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MODULE 2: **Sustainable Agriculture**

LESSON 1: **Definition and Impact of Sustainable Agriculture**

TIME: **1 hour 36 minutes**

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This lesson was made possible with the assistance of the following organisations:

**MODULE 2**

**Sustainable Agriculture**

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On completion you will be able to:

* Provide a definition of sustainable agriculture.
* Understand the impacts of various agricultural practices.
* Identify various sustainability practices.

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**Dr Maina Muniafu**

## AUTHOR:

## TIME:

## 1 hour 36 minutes

**LESSON**

**DEFINITION AND IMPACT OF SUSTAINABLE AGRICULTURE**

## OUTCOMES:

## :

## INTRODUCTION:

## :

Agriculture is a vital sector of the economy, mainly for the life sustaining products that it provides. On the other hand, it is a high-resource demand venture especially if it is carried out with an entrepreneurial approach. Its impact on the environment is wide and varied and call for specific measures, some of which attempt to strike a balance between production output and limiting environmental impact.

**Definition and Aims of Sustainable Agriculture**

As a group, we already have some idea of what the concept sustainable agriculture is! It is possible that your understanding is derived from your aim within agriculture. Let us see if we can develop our own definition.

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Defining Sustainable Agriculture (10 minutes)

## Activity 1

Working in groups of four:

1. Identify key words that help you understand the concept ‘Sustainable’ and insert them in the table below:

Sustainable (Key words)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

1. Now do the same for the concept, ‘Agriculture’

Agriculture (Key words)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

1. Now insert the words in both tables to construct a definition for the concept ‘Sustainable Agriculture’

|  |
| --- |
| Combined definition:  |

##



See the Feedback section at the end of this lesson to see a definition that can be compared to the definition your group developed.

**IMPACT OF AGRICULTURAL PRACTICES**

Farming can have an enormous impact on the environment and the availability of resources, and if not monitored and controlled the impact is not often good. If we want to enjoy the environment and have access to natural resources in the future, we will need to think of ways to ensure our activities have minimal impact. But first, what are these potential impacts?

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## Activity 2

Environmental Impact (20 minutes)

1. Read the following article:

**Environmental impacts of agriculture**

1. Land clearing for cultivation purposes leading to
* Loss of biodiversity
* Loss of natural habitats and potential human/wildlife conflicts
* Disruption of ecosystem balances and their functions
1. Changes in regions reflectance and water balances
* Loss of forest cover leads to heat build ups
* Lack of vegetation, especially trees, means that less water is held underground
1. Tillage of cropland
* Loosening of soil exposes it to erosion agents (water, wind)
* Loss of nutrients such as nitrogen from evaporative processes
* Creation of hard pan in ploughing
1. Input demands for large scale/mechanized/entrepreneurial farming
* Pressure on natural resources such water (depletion of ground and surface reservoirs) and fossil fuels (petrol for machines)
* High input of inorganic fertilizers and application of chemicals such as pesticides and herbicides among others
1. Negative impacts on soils including:
* Loss of nutrients/fertility especially from reducing soil organic matter additions
* Changes in soil structure and soil chemistry
* Salination and alkalization from irrigation and inorganic fertilizers respectively
1. Eutrophication of water bodies from:
* Inorganic fertilizer run-offs
* Excess manure run-offs
1. Negative effect of applied chemicals including:
* Loss of useful insects such as the pollinators
* Possible impacts on human health
* Impact of chemical residuals in the ecosystem
1. Narrowing of crop/animal diversity in favour of high yield varieties
2. Potential for overgrazing and trampling of land in livestock areas



1. Use the table below and match activities described above with various resource and environmental impacts. The second row has been done for you to illustrate what is required.

Exercise on impact of agriculture

See the Feedback section at the end of this lesson to see the model answer for this activity

|  |  |  |
| --- | --- | --- |
| **Agricultural activity** | **Resource Impact** | **Environmental impact** |
| Tilling |  |  |
| Land clearing | Natural vegetation, wild animals (small and large) | Loss of biodiversity, changes in heat and water balances, human-wildlife conflicts |
| Chemical applications to crops and animals |  |  |
| Addition of inorganic fertilizers |  |  |
| Rearing high livestock numbers in limited open space |  |  |
| Irrigation |  |  |
| Rearing high livestock numbers in limited closed space |  |  |
| Intensive crop/animal production |  |  |



Work in a group of four members and see if you can brainstorm some of these sustainable measures. Fill in the table below based on the group discussions that should identify both the shortcomings and advantages of each method.

**SUSTAINABILITY PRACTICES IN AGRICULTURE**

See the Feedback section at the end of this lesson to see the model answer for this activity

|  |  |  |  |
| --- | --- | --- | --- |
| **Agricultural activity** | **Sustainable measures** | **Advantage(s)** | **Disadvantage(s)** |
| Tilling |  |  |  |
| Land clearing |  |  |  |
| Chemical applications to crops and animals |  |  |  |
| Addition of inorganic fertilizers |  |  |  |
| Rearing high livestock numbers in limited open space |  |  |  |
| Irrigation |  |  |  |
| Rearing high livestock numbers in limited closed space |  |  |  |
| Intensive crop/animal production |  |  |  |

## Activity 3

Sustainable Practices (30 minutes)

We can, however, limit our impact on resources and the environment by emulating known agricultural practices that are environment friendly and thus sustainable. Some of these practices are known to you.



Farming without thought of the impact of various methods we employ is short sighted. In many ways we farmers have much to lose if we work destructively. Our livelihood is dependent on natural resources and the environment. We need to be sensitive to the potential impact we wield.

# Conclusion

Wikipedia. (2011). *Sustainable Agriculture*. Available online: [http://en.wikipedia.org/wiki/Sustainable\_agriculture Accessed 02/03/2011](http://en.wikipedia.org/wiki/Sustainable_agriculture%20Accessed%2002/03/2011) CC: BY-SA

Sustainable Table. (2011). *What is Sustainable Agriculture?* Available online: <http://www.sustainabletable.org/intro/whatis/> ©

# Enrichment Resources

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|  |  |  |
| --- | --- | --- |
| **Agricultural activity** | **Resource Impact** | **Environmental impact** |
| Tilling | Soil | Soil erosion |
| Land clearing | Natural vegetation, wild animals (small and large) | Loss of biodiversity, changes in heat and water balances, human-wildlife conflicts |
| Chemical applications to crops and animals | General ecosystem | Loss of useful insects, chemical residuals and accumulation in food chains, health effects on humans |
| Addition of inorganic fertilizers | Soil, water bodies | Changes in soil chemistry, eutrophication of water bodies |
| Rearing high livestock numbers in limited open space | Soil, vegetation | Soil erosion and soil compaction |
| Irrigation | Soil, water reservoirs | Salination, depletion of water |
| Rearing high livestock numbers in limited closed space | Water bodies | Manure run-offs that cause eutrophication |
| Intensive crop/animal production | Energy, water, nutrients | Fossil fuel, water and soil nutrient depletion, loss of crop/animal diversity  |

Exercise on impact of agriculture

## Feedback Activity 2

**Sustainable Agriculture definition:**

*Sustainable Agriculture refers to a production process that utilizes resources in a manner that reduces negative impact on the surroundings and ensures that such resources are available for use by future generations*

## Feedback Activity 1

# Feedback

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|  |  |  |  |
| --- | --- | --- | --- |
| **Agricultural activity** | **Sustainable measures** | **Advantage(s)** | **Disadvantage(s)** |
| Tilling | Minimum tillage | Lower soil erosion | Higher pest incidences |
| Land clearing | Reduced cultivation expansