Getting around this course

### Margin icons

As you work through this course you will notice the frequent use of margin icons. These icons serve to “signpost” a particular piece of text, a new task or a change in activity. They have been included to help you to find your way around this course.

A complete set of icons is shown below. We suggest that you familiarise yourself with the icons and their meanings before you begin.

			
Activity	Assessment	Assignment	Case study
			
Discussion	Group activity	Help	Note it!
			
Outcomes	Reading	Reflection	Study skills
			
Summary	Terminology	Time	Tip



# Unit 1

## Food security in the wake of climate change: Impacts of climate change on food and nutrition security

### Introduction

This unit looks at the impact of climate change on food — specifically, the impact on the soil, which affects both agricultural production, including the quantity and quality of harvests, and animals.

On completion of this unit, you will be able to:



#### Outcomes

- *describe* the impact of climate change on food security and food justice.
- *link* increasingly severe weather events to emerging food security concerns.



#### Terminology

#### Carbon dioxide (CO<sub>2</sub>):

A naturally occurring gas that absorbs and gives off heat. It is a by-product of burning fossil fuels or biomass (dead organisms) and removing trees and changing land-use patterns. It is also produced by some industrial processes.

#### Degradation:

Changes that negatively affect the structure or functioning of a site — natural or human-built — and lower the production capacity of the site.

#### Drought:

The result of lower than normal precipitation (usually rain or snow). It negatively affects production systems that depend on land resources.

#### Emissions:

Gases or particulates that are released into the atmosphere.

<b>Food justice:</b>	Universal access to nutritious, affordable and culturally appropriate food. When there is food justice, there are no structural disparities in food access, particularly for minorities, people of colour, persons with disabilities and people with low incomes; there are equal opportunities for land ownership, universal knowledge about agricultural practices and equitable distribution of technology and resources; and workers' rights are upheld.
<b>Food security:</b>	Having regular and long-term physical and economic access to sufficient, affordable, safe and nutritious food that meets a person's basic needs and preferences for a healthy life.
<b>Nutrition security:</b>	Having affordable and consistent access to the primary nutrients that are required for healthy living — including proteins, carbohydrates, vitamins, fats and minerals along with sunshine (which provides vitamin D), which promote well-being and can help to prevent diseases.
<b>Fossil fuel:</b>	Natural fuel formed from the remains of previously living organisms — for example, coal, oil and natural gas.
<b>Greenhouse gases (GHGs):</b>	Atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO <sub>2</sub> ), methane (CH <sub>4</sub> ) and nitrous oxide (N <sub>2</sub> O).
<b>Natural resource depletion:</b>	The exhaustion or reduction of natural resources — for example, water, soil or forests — because of unsustainable exploitation or environmental degradation.
<b>Livelihoods:</b>	The various ways in which a person or community makes a living. It includes all the activities and resources that are necessary to meet people's basic needs, such as food, water, shelter, clothing and healthcare. Livelihoods also contribute to the economic and social development of communities.

## Linking climate change to food and nutrition insecurity

### What is climate change?

Climate change is characterised by significant and long-term changes in temperatures, wind patterns and typical weather patterns in a particular place or the planet as a whole. It also makes weather patterns less predictable. For example, a region might experience lower or higher than average temperatures or more frequent and severe weather events, such as storms, floods or droughts.

The main cause of climate change is too many greenhouse gas (GHG) emissions from burning fossil fuels — coal, oil and natural gas — which release carbon dioxide (CO<sub>2</sub>). Deforestation and some agricultural activities also contribute to CO<sub>2</sub> emissions. GHGs trap heat in the atmosphere surrounding Earth. Soil and plants absorb CO<sub>2</sub>, but the use of some types of chemical fertilisers and very large herds of cattle can contribute to GHG emissions.

### Climate change, agriculture and the challenges ahead

Watch the video [Climate, Agriculture and the Challenges Ahead](#) by Planet Forward. It talks about the effect of climate change on food. It uses the examples of corn, soya bean and cotton, but the impact is universal.



#### Activity

Can you identify any increase in any insect pests in your community? Discuss this issue with other participants or your neighbours, if possible.

### Climate change and severe weather

Climate change is making extreme weather events — for example, hurricanes, floods and droughts — more frequent and severe. In addition, Earth's temperature has been rising over the years, particularly over recent years. Glaciers and ice sheets are melting, rising sea levels are inundating coastal communities and displacing millions of people, and flooding is occurring in some places, including Australia and Southeast Asia. Heavy storms can destroy birds' nests and drown animals.

In Africa, climate change is contributing to more frequent and more severe droughts. These droughts are causing crop failures, which in turn are causing widespread hunger. In Asia, climate change is causing sea levels to rise and flooding to become more common. The floods are affecting coastal farmland and displacing farmers.

In Latin America and the Caribbean, climate change is changing rainfall patterns and contributing to widespread damage and loss of life.

## **Climate change and depletion of natural resources**

Natural resources are described as **depleted** when they are being used up faster than they can be replenished. Population growth and economic development both contribute to the depletion of natural resources, but climate change also contributes to it in several ways.

### **Soil degradation**

Soil degradation is the process by which soil loses its quality and fertility. Heavy rainfall and floods saturate soil, which results in surface runoff and erosion. Soil degradation can reduce crop yields; increase the likelihood of flooding and landslides; and reduce water quality (because degraded soil is less able to filter pollutants out of water). Drought also degrades soil. When soil is dry, the wind can blow it away more easily.

### **Water scarcity**

Climate change negatively affects water supplies. This can lead to increased competition for water and even conflict, which in turn can prevent food supplies from reaching some regions. When sea water gets into farmlands, the salt damages the soil and reduces its productivity. Rising sea levels are leading to a scarcity of quality water for agriculture.

Water scarcity also damages ecosystems. Insufficient water to support plant and animal life can lead to desertification and loss of biodiversity.



Image source: Cocoparisienne. (n.d.). *Desert dryness landscape*. Pixabay.  
<https://pixabay.com/photos/desert-dryness-landscape-sand-tree-2227962/>  
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(<https://pixabay.com/service/license-summary/>)

Some insects that carry diseases can expand their habitat when there are extreme weather events. For example, changing temperatures and rainfall patterns across Africa could increase the spread of yellow fever, which is already responsible for 78,000 deaths each year in the region. (See Dunning, 2020, for more information.)

### **Climate change and food insecurity**

Climate change affects food production, the food supply chain, livelihoods and people's ability to afford and access food. Food insecurity occurs when people have no reliable access to sufficient, nutritious food. People in this situation experience hunger and may even go for days without eating, thereby putting their health and well-being at grave risk.

Food insecurity negatively impacts a person's ability to survive or recover in the event of a shock or hazard.

In 2020, nearly 800 million people were undernourished. The number of people facing severe food insecurity increased from 132 million in 2019 to 161 million in 2020. (See FAO et al., 2022, for more information.)

Here are some examples of how climate change has caused food insecurity around the world in recent years.

The Horn of Africa has experienced severe droughts that have been linked to climate change. The droughts destroyed crops and livestock and contributed to widespread food insecurity. (See World Health Organization, 2024, for more information.) Other places in East Africa have been experiencing unusually dry weather and high temperatures in recent years. A lack of water in soil can reduce the activities of the microorganisms it contains or increase the concentration of nitrogen and phosphorus in it. Wind easily blows away dry soil.

In 2022, a severe drought in the Horn of Africa caused widespread crop failures and killed millions of livestock. This led to severe food insecurity. Across Kenya, Ethiopia and Somalia, "malnutrition rates are rising: more than 7.1 million children are acutely malnourished" (OCHA, 2022, paragraph 2). The resulting food shortages led to an increase in prices at a time when food prices were already increasing significantly internationally.

Bangladesh is one of the most flood-prone countries in the world, and it is particularly vulnerable to the effects of rising sea levels. As sea levels rise, more and more land is becoming inundated with saltwater, which makes it difficult to grow crops and raise livestock. People are being displaced from their homes, which increases their vulnerability to food insecurity. In 2021, the country experienced severe flooding. It affected over 7 million people and destroyed crops and livestock on over 1 million acres of land. In 2022, severe flooding affected over 3 million people and damaged crops and livestock.

Also in 2022, Pakistan experienced severe flooding that affected over 33 million people and destroyed crops and livestock on over 4 million acres of land. In both Pakistan and Bangladesh, the flooding damaged roads and bridges, which made it difficult to transport food and other essential supplies to the affected communities.

In 2020, a heat wave in India and Pakistan destroyed crops and led to widespread food shortages. In 2021, flooding in Central China destroyed crops and livestock, and caused billions of dollars in damage. In the Caribbean, climate change is causing more frequent and severe hurricanes. These damage crops and livestock and make it difficult for

people to get to food markets. In the Pacific islands, climate change is causing sea levels to rise and inundate coastal areas, making it difficult to grow crops. In the Philippines, typhoons can damage crops and livestock, displace people, and disrupt food supply chains.

In the United States of America, 10.2 per cent of households were food-insecure at some point in 2021. This figure increased to 12.8 per cent in 2022. This means that over 33 million people did not have enough to eat. In 2021, 12.5 per cent of children under the age of 18 were food-insecure. (See United States Department of Agriculture, 2023, for more information.)

In the 2023 Global Hunger Index Report, which reports on food insecurity around the world, Pakistan was ranked 92nd; Bangladesh, 80th; Tanzania, 100th; Malawi, 101st; and Mozambique, 111th. (See Concern Worldwide & Welthungerhilfe, 2023, for more information.)

The World Food Programme (WFP), the world's largest humanitarian organisation, provides food assistance to people in need around the world. In 2022, it assisted 160 million people in 120 countries such as Pakistan, Bangladesh, Malawi and Mozambique. (See World Food Programme, 2024a, for more information.) In 2023, it estimated that around 345 million people were experiencing acute hunger. This is the highest number of people facing acute hunger in over a decade. (See World Food Programme, 2024b, for more information.)

In 2021, extreme weather events were the main cause of acute hunger in eight African countries. Approximately 23.5 million people experienced emergency levels of hunger. (See World Food Programme, 2023, for more information.)

Recently, Ethiopia has experienced more frequent and severe droughts. It has been estimated that climate change could increase the cost of food by up to 60 per cent by 2050. This would have a significant impact on low-income households. (See Climate Resilient Food System Alliance, 2022, for more information.)



## Reading

Climate Resilient Food System Alliance. (2022). *Ethiopia: A case study*. [https://unfccc.int/sites/default/files/resource/crfs\\_casestudy\\_ethiopia.pdf](https://unfccc.int/sites/default/files/resource/crfs_casestudy_ethiopia.pdf)  
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World Health Organization (2024, 4 March). *Drought and food insecurity in the Greater Horn of Africa*.  
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## Unit summary



### Summary

In this unit you learned about how climate change causes severe weather events and how this affects food security and food justice. You read about some impacts of climate change in different parts of the world that threaten people's ability to survive crises and learned that a person's vulnerability to the effects of climate change is affected by where they live.

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## Assessment



**Assessment**

**Assessment: Multiple choice questions: 1**

1. Which of the following are examples of climate change?
  - A. Changes in temperatures
  - B. Changes in the colours of the rainbow
  - C. Changes in wind patterns
  - D. Changes in regular weather patterns
  - E. A., C. and D.
  - F. All of the above
  
2. Which of the following are natural resources?
  - A. Water
  - B. Air
  - C. Forests
  - D. Greenhouse gases (GHGs)
  - E. A., B. and C.
  - F. All of the above
  
3. What is natural resource degradation?
  - A. A decrease in population
  - B. Spoilage of fruits and vegetables
  - C. Natural resources such as soil and water being used up faster than they can be replaced
  - D. Disappearance of natural resources.
  
4. What is food security?
  - A. Having enough safe and healthy food to eat at all times
  - B. Being unable to access food for only a few days of the month
  - C. Having food in the house and still being hungry

5. What are the major causes of food insecurity?
- A. Low income
  - B. Unemployment
  - C. Lack of access to healthy food
  - D. Natural disasters
  - E. All of the above
  - F. A., B. and D.



## Unit 2

# Importance of food security for developing community resilience: Key role of food and nutrition security and future preparedness

## Introduction

In this unit, we look at accessibility to quality food, which is particularly challenging for vulnerable groups of people, including racial or ethnic minorities, people with low incomes and people who live in rural or remote areas. Accessing food can also be a challenge for people who depend on outside sources for food supplies.

On completion of this unit, you will be able to:

- *discuss* the nuances (similarities and differences) of subsistence and sustainable agriculture.
- *discuss* community farming and similar concepts that build community resilience.



### Outcomes



### Terminology

<b>Climate change mitigation:</b>	Eliminating greenhouse gases from the atmosphere by reducing emissions or increasing the capture of these gases.
<b>Deforestation:</b>	Clearing forests to use the trees to meet humans' needs and convert the land for other uses.
<b>Food crisis:</b>	When the number of people in a region who are experiencing acute hunger and malnutrition rises sharply. It usually happens in populations that are already suffering from prolonged hunger and malnutrition.
<b>Sustainable livelihoods:</b>	Ways of earning a living that meet people's present needs without compromising the ability of

future generations to meet their own needs. They are usually associated with small-scale production.

**Subsistence agriculture:**

A method of farming where the people who produce the harvests or raise the livestock eat or use what they produce rather than taking it all to market. Subsistence agriculture is usually small-scale. The farmers are at risk of starvation or food crisis if their harvests fail or their livestock fall ill or die.

**Best practices:**

Guidelines based on examples of successful actions that have been taken in the past and are likely to produce similar good outcomes if followed again.

**Community farming:**

A form of agricultural production that uses sustainable practices and connects landowners, farmers and local buyers.

**Green manure:**

Quick-growing crops that are cultivated specifically for building and maintaining soil fertility and structure. They are normally ploughed under or incorporated back into the soil, either directly or after the plant materials have been removed and allowed to rot to form compost.

## Food security and food justice

Certain populations — for example, older adults, children, persons with disabilities or health challenges, people with low incomes, migrants and Indigenous peoples — are particularly vulnerable to the impacts of climate change, including food insecurity. The disproportionate impacts are because of poverty, unemployment and low wages, limited ownership of assets, limited access to healthcare, and greater exposure to natural disasters. Severe weather conditions caused by climate change threaten food security, and not having a place to grow food can make it hard to achieve food security. People who experience these conditions are denied the opportunity to have sustainable livelihoods and face a food crisis and food injustice. Many people do not have access to healthy food because of discrimination; others do not have access to a variety of nutritious foods, especially if they live in areas affected by wars or natural disasters. A diverse diet consisting of a variety of culturally appropriate food is an essential aspect of food security.



Image source: Allan Lainez. (2024, January). *A wooden table topped with plates of food.* Unsplash. <https://unsplash.com/photos/a-wooden-table-topped-with-plates-of-food-oW15OJAq6nA>

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Food justice is about making sure that no one goes hungry and that everyone has access to enough good food and drinks every day. It is also about the right to be involved in the decisions that affect our food system.

We can work together to help more people have food security. Watch the video [Climate Change: The Philippines](#) by Oxfam Australia for some examples of how to do this.

## How to achieve food justice and food security

As individuals, we can achieve food justice by:

- buying local farm produce to reduce the transportation and refrigeration costs associated with importing foods
- eating less meat and dairy to reduce GHG emissions from large-scale livestock farming
- wasting less food
- buying fair trade products from small farmers who have been identified as producers who follow social, environmental and economic best practices

These actions will also help to mitigate the impacts of climate change.



### Activity

- How many of these actions can you take or adopt?
- How many of these actions can you convince your neighbours or other community members to take?
- Write your thoughts in your journal.

Here are some best practices to promote food justice and security:

- **Support community food security initiatives** that make healthy food more accessible to everyone — for example, food banks, community farming and food co-operatives.
- **Advocate for food justice policies** that make healthy food more affordable and support sustainable agriculture.
- **Educate yourself about food justice** by reading and watching documentaries about it and talking to people who are working to achieve it.
- **Invest in food security programmes** to ensure that everyone has access to affordable, healthy food, even in the face of climate change.

Watch the video [Understanding Global Food Security and Nutrition](#) by the German Federal Ministry of Food and Agriculture (BMEL). It explains that although there is enough food to feed the world, some people have less access than others to food. Challenges relating to making food accessible, affordable and usable for everyone lead to hunger. The video highlights some actions that governments can take to promote food security — in particular, it notes that supporting local farmers (especially women) with access to fertile land, seeds, agricultural infrastructure, water sources, education and loans can make a big difference.

Governments and civil society organisations can also work towards reducing the effects of climate change, and promoting food security in doing so, by:

- reducing GHG emissions by using fewer fossil fuels, which are the largest source of ghg emissions, and switching to renewable energy sources such as solar and wind power
- investing in climate-resilient agricultural practices
- expanding access to social safety nets to help people who have low incomes or are vulnerable in other ways to cope with food insecurity
- protecting and properly managing forests to prevent deforestation, or planting trees, because forests play an important role in absorbing CO<sub>2</sub>
- using renewable energy sources such as solar and wind power to avoid depleting natural resources
- improving early warning systems to help organisations and individuals to identify and respond to food crises quickly

## Role of subsistence and sustainable agriculture

### Subsistence farming

Subsistence producers exist on a combination of subsistence and, when there is a surplus harvest, commercial activities. One study found that in Ethiopia, subsistence agriculture can account for 58 per cent of rural households' calorie consumption. (See Sibhatu & Qaim, 2017, for more information.)

Subsistence farming can result in more intense use of farm inputs, which is measured as high levels of productivity, but subsistence farming can also be associated with unsustainable farm practices. For example, continuously cultivating on the same plot can drain the soil and reduce the quality and quantity of future yields. (See Fan & Rue, 2020, for more information.)

Subsistence farming households are at risk of food insecurity. For example, they can have deficiencies in their diet because certain foods are only available for part of the year. In the event of a severe weather disaster, they do not have the resources to build back. Subsistence agriculture can be either sustainable or unsustainable.

### Sustainable agriculture

Sustainable agriculture is a way of earning a living that meets people's present needs without compromising the ability of future generations to meet their own needs. A subsistence farm is usually small, but a sustainable farm can be of any size.



### Reading

Shenggen Fan, S., & Rue, C. (2020). The role of small farms in a changing world. In S. Gomez y Paloma, L. Riesgo, & K. Louhichi (Eds), *The Role of Smallholder Farms in Food and Nutrition Security* (pp. 29-43). Springer Cham. <https://doi.org/10.1007/978-3-030-42148-9>  
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Sibhatu, K. T., & Qaim, M. (2017). Rural food security, subsistence agriculture and seasonality. *PLOS ONE*.  
<https://doi.org/10.1371/journal.pone.0186406>  
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## Community farming

When people in a community who are interested in protecting agricultural land and eating healthy, natural food get together to support farms in their neighbourhoods, their collaboration is called **community farming** or **community-supported agriculture**. The farmers are responsible for producing the crops or raising the livestock and may gain access to land — or more land — for farming. Some community members offer advice on sustainable farming practices, some provide labour and some pay upfront for regular supplies of fresh, healthy food. The farmers and producers work as a partnership, sharing both the risks and benefits.

Community agriculture can improve both diets and food security. The food costs less because it is coming directly from community gardens.

A community agriculture project can be designed to reflect local culture and local needs. For example, in the Utah Conservation Corps Urban Community Farm (UCC UCF) in the United States of America, farmers and volunteer labourers learn how to maintain efficient and productive small-scale agricultural systems. The community members have access to fresh food, which contributes to their food security, and food may also be donated to members of the local community who are food-insecure. (See Hanson et al., n.d., for more information.)



### Reading

Hanson, B. McCann, R. B., & Damitz, S. *Community Agriculture: Concepts Models and Impacts*. Utah State University Department of Environment and Society and Utah Conservation Corps.  
<https://extension.usu.edu/sustainability/research/community-agriculture-concepts-models-impacts>  
Licence: copyright Utah State University, 2010



### Activity

- Think about whether any type of community farming could succeed in your local community.
- How easy or how difficult do you think it would be to convince your family or neighbours to take part in community farming?

## Sustainable subsistence food production practices

Here are some examples of climate-smart, climate-resilient agricultural practices that are suitable for sustainable, subsistence farming:

- **Practising crop diversification**, including planting a mix of cover crops for shade, and crop rotation to replace soil nutrients, support healthy soil and minimise space for weeds to grow.
- **Growing native plant varieties** that are suitable for local environmental conditions.
- **Conserving water**, including collecting rainwater for irrigation. Targeted watering delivers water directly to the roots of plants during the coolest times of the day to reduce waste and evaporation.
- **Using organic pest and weed control products** and reducing the use of chemical pesticides and fertilisers.
- **Practising integrated pest management.**
- **Composting or using leaves, grass cuttings and food scraps as fertiliser.**
- **Protecting the forests.**
- **Protecting biodiversity** by protecting animal and plant habitats, reducing pollution and sustainably managing natural resources.

### Linking locale-specific impacts of climate change to sustainable efforts

“The negative effects of droughts in soil fertility can be minimized by adding organic substances such as compost, sewage slugs, or municipal solid waste that increases the activity of soil enzymes.”

Source: Bogoti, K., & Walczak, M. (2022). The impact of drought stress on soil microbial community, enzyme activities and plants: *Agronomy*, 12(1): 1.  
<https://doi.org/10.3390/agronomy12010189>

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Some farmers are adopting accessible climate-smart agricultural practices such as mulching, intercropping and using green manure. In Bangladesh, some farmers are planting varieties of rice that can tolerate salinity in the soil. In Mozambique, irrigation systems, including reservoirs, can reduce

the impact of climate change, but they are mainly used by large-scale commercial farmers.

Other farmers practise protected agriculture. This means that they grow their crops under shelter — for example, greenhouses, shade cloths or windbreaks — to protect them from the elements and modify the natural environment surrounding them. This type of agriculture can extend the growing season and result in a better quality, larger quantity and wider variety of crops.

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## Unit summary



### Summary

In this unit you learned about food security and food justice and the challenges many people face with getting access to food. You also learned about subsistence agriculture and sustainable agriculture.

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# Assessment



### Assessment

#### Assessment: Multiple choice questions: 2

1. What is a subsistence farmer?
  - A. A small landholder who consumes the majority of their farm produce at home
  - B. A small commercial farmer who produces to sell on the market
  - C. A small peasant farmer who leaves the land idle
  - D. A small landowner who buys food in the market to feed their household
2. How can you tell whether a farmer is practising sustainable agriculture?
  - A. The farmer manages water efficiently
  - B. The farmer manages the nutrients in the soil
  - C. The farmer avoids soil erosion by planting trees
  - D. The farmer plants mixed crops
  - E. All of the above
3. What is food security?
  - A. Having enough safe and healthy food to eat at all times
  - B. Being unable to access food only few days of the month
  - C. Having food in house and still being hungry
4. What are some probable threats to food security due to climate change?
  - A. Low income
  - B. Unemployment
  - C. Lack of access to healthy food
  - D. Natural disasters
  - E. All of the above

5. Which of the following are characteristics of community-supported farming?
- A. A form of agricultural production that brings together landowners, farmers and local buyers to use sustainable practices to produce safe, healthy food
  - B. When people from a community who are interested in protecting agricultural land and eating healthy natural food get together to support farms in their neighbourhoods
  - C. Some community members offer advice on sustainable farming practices, some provide labour and some pay upfront to ensure regular supplies of fresh and healthy food
  - D. All of the above
  - E. A. and C. only



## Unit 3

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# Innovations in sustainable agriculture and subsistence food production: Backyard gardening, community farming and other traditional practices

## Introduction

In this unit, we look at different aspects of innovation in agriculture and food production and how these modern approaches can strengthen resilience to climate change. We look at some examples of best practices in food production and agro-processing and their relationship to geographic context and climate change issues.

On completion of this unit, you will be able to:

- *identify* best practices in geographical contexts — for example, soil-less farming, backyard gardening and soil moisture conservation.



### Outcomes



### Terminology

**Innovation:**

New products and processes used in specific contexts to increase effectiveness, resilience to climate change or environmental sustainability, or to use fewer resources to produce more output. An existing idea can be considered an innovation if it is being used in a new location or context.

**Modern approaches:**

Actions or practices established in the present or in recent times.

**Best practices:**

Guidelines based on examples of successful actions that have been taken in the past and are likely to produce similar good outcomes if followed again.

<b>Vertical farming:</b>	Soil-less crop production in which seedlings and plants are grown in stacked layers, one above the other.
<b>Controlled environment agriculture:</b>	Any method of agriculture production that can control temperature, humidity, airflow and light in a dedicated growing environment, typically using greenhouses or indoor vertical farms to allow year-round production in any location.
<b>Food processing:</b>	Actions to convert raw agricultural products to prepare them for consumption or storage by, for example, washing, chopping, grinding, cooking, pasteurising, freezing, fermenting and packaging.
<b>Food preservation:</b>	Processes that increase the shelf life of food by preventing spoilage.
<b>Genetic engineering:</b>	Editing the genome of a plant to insert DNA from other species to give the host plant desired traits — for example, pest- or drought-resistance, or improved nutrient content. Genetically modified crops reduce the need for large quantities of pesticides and insecticides, and their improved nutritional content reduces vulnerability and enhances food justice.

## Innovations: Agriculture and food production

There are many modern agricultural technologies and techniques, some of which are suited to particular geographical contexts.

Here are some examples of innovative actions that strengthen the resilience of crops, fishes and other types of animals, and the food producers themselves against natural hazards:

- using automated and drip irrigation systems
- using drones to take photographs and provide information about crop health and livestock
- practising soil-less agriculture



Image source: Scramgnon, B. (2014). *Close-up of bulb bottles on wood*. Pexels. <https://www.pexels.com/photo/close-up-of-beer-bottles-on-wood-315658/>  
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Soil-less agriculture allows crops to be grown all year and in any space, but preferably close to the markets in which they will be sold. In a controlled environment, there is less risk of damage by birds and pests, which reduces the need for pesticides. One drawback of this type of farming is that it uses much more energy than traditional farming.

Here are three examples of soil-less agriculture:

- **Hydroponics:** Nutrients are added to water and fed directly to the roots of the crops.
- **Aquaponics:** This technique combines aquaculture (raising aquatic animals such as fish, crayfish, snails or prawns in tanks) with hydroponics (see the point above). The fish waste in the water is fed to hydroponically grown plants.
- **Vertical farming:** Plants are grown in layers one above the other. This production method requires water pumps, water distribution systems and power-generating equipment to recycle the water. It also requires equipment to monitor moisture levels, light levels and temperature. It is a useful approach in places where land is scarce, such as in urban spaces — for example, people can do vertical farming on balconies in high-rise buildings. In indoor spaces, LED lamps can be used as a substitute for sunlight.

Many tools that are designed to increase agricultural productivity are not accessible to subsistence producers because they are expensive and require special training to use them.

## Innovations: Subsistence food production

In India, some innovations that are used in subsistence farming are soaking lentil, arhar and chickpea seeds in buttermilk to protect the crop from wilt disease; scattering salt over rice crops to protect them from blight disease; intercropping marigolds with tomatoes and chili peppers to protect them from mosaic and nematodes and to control wilt disease in pigeon peas; putting twigs in the fields to encourage owls to nest and feed on rats; spreading cooked rice in fields to attract birds, which also eat the caterpillars; adding ash to the soil for extra nutrients; spraying a solution with bull dung on crops as an insect repellent; and using cow urine mixed with mustard oil and water to prevent various diseases and pests in the rice crops. (See Ministry of Electronics & Information Technology, n.d., for more information.)

The Sustainable Sugarcane Production Technology Project was launched in Kolhapur, Maharashtra, because “sugarcane farmers in the District were facing several problems such as poor soil health, high input cost, fragmented land holdings, lack of technology, intensive use of resources (water and labour), effects of climate change and sudden increase in pest and diseases. As a result, sugarcane yield and farmer returns were highly inadequate.” The project introduced “an innovative set of agronomic practices that involved using fewer seeds, raising seedlings in a nursery, following new planting methods with wider plant spacing, and better water and nutrient management to increase the cane yields significantly” (Department of Administrative Reforms & Public Grievances, Ministry of Personnel, Public Grievances & Pensions, Government of India, n.d., p. 23).

Here are some examples of more sophisticated innovations that can be used in subsistence, backyard and other traditional farming practices:

- **Integrated pest management (IPM):** Using a variety of preventative and traditional methods such as practising crop rotation, planting pest-resistant varieties of plants, weeding and trapping pests. (See Mwatawala et al., 2015, p. 5, for more information.) One vision for the future of pest management in regions like East Africa is to produce plant-based insecticides locally.
- **Zero tillage:** The soil is not disturbed between harvest and sowing because tilling and over ploughing leads to soil degradation over time. (See Johansen et al., 2012, for more information.)
- **Inorganic soil cover:** Human-made mulch that does not decompose or break down quickly — for example, plastic sheeting, landscape fabric and rubber mulch.
- **Raised beds or ridges:** These reduce the total surface area needed for irrigation, as only the areas between ridges/beds are irrigated or flooded.

- **Homestead farming or intensive production of small livestock:** Raising animals in controlled areas instead of letting them roam freely to reduce their vulnerability to risks and disasters, such as disease outbreaks, drought, floods, etc. This also allows for better livestock management.
- **Hybrid seeds:** Planting seeds that are pest-, drought- or flood-resistant.
- **Improving drainage systems:** This will help to alleviate flood risk.
- **Having evacuation routes for livestock:** These make it easier to move livestock to an alternative location during adverse weather.
- **Harvesting rainwater** by collecting rain from the roofs of buildings and storing it in tanks, wells or reservoirs: This method of conserving water reduces flooding and erosion and raises the water table.
- **Practising agro-electric production:** This approach combines a solar plant with crops grown between the rows of solar panels. The dual production on a single plot of land increases food security and revenue from the energy produced (see Department of Administrative Reforms & Public Grievances, Ministry of Personnel, Public Grievances & Pensions, Government of India, n.d., pp. 95-98).

Some other innovations in sustainable agriculture that are applicable to subsistence food production through community farming are the construction of:

- **gabion baskets** made of mesh wire and filled with rocks, concrete, sand or soil to stabilise shorelines or riverbanks and prevent flooding or slope erosion.
- **levees** to divert water along a riverbed or coastline to land that can be used for agriculture. They are usually made of earth or piles of rocks and can be reinforced with wood, plastic, metal or concrete.
- **community ponds** in farming areas to save water to use during prolonged dry periods.

## Information and communication technologies

Innovations in the form of mobile telephones and the Internet allow smallholder farmers to access real-time information about daily weather conditions, upcoming natural disasters and potential emergencies and market prices, and let them connect with other farmers. They can do their banking and can buy and sell goods and services online.

In India, a smartphone app is being used to rent farm equipment, and in Sub-Saharan Africa, farmers use a “virtual cooperative” to come together and negotiate with suppliers for better prices for goods. (See Sunga, 2017, for more information.)

The Ricult Farmer App provides “smallholder farmers with free weather data, satellite imagery, pest management, and measurement tools that utilize machine learning and AI. Perhaps just as useful, farmers can use the app to secure bank loans” (Ilaria-Mayerhofer & Smith, 2022).

Watch the video *Digital Technologies are Empowering Rwandan Youth to Transform Farming* by the Food and Agriculture Organization of the United Nations. It highlights the use of digital technology by young farmers in Rwanda.



### Activity

After you have watched the video, list the three ways in which Daniel Nshimiyimama says digital technology is empowering him.

## Innovations in agro-processing

The conventional methods of food processing include drying, dehydration, smoking, evaporation, extrusion and freezing. They can have a negative effect on the food's natural colour, flavour and nutrient content.

“Since fruit and vegetables are so diverse, many different types of processed foods can be produced including dried and canned products, chutneys, pickles, jams, sauces, pastes, snacks, oils and juices. ... Fruit and vegetables can be canned or frozen, but processed products must be packaged and stored properly in order to achieve their potential shelf life of up to one year. ... Wherever possible, processed fruit and vegetables should contain a minimum of food additives and ingredients such as salt and sugar, in order to preserve their nutritional benefits and to make a positive contribution to fighting all forms of malnutrition” (FAO & CIRAD, 2021, p. 88).

Innovations in agro-processing include:

- **Microwave and ohmic heating:** These generate heat directly inside the products without using an external heating surface and are suitable for processing foods that contain water.
- **Ultrasound:** This uses vibrations or sound waves to analyse the composition, structure and physical properties of products and is used in defoaming, freezing and tenderising meat and sterilising equipment
- **High-pressure processing:** This involves applying intense uniform pressure to a product to destroy micro-organisms and is suitable for processing products with 40 per cent free water
- **Pulsed electric field processing:** This involves applying pulses or very quick releases of high electrical voltage into a raw product and is used in preserving fluid or semi-fluid food
- **Pulsed light treatments:** this involves using rays of light from ultraviolet to infra-red wave lengths in pulses or very quick flashes to inactivate micro-organisms and is used in drying and decontaminating

food, sanitising packaging materials and disinfecting processing equipment.

These innovative methods of food processing are used in pasteurisation, sterilisation, oil/juice extraction, filtration, blanching and drying. They use less water and energy than traditional processes, so they have less impact on the environment. (See Kautkar & Pandey, 2018, for more information.) However, they are more suited to large-scale production. (See De Vries et al., 2018, for more information.)

### Agro-processing in subsistence agriculture

Simple technologies include drying, fermenting, canning, freezing, preserving and juicing. Fruits, vegetables and flowers can be processed and stored for immediate or future use or for selling later.

Here are three examples of products that are prepared using locale-specific, traditional agro-processing practices suitable for subsistence food production:

- togwa: a non-alcoholic drink prepared in Tanzania
- fermented cassava (bila): a speciality of the Naila village in Fiji
- unleavened cassava bread: popular in Warapoka, Guyana

(See Faure et al., 2018, for more information.)

Can you identify a traditional or an innovative agro-processing practice in your community?



#### Activity



Reading

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Licence: CC BY-NC-SA 3.0 IGO

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## Unit summary



### Summary

In this unit you learned to identify best practices in their geographical contexts. You read several examples of innovation in food production and agro-processing in a number of countries and learned about innovations in production and agro-processing that subsistence farmers could adapt.

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# Assessment



### Assessment

#### Assessment: Multiple choice questions: 3

1. Which of the following innovations in agriculture production techniques can be used to mitigate drought conditions?
  - A. Drip irrigation
  - B. Water harvesting
  - C. Drought resistant hybrid seeds
  - D. All of the above
  
2. Which of the following innovations in food production techniques can be used to mitigate saltwater intrusions?
  - A. Using hybrid seeds that produce salt-tolerant crops
  - B. Building levees along the coastline
  - C. None of the above
  - D. Both A. and B.
  
3. Which of the following innovations in food production methods can be used to mitigate soil erosion?
  - A. Using crop residue for soil surface cover
  - B. Using genetically modified seeds
  - C. Zero tillage farming
  - D. A. and B.
  - E. A. and C.
  
4. Which of the following innovations can be used by young, small-scale, subsistence food producers?
  - A. Integrated pest management
  - B. Crop residue for soil cover
  - C. Hybrid seeds
  - D. Information and communication technology

- E. All of the above
5. Which of the following agro-processing practices can be used by small-scale food producers?
- A. Drying
- B. Fermenting
- C. Ultrasound technology
- D. Preserving
- E. All of the above
- F. A., B. and D.



## Unit 4

# Traditional and sustainable best practices and their alignment with location-specific conservation of natural resources

## Introduction

In this unit we discuss traditional and sustainable best practices in conserving natural resources in specific places.

The majority of small-scale farmers do not have access to modern devices and rely instead on skills and knowledge that have been passed down from generation to generation. Many subsistence farmers are women who do not have the means to invest in modern agricultural technology and so they rely on traditional methods. They also tend to use hand-held tools like hoes and digging sticks instead of animal-driven or mechanised ploughs because these require less upper-body strength.

On completion of this unit, you will be able to:



### Outcomes

- *describe* small-scale food processing at the household and community levels.
- *recognise* innovations in tools and techniques for food processing and preservation.



### Terminology

**Traditional:** Describes actions and practices from the past that have stood the test of time.

**Sequestration:** The process of capturing, securing and storing CO<sub>2</sub> from the atmosphere. Too much CO<sub>2</sub> and other greenhouse gases (GHGs) in the atmosphere can trap heat and contribute to climate change. Human efforts to increase sequestration are called reducing the human carbon footprint.

<b>Organic fertilisers:</b>	Fertilisers that come from animal waste manure, slurry or guano; decomposed plant waste, such as compost; and biosolids that can be added to soil or plants to provide nutrients and sustain growth.
<b>Inorganic fertilisers:</b>	Fertilisers that are made by humans and contain mineral or synthetic chemicals.
<b>Microbe/biological fertilisers:</b>	Fertilisers that contain living micro-organisms (microbes) that do not supply nutrients directly to the plant but assist with root formation and nitrogen fixing.

Responsible land use has three dimensions: environmental, economic and social. Every individual can contribute to sustainability by choosing clothing and products that have been created in accordance with fair trading practices, buying regional and seasonal products, not wasting food and consuming less meat.

Watch the video *Soil Protection: Soil Sustains Life* by ELDInitiative. It gives an overview of how food production — especially the production of meat and of feed for livestock — leaves a “footprint” on the soil and can lead to large-scale soil degradation in developed countries.

## Conservation

Conservation refers to actions that humans take to manage, preserve and protect something — in particular, natural resources — to prevent its exploitation, destruction or neglect. Natural resources include the air, land, water and animals — all of which are threatened by climate change.

In agriculture, conservation refers to farming practices that are designed to prevent the destruction of arable land or to regenerate land that has deteriorated or been overused or has been damaged by climate change. They help to ensure that there is:

- permanent soil cover,
- minimum soil disturbance, and
- diversification of plant species.

Conservation practices mitigate climate change by increasing carbon sequestration. Plants and other types of vegetation absorb CO<sub>2</sub> from the atmosphere and store it in the soil, which helps to reduce GHG emissions. In the long term, this improves crop production, which helps to increase food security.

## Traditional conservation practices

Here are some of the main traditional conservation practices in agriculture:

- **Using organic soil cover and permanent soil cover:** These natural materials sit on the soil surface and protect the land from erosion. Rain droplets can cause the soil surface to become compact, which increases runoff and reduces water infiltration. Organic or natural soil materials include crop residues, hay, animal manure, compost, sawdust, ground pine bark, wood chipping, leaves and peat moss.



Image source: Dcwcreations. (n.d.). *Mulching with hay*.  
<https://www.istockphoto.com/photos/soil-cover?page=2>  
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- Combining **crop residue** with less tillage or **zero tillage**: This reduces the amount of water evaporation from the soil and can reduce the amount of irrigation that is needed.
- Practising **crop rotation**: planting different crops in the same field at different times means the soil does not become exhausted. When soil is exhausted, it can lead to lower yields, which in turn can reduce food security. (See FAO, 2022, for more information.)
- **Intercropping**: Planting two or more crops together in the same field at the same time.
- Practising one of the many variations of **crop diversification/polyculture**, such as having a mixture of different crops and livestock, practising agro-forestry, or having a combination of tree crops and pastures.
- **Reforestation**: Replanting trees and preserving biodiversity in forests.

- **Contour farming/terracing:** Planting across a slope along the contours instead of up and down. This practice reduces runoff and soil erosion and increases the amount of water that infiltrates the soil, which in turn prevents flooding from intense rains caused by climate change.
- **Destroying infected crop residues:** Crop residue is burned after harvesting to destroy pests and weeds that interfere with agricultural yields. Climate change is creating temperatures and moisture levels that encourage pests and weeds.

Traditional IPM also involves mechanical pest control in which some of the soil-infesting larvae or adult insects are controlled by tillage. The subterranean insects are exposed to sunlight, which harms them, or predators, such as birds or other insects.

- **Windbreaks:** A line of planted trees or plants designed to reduce wind speed and protect crops, livestock and soil from wind erosion. They can also help sequester carbon.
- **Grassed waterways:** Wide, shallow channels that are dug where there is a concentration of water runoff in an agricultural field. Permanent vegetation is planted in the channels, and the roots help slow the flow of water, which holds the soil in place and prevents erosion. The vegetation also reduces the amount of GHGs in the atmosphere.
- **Traditional rainwater harvesting:** Water from the roofs of buildings is channelled into covered barrels or containers and stored for use when water is scarce.

As noted in Unit 3, many modern innovations in agriculture and food production are only suitable for large-scale production. (See Dahlin & Svensson, 2021, for more information.)

Some women-led businesses in the eco-tourism industry have successfully used traditional practices to conserve natural resources while creating and sustaining decent livelihoods. (See Akhter et al., 2013, for more information.)

## The complexities of conservation: Bangladesh

The situation in Bangladesh illustrates the complexities that can arise when a particular area requires a mix of conservation practices to mitigate the impacts of climate change. For example, while rice production has increased over the years, it has required increasing reliance on ground water. Dry season irrigation systems use a lot of ground water and energy. The heavy use of ground water means the water table has gone down to dangerous levels. There has also been a switch from local low-yielding varieties to high-yielding varieties of rice, as well as for many other crops. The new varieties of rice are heavily dependent on fertilisers applied via controlled water management and on pesticides and other chemicals. The

ecosystem has been damaged by leaching of agro-chemicals from the overuse of pesticides and other chemicals.

In addition, certain naturally occurring phenomena create problems for agricultural crop production and threaten food security. These natural problems include increased salinity in parts of the country, arsenic in ground water finding its way into the food chain, acidic soil and soil erosion in hilly areas due to deforestation. Altogether, the effect is a deterioration in the quality of the land in some places due to degradation of soil fertility, soil erosion, soil and water pollution, depletion of soil organic matter, water logging, increased soil salinity, pan formation (or hardening of the soil), acidification and deforestation.

In response, the government has made some commitments to a wide range of actions to support agriculture in its *National Conservation Strategy 2021-2036* policy document.

Adapted from: Ministry of Environment, Forest and Climate Change Government of the People's Republic of Bangladesh. (2021). *Bangladesh National Conservation Strategy 2021-2036*.

<https://faolex.fao.org/docs/pdf/BGD219210.pdf>

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## Water conservation: Sri Lanka

In Sri Lanka — especially in the Dry Zone — thousands of small irrigation tanks of varying shapes and sizes provide water for paddy cultivation. The tanks are usually made by building a dam across a flowing stream or river. A complex system of dams, canals and tanks traps and moves the water from different rivers.

Adapted from: Agriculture in Sri Lanka. (2023, 8 December). In *Wikipedia*.

[https://en.wikipedia.org/wiki/Agriculture\\_in\\_Sri\\_Lanka#References](https://en.wikipedia.org/wiki/Agriculture_in_Sri_Lanka#References)

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Reading

Akhter, S., Alamgir, M., Sohel, S. I., Parvez, R., Ahmed, M., & Chowdhury, M. S. H. The role of women in traditional farming systems as practiced in home gardens: A case study in Sylhet Sadar Upazila, Bangladesh. *Tropical Conservation Science*, 3(1),17-30. <https://doi.org/10.1177/194008291000300103>  
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Dahlin, J., & Svensson, E. (2021). Revitalizing traditional agricultural practices: Conscious efforts to create a more satisfying culture. (2021). *Sustainability*, 13(20), 11424. <https://doi.org/10.3390/su132011424>  
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Food and Agriculture Organization of the United Nations. (2022). *Conservation agriculture*. <https://www.fao.org/conservation-agriculture/overview/what-is-conservation-agriculture/en/>  
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## Traditional home and small-scale food preservation and processing

Some home-based food processing and preservation practices have been passed down through generations. Preservation refers to all actions humans take to stop or slow down spoilage by removing, killing or slowing down the micro-organisms that cause illnesses, or slowing down the natural chemical and enzymatic reactions that cause spoilage. Traditional preservation methods involve using high temperatures, low temperatures, dehydration (drying), high concentrations of salt or sugar, smoking, salting, fermenting and pickling.

Food processing differs from preservation in that it transforms foods from their raw state into a different form of food.

Traditional home-based food processing and preservation can help to maintain the nutritional value of food by preserving vitamins and minerals that are often lost during commercial manufacturing processes. These methods help to extend the shelf life of food and reduce food waste.

Home-based food processing and preservation also have economic benefits. Families can save money on groceries and reduce their dependence on store-bought products. This can be especially important in areas where fresh produce is expensive or difficult to obtain. Preserving food allows people to cope during food shortages that may have been caused by the seasonal unavailability of food and natural disasters like

hurricanes and droughts. Having preserved food available at home therefore contributes to food security.

Here are some simple, traditional food preservation methods:

- **Drying** removes water from the food to slow down growth of germs and chemical-enzyme action.
- **Salting** makes water in food tissues unsuitable for germs/micro-organisms to grow in.
- **Sweetening/candyng**, or preservation by sugar, removes water from food tissues, making it difficult for germs/micro-organisms to grow or survive.
- **Chilling** or refrigeration exposes food to temperatures between 0°C and 5°C and slows the growth of germs.
- **Freezing** — keeping food in temperatures below 0°C — completely stops the growth of germs.
- **Heating** – pasteurisation, blanching, and sterilisation.
- **Smoking** removes most of the moisture in food and is used to preserve meat, fish and seafood.
- **Pickling** increases the acidity or sourness of food and makes it difficult for germs to survive.
- **Fermenting** increases the acidity or sourness of food, which changes the taste and increases the nutrient quality.

Adapted from Naika, A. (2020). Preserve your own food. Promoting healthy eating through home food processing and preservation. Food and Agriculture Organization of the United Nations.

<https://www.fao.org/3/cb2113en/CB2113EN.pdf>

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#### Activity

Go online and read the booklet *Preserve Your Own Food: Promoting Healthy Eating through Home Food Processing and Preservation*. It is a practical guide to simple methods and techniques for preserving food at home.

Naika, A. (2020). *Preserve your own food. Promoting healthy eating through home food processing and preservation*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/3/cb2113en/CB2113EN.pdf>

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#### Activity

Now watch the video *How to Store Raw Mango for Long Time* by Pai's Kitchen. It explains how to preserve mangos and provides recipes for making mango chutney as an appetisers or side dish.

## Innovations in food processing and preservation

Here is a list of some innovations in food preservation and food processing that you can adapt for household use.

- **Chemical preservatives** such as sodium benzoate and benzoic acid are commonly used for preserving a wide range of foods as jellies, pickles, sauces and juices.
- **Hot fill** consists of applying a short blast of high heat (194–203°F or 90–95°C) to foods and their containers to kill all bacteria when the product is being packaged. This technique is used for drinks, juices and vinegar-based sauces.
- **Cold fill** consists of applying a short blast of extremely low temperatures to food packaging to sterilise the contents and avoids the use of preservatives, especially in dairy products.
- **Reverse osmosis** is a water purification technique to filter out contaminants and sediments like chlorine, salt and dirt from drinking water. It is used for many bottled water products.
- **Liquid sterilisation** is a technique in which the material is soaked in a sterile solution for a specified period of time and at a specified temperature.
- **Retort processing** involves sterilising, pasteurising or exposing a food and its packaging to high temperature to make both safe for human consumption. The retort pouch is a packaging material used instead of cans.
- **Instant powder** products are solid foods that are dried then pounded or pulverised to form light, tiny, loose particles that can be rehydrated.

Many of these innovative techniques require special equipment when they are used on a large scale, but there are techniques, tools and machines that you can use for household- or community-level food processing. There are machines for:

- steaming/blanching food
- peeling coconuts/disintegrating jelly/dicing and shredding/extracting coconut milk/shredding desiccated (dried) coconut
- solar and drum drying
- extracting cane sugar juice
- sterilising cans
- stripping the skin from seeds
- sealing plastic bags
- chopping, cutting, mixing and emulsifying a wide variety of food products
- heating, rolling and roasting peppercorns, nuts, beans and seeds
- peeling corn kernels
- dicing/shelling/milling/pulping/removing rinds for making pastes (such as curry)

- heat sterilising

Pakistan is one of the world's largest producers of rice and wheat, and it processes cereals and pasta using high temperatures. Agri-processing is used for producing milk, flour, sugar, pulses and grains. It is also used in the fruit and vegetable subsector (particularly for making citrus and mangoes into jams, jellies, and marmalades etc.). Small- and medium-sized producers make edible oils which are processed into ghee and cooking oil.

In Malawi, small- and medium-sized food processors produce cereals from maize or corn. Farmers process sweet potato and soy and turn cassava into makaka, kanyakaska and kadonoska.

In Mozambique, the most important processed products are sugar, cashew nuts, soft drinks, tea, frozen shrimp, cornmeal, wheat flour and bread and cooking oil.

In Sri Lanka, thousands of smallholders plant tea to earn a living. Most Ceylon tea is produced according to artisanal and traditional methods compared to the mechanised cut, tear and curl method which is practised worldwide. (See "Tea production in Sri Lanka," 2024, for more information.)



### Reading

Tea production in Sri Lanka. (2024, 23 February). In *Wikipedia*.  
[https://en.wikipedia.org/wiki/Tea\\_production\\_in\\_Sri\\_Lanka](https://en.wikipedia.org/wiki/Tea_production_in_Sri_Lanka)

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## Climate-resilient crops and plants

Local subsistence farming has been replaced in many places by large-scale, international, commercial production for the export market. The long-term effects have been a reduction in traditional food production, changes from fibre-rich and plant-based diets to high-fat diets, a dependence on imported food supplies and increases in lifestyle-related diseases such as diabetes. Nevertheless, some traditional household-based food processing and food preservation techniques, based on local, climate-resilient food crops and food plants, have proven to be sustainable.

Many traditional, local food production practices have been shown to be climate-resilient and able to withstand highly variant ecological and climatic conditions. For example, some communities rely heavily on starchy roots for nutrition. These plants have short growing seasons and are protected from the impacts of natural disasters because they grow underground, so they are a relatively secure source of nutrition.

Agricultural practices such as terracing, shifting agroforestry (using a diverse matrix of ground and tree crops) and multicropping preserve biodiversity, minimise erosion and improve the nutrient content of soil, which protects the quality of arable land. Traditional food trees in agroforestry and home gardens also enhance food access and dietary diversity, particularly among rural and resource-constrained families. In the Caribbean, cassava bread is produced because of it has a long shelf life and is transportable. In small Pacific islands, drying, fermenting and paste-making are used for long-term food storage. Processing and preserving local, climate-resilient food crops and food plants helps to safeguard food and nutritional security and environmental biodiversity.

Adapted from: Marrero, A., & Mattei, J. (2022). Reclaiming traditional, plant-based, climate-resilient food systems in small islands. *The Lancet: Planetary Health*, 6(2), e171-e179. [https://doi.org/10.1016/S2542-5196\(21\)00322-3](https://doi.org/10.1016/S2542-5196(21)00322-3)  
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## Unit summary



### Summary

In this unit you learned about the differences between preservation and processing, the various food preservation and food processing techniques that can be used on a small scale at the household and the community level, and innovations in equipment and techniques for food processing and preservation, including some that can be used for household or community production.

Your  
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here

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# Assessment



### Assessment

#### Assessment: Multiple choice questions: 4

1. A best practice is:
  - A. Someone's best efforts
  - B. Examples of actions that have been successful in the past and would produce similar good results in the present
  - C. Examples of actions that have been successful in the past but would not apply to the present situation
2. What is food preservation?
  - A. Actions that extend the shelf life of food
  - B. Actions that transform raw foods into another form of food
  - C. Actions that encourage micro-organisms to grow
3. What is food processing?
  - A. Actions that extend the shelf life of food
  - B. Actions that transform raw foods into another form of food
  - C. Actions that encourage micro-organisms to grow
4. Which of the following food crops is naturally climate-resilient?
  - A. Wheat
  - B. Rice
  - C. Starchy root crops
  - D. Bananas
5. Which of the following are Indigenous conservation farming practices?
  - A. Shifting agroforestry
  - B. Multicropping systems
  - C. Monoculture
  - D. Terracing

- E. All of the above
- F. A., B. and D. only

## Unit 5

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# Small-scale traditional food production and food processing techniques for sustenance and survival

## Introduction

Subsistence agriculture is a key characteristic of traditional or Indigenous communities. In this final unit we will look at some of the food cultivation approaches that are used in a selection of those communities and that have proven to be sustainable and in harmony with the environment.

We will also look at some traditional food processing approaches that are still practised. Too often, Indigenous agricultural techniques have been discredited and abandoned, mainly because they were practised at a subsistence level and therefore not considered applicable or valuable for plantation or large-scale production.

Indigenous knowledge systems and practices are usually passed on from person to person, affordable, locally available, in harmony with nature and sustainable. They are also environmentally friendly because they usually involve fewer toxic chemicals, which also means they are not harmful to human health.

Researchers are now acknowledging the eco-friendly and sustainable nature of traditional practices. Instead of being regarded as backward or slow adopters of modern technology, farmers who apply these practices are becoming recognised as innovators.

On completion of this unit, you will be able to explain best practices in food production and food processing in traditional communities.

Specifically, you will be able to:



### Outcomes

- *link* traditional community-based food production practices to the local cultural and geographical context.
- *link* traditional community-based processing techniques to the local cultural and geographic context.
- *adapt* traditional practices — community-based food production and processing techniques — to specific contexts.



### Terminology

**Traditional/  
Indigenous  
communities:**

Indigenous peoples share some common characteristics, including a history that pre-dates colonial “discovery”; strong links to the land and nature; distinct economic, political and social systems including languages, cultures and beliefs; a commitment to retaining their ancestral foundations; and communal land ownership with informal arrangements for individuals or families to cultivate allotted plots. (Note that some people prefer to use tribe, aboriginal, ethnic, first people or First Nations to describe themselves, rather than Indigenous. Always use the term or terms that a specific group or person prefers.)

**Indigenous  
knowledge:**

The information that people in a given community have collected over time and is expressed in their practices, technologies, beliefs, tools and communication systems. It is based on experience, often acquired over centuries, and adapted to the local culture and environment.

Indigenous knowledge can change over time or can be lost, forgotten or even discarded, especially if it does not have a written form.

**Fermenting:**

A natural process for preserving foods in which micro-organisms convert carbohydrates into alcohol or acids. Fermenting also encourages the growth of beneficial bacteria called probiotics.

## Indigenous food production and climate conditions

### Rice production in the Philippines

The video [\*Preserving the Vanishing Culture of the Ifugao\*](#) by International Rice Research tells the story of muyong rice production in the Ifugao district of the Philippines. It shows the terraces spread across the mountain slopes to reduce erosion, surface water runoff and the accumulation of soil and sediments in the rice paddy fields.

The narrator is concerned that the traditional life of the people who live here is vanishing. The role of the mumbaki — priests who are responsible for all the ceremonies and cultural rituals and were previously highly respected — is particularly endangered. In one ritual, after the men drink wine and pray to their ancestors, they offer up planting seeds and kill a chicken. The priests inspect the contents of the bile sacs of the chicken, which they interpret as a sign of the upcoming season. While the men perform the rituals in the granary, the women work in the fields, singing to maintain a rhythm as they do so.



### Activity

While you watch the video, note the signs of modern life that appear alongside those of the traditional life — for example, the different types of clothes (compare the officials dressed in their white shirts with the mumbaki dressed in traditional clothes), the modern fridges and microwave ovens and the traditional hand-picking of the rice.

Many aspects of the area’s traditional practices are evident in the modern world but they are at risk of vanishing. Do you think the traditional culture can be saved?

“Indigenous Knowledge Systems and Practices have been proven to contribute to the sustainability and productivity of many ecosystems, examples of which include the rice terraces and imuyung, private woodlot of the Ifugao, the traditional biodiverse swidden of the Hanunuo, and the fish conservation practices of the Dumagat” (International Labour Organization, p. 1).

Source: International Labour Organization. (1998). *General framework for the protection and promotion of indigenous knowledge systems and practices in the Philippines*. [https://www.ilo.org/manila/publications/WCMS\\_764036/lang--en/index.htm](https://www.ilo.org/manila/publications/WCMS_764036/lang--en/index.htm)

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**Case study****Muyong rice terracing in the Philippines**

For over 2,000 years, the Ifugao people have laboriously carved out hundreds of terraces in the sides of mountains for rice farming, with irrigation channels to feed water to the crops on the different levels. Parts of the rice paddy are used for planting taro and onions.

The Ifugao people also practise muyong agroforestry, which involves leaving the very top of the mountain slopes covered with forests. Here, the farmers grow sweet potatoes. Their cultivation methods include slashing or cutting down the trees and woody plants in a particular area. The vegetation is left to dry and then the biomass is burned. The ash forms a nutrient-rich layer of soil and act as a soil cover to eliminate weeds and pests.



### Case study

## Chena, Kandyan and analogue practices in Sri Lanka

Chena, Kandyan forest gardening, mixed cropping techniques and analogue forestry are traditional cultivation methods that help to create a resilient and diverse agricultural landscape.

Chena is one of the oldest traditional cultivation methods in Sri Lanka. It involves slashing and burning to clear patches of forest in which to cultivate vegetables and grains. While this practice may appear to contribute to deforestation, it is more sustainable than modern agricultural practices because chena farmers adopt **rotational** farming — that is, they move their farming activities from one piece of land to another, using each plot only for a limited time. This allows the soil and forests to regenerate.

When selecting land for chena cultivation, farmers avoid areas with large trees, which are used to construct houses. They also avoid regions with intensive wildlife as a precautionary measure. Prior to clearing any land, chena farmers employ traditional measures to safeguard wildlife.

**Mixed cropping** involves growing different crops together to control pests and diseases. This practice enhances biodiversity on farms while providing both economic and environmental stability. Legumes are planted to increase soil nitrogen and reduce reliance on chemical fertilisers.

**Kandyan forest gardening** involves cultivating a combination of trees, shrubs, vines, and plants on the same plot of land, which maintains a high level of biodiversity. This type of garden is highly resilient to economic and environmental shocks. Similarly, **analogue** reforestation closely replicates the mix of vegetation of the natural forests and maintains biodiversity.

Adapted from: Agrospecials. (2023). Traditional and indigenous farming practices show Sri Lanka the way to sustainable food production. *Agrospecials*, Edition 9. <https://magazines.rijksoverheid.nl/lnv/agrospecials/2023/01/sri-lanka>  
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(<https://magazines.rijksoverheid.nl/lnv/agrospecials/2023/01/colofon>)

Farmers who practise chena cultivation also follow the cultural tradition of planting in sync with the phases of the moon because they believe that the moon affects the crop yield. They consider the period between the new moon and the full moon to be a suitable period for sowing and harvesting seed and fruit crops. Based on the same principle, leafy vegetables grow from the new moon to the full moon period. The farmers also believe that the water content in the soil gradually improves in the period between the full moon and the new moon, and they therefore

select this period for growing root crops, such as sweet potatoes, cassava and onions. They report that the period between the new moon and the first quarter and between the full moon and last quarter are particularly suitable periods for root crops. This indicator basically affects the plant growth cycle and maturity at harvest, thereby increasing the harvest.

As noted before, one of the main sustainable principles of the chena cultivation technology is the use of diversified and polyculture cropping techniques. These techniques are based on the existing agro-ecological diversity and accessibility to agricultural inputs. They do not require the use of toxic chemical and are integrated with locally and historically developed Indigenous knowledge.

In chena production, farmers look for signs of natural vegetation to determine areas with a high water table. Some crops (coriander and bitter gourd) are planted along perimeter fences for household use and to ward off wild animals. Some crops are grown along natural rainwater channels. Some crops — for example, beans (or crops with vines) — are planted close to corn so the corn stalks can support them as they grow. Cassava is harvested during the off-season of the main crops and is an important source of food for farming households. Some vulnerable crops — for example, tomatoes and leafy vegetables — are grown near the family home because they can be more easily protected there from monkeys and birds. The farmers also follow tradition by maintaining an indigenous seed bank in their households.

These unique techniques result in multiple harvests and increased yields and less dependence on inorganic chemicals. Taken together, they bring farming families many economic benefits and enhance the resilience of the families.

Adapted from: Irangani, M. K. L. (2020). Sustainable principles of indigenous chena cultivation and management in Sri Lanka: Lessons for contemporary agricultural problems. *International Journal of Scientific and Research Publications*, 19(11), 46-54.

<http://dx.doi.org/10.29322/IJSRP.10.11.2020.p10706>

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### Case study

#### Matengo (ngolo) pit farming in Tanzania

For over a century, the Matengo people have lived in the Mbinga district of southern Tanzania and cultivated the mountain slopes there. Matengo (also known as ngolo) farming uses a unique soil conservation system to mitigate soil erosion on the slopes. Beans are planted in the late rainy season and maize the following calendar year. From time to time, fields are left fallow. In the early rainy season, weeds are allowed to grow. They are then cut and left to dry for two weeks. The dried grass is collected and arranged into ridges by the men farmers. These ridges form squares and a grid pattern in the fields. Next, the ridges are covered with a little topsoil by the women farmers who then sow the seeds on the ridges. The crop requires very little maintenance and is harvested in the early dry season. Next season, maize is planted on the ridges where the beans were grown. Sometimes cassava is planted on the ridges. There is almost zero tillage, which reduces rain-induced erosion. As the maize grows, the leaves cover the soil, which helps to conserve the soil. The combination of short-term fallowing and use of green manure means that chemical fertilisers are not required.

The spaces between the ridges become square pits that fill with rainwater during heavy rains, even on the steep slopes, but most of the standing water disappears quickly because of sub-surface drains. The pits trap sediment and minimise soil loss caused by runoff water.



### Case study

#### Soil erosion mitigation in central Vietnam

In the mountainous regions of central Vietnam, local farmers practise adaptation measures to mitigate soil erosion. They change cropping patterns, adjust their planting calendars and use native varieties as part of intercropping methods. Research has shown that the soil erosion rate tends to decrease as compared with non-Indigenous practices.

Adapted from: Van Huynh, C., Pham, T. G., Nguyen, T. Q., Nguyen, L. H. K., Tran, P. T., Le, Q. N. P., & Nguyen, M. T. H. (2020). Understanding indigenous farming systems in response to climate change: An Investigation into soil erosion in the mountainous regions of central Vietnam. *Applied Sciences*, 10(15). <https://doi.org/10.3390/app10155091>  
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### Case study

#### Traditional rice varieties in Bangladesh

Many traditional rice cultivars in Bangladesh have successfully adapted to diverse agro-ecological conditions. For example, over the years, numerous irrigation systems have depleted the water table in some regions, but the traditional aus rice varieties have some tolerance to drought. In the coastal areas, where salinity is common, the aman rice variety is the preferred crop because it can withstand salinity. However, it has a relatively poor yield.

Many small-scale farmers cannot afford to buy seeds, fertilisers or pesticides or to invest in irrigation systems. Instead, they use the seeds from their own harvest. Hundreds of traditional rice cultivars are now being grown in Bangladesh because of their adaptability, superior grain quality and resistance to abiotic and biotic stresses.



### Case study

#### Indigenous early maturing seeds in India

For paddy based, rainfall-fed farming, Indian farmers have developed a set of strategies to select the seeds, maintain seed stocks and anticipate climate changes. The farmers use cultural practices to forecast the weather. These practices are based on both biological indicators — for example, the time for the fruiting of mango trees, movement of ants and the presence of certain birds and insects — and spiritual indicators.

The Khari (Kharif) method involves growing crops at the beginning of the monsoon. The seeds germinate in the soil during the first rainfalls and the crop is ready for harvesting 70 days after sowing — before the soil is waterlogged.

Other examples of Indigenous farm practices are Jhuming, or alder-based farming, which is a combination of slash and burn and shifting cultivation or rotational agriculture. Slash and burn is usually done in the first year. Crops are grown in the fields for two years and then the fields are rested to allow for a build-up of nutrients. Meanwhile, the farmers cultivate another plot.

The **Zabo** farming system farming is a pond-based farming system that was developed over the centuries and is practised in the plains. It combines water conservation with forestry, crop production and animal protection.

## Indigenous food processing

Indigenous foods are usually nutritious because they are produced without synthetic chemicals and are often a good source of vitamins, minerals and antioxidants that are essential for good health. However,

traditional food processing methods can be time-consuming and labour-intensive, which can make them less appealing to producers.

## Fermented foods

Fermented foods feature in many traditional diets in numerous countries throughout the world and can reduce the demand for imported foods.

In Nigeria, the slurries of carbohydrate-based fermented foods such as ogi, fufu and wara have health-promoting properties and can be used to manage gastroenteritis. The micro-organisms involved in the fermentation process produce anti-microbial products that can be stored for long periods. The sale of fermented products supports livelihoods.

Adapted from: Adesule, A.T. and Awojobi, K.O. (2014). Enhancing sustainable development through indigenous fermented food products in Nigeria. *African Journal of Microbiology Research*, 8(12), 1338-1343.

<https://pdfs.semanticscholar.org/98cf/45c7b46f3cfe02c72976fcf95195750babc8.pdf>

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Amasi is a natural yogurt that is indigenous to South Africa and Lesotho. Many communities such as the Zulu, Masai, Tsonga and Xhosa people eat it. It is typically served with pap (porridge).

In Bangladesh, many different types of traditional fermented foods and beverages are produced at the household level — for example, cereal-based fermented food (jilapi, amitri, pauruti, pantavaat), fermented fish (cheapa sukuti, lonailish, shidal), fermented legumes (papad, kumrabori), fermented milks (dodhi/doi, ghee, lassi, matha), alcoholic and non-alcoholic beverages (bangle maad, tari, borhani) and fermented fruits and vegetables (aachaar, chutney). Most traditional food fermentation industries are rural, seasonal, labour-intensive and informal.

The traditional process for making ghee (clarified butter) involves simmering butter until the milk solids separate from the fats and caramelize. It is then strained off to remove all caramelised milk solids. The filtered clear pure fat (ghee) is completely free of lactose and casein.

Okpa is a snack made from ground beans, spices and palm oil. This filling is wrapped in banana leaves and steamed. In the Caribbean, paimé (Trinidad and Tobago) and conkies (Barbados) are similarly prepared with ground corn, puréed pumpkin, sweet potato and grated dried coconut. Ground meat can be added to make pastelle (Trinidad and Tobago).

Ogi (also called akamu) is a fermented cereal pudding from Nigeria. It is typically made from maize, sorghum, guinea corn or millet. In the traditional process, the grains are soaked in water for up to three days and then before wet-milled or ground and passed through a sieve to remove the husks. The filtered cereal is then allowed to ferment for up to three days until it is sour. It is then boiled into a **pap** or cooked into a creamy pudding.

Watch the video [Millet Pap from Scratch](#), by Lovemrskush. It describes the process of making pap. A modern electrical blender is used for the grinding step, but otherwise the process remains the same.

In Kenya, pap is known as uji and is generally made with millet and sorghum. It is commonly served for breakfast and dinner and often has a thin, gravy-like consistency. (See “Ogi,” 2024, for more information.)

In West African cuisine, fufu — also spelled fufuo, fufou, foofoo or foutou — is a pounded meal made from boiled and mashed starchy vegetables such as cassava, plantains or yams. It is usually served with soups or stews. In pre-colonial times, before the Portuguese traders introduced cassava to Africa from Brazil in the 16th century, fufu was made from cocoyam, plantain and yams. Fufu is also known as sakora, sakoro or couscous de Cameroun.



Image source: PGSkot. (2011). Preparing the fufu. In *Wikipedia*.  
[https://en.wikipedia.org/wiki/Fufu#/media/File:Preparing\\_the\\_fufu.jpg](https://en.wikipedia.org/wiki/Fufu#/media/File:Preparing_the_fufu.jpg)  
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A traditional method of processing cassava is to make unleavened cassava bread. This is a very lengthy process. Watch the video [Making Cassava Bread in Warapoka](#), by Reel Guyana, to see how it is done.



### Reading

Ogi (food). (2024, 15 March). In *Wikipedia*.  
[https://en.wikipedia.org/wiki/Ogi\\_%28food%29](https://en.wikipedia.org/wiki/Ogi_%28food%29)  
Licence: CC BY-SA

Fufu. (2024, 10 March). In *Wikipedia*. <https://en.wikipedia.org/wiki/Fufu>  
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## Unit summary



### Summary

In this unit you learned about best practices and traditions in food production and food processing in a variety of Indigenous or traditional communities. The sustainable principles and management practices of traditional cultivation practices offer solutions for contemporary agricultural problems — for example, dependency on expensive agrochemicals and other production tools and equipment, soil infertility and water shortages — and support both food safety and farmer safety.

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**Attain Food Security through Subsistence and Sustainable  
Agriculture**

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**Assessment**

**Assessment: Multiple choice questions: 5**

1. Which of the following are examples of Indigenous food production systems?
  - A. Terracing on hill sides
  - B. Chena or slash and burn
  - C. Soil-less propagation
  - D. Kandyan forest gardening
  - E. All of the above
  - F. A., B. and D. only
2. Which of the following are examples of Indigenous food preservation techniques?
  - A. Drying
  - B. Curing
  - C. Smoking
  - D. All of the above
  - E. A. and C. only
3. How does Indigenous food production address emerging food security concerns?
  - A. Indigenous foods are usually produced without artificial chemicals and are more nutritious, so they contribute to nutrition security
  - B. Foods preserved by Indigenous methods can be sold long after they have been harvested
  - C. Preserved foods are often good sources of vitamins, minerals and antioxidants
  - D. All of the above
4. Which Indigenous food cultivation practice is associated with mitigating hillside erosion?

- A. Matengo (ngolo) pit farming
  - B. Jhuming
  - C. Khari (kharif)
  - D. Fallowing
5. Which of the following is the most common traditional method of food preservation?
- A. Dry salting
  - B. Curing
  - C. Drying
  - D. Fermenting

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## Answer key (Multiple choice questions)

### Multiple choice questions: 1 (Unit 1)

1. Which of the following are examples of climate change?

**E. A., C. and D.**

2. Which of the following are natural resources?

**E. A., B., and C.**

3. What is natural resource degradation?

**C. Natural resources such as soil and water being used up faster than they can be replaced**

4. What is food security?

**A. Having enough safe and healthy food to eat at all times**

5. What are the major causes of food insecurity?

**E. All of the above**

### Multiple choice questions: 2 (Unit 2)

1. What is a subsistence farmer?

**A. A small landholder who consumes the majority of their farm produce at home.**

2. How can you tell whether a farmer is practising sustainable agriculture?

**E. All of the above**

3. What is food security?

**A. Having enough safe and healthy food to eat at all times**

4. What are some probable threats to food security due to climate change?

**E. All of the above**

5. Which of the following are characteristics of community-supported farming?

**D. All of the above**

### Multiple choice questions: 3 (Unit 3)

1. Which of the following innovations in agriculture production techniques can be used to mitigate drought conditions?

**D. All of the above**

2. Which of the following innovations in food production techniques can be used to mitigate saltwater intrusions?

**D. Both A. and B.**

3. Which of the following innovations in food production methods can be used to mitigate soil erosion?

**E. A. and C.**

4. Which of the following innovations can be used by young, small-scale, subsistence food producers?

**E. All of the above**

5. Which of the following agro-processing practices can be used by small-scale food producers?

**F. A., B. and D.**

### Multiple choice questions: 4 (Unit 4)

1. A best practice is:

**B. Examples of actions that have been successful in the past and would produce similar good results in the present.**

2. What is food preservation?

**A. Actions that extend the shelf life of food**

3. What is food processing?

**B. Actions that transform raw foods into another form of food**

4. Which food crop is naturally climate-resilient?

**C. Starchy root crops**

5. Which of the following are Indigenous conservation farming practices?

**F. A., B. and D. only**

## Multiple choice questions: 5 (Unit 5)

1. Which of the following are examples of Indigenous food production systems?

**F. A., B. and D. only**

2. Which of the following are examples of Indigenous food preservation techniques?

**D. All of the above**

3. How does Indigenous food production address emerging food security concerns?

**D. All of the above**

4. Which Indigenous food cultivation practice is associated with mitigating hillside erosion?

**A. Matengo (ngolo) pit farming**

5. Which is the most common traditional method of food preservation?

**D. Fermenting**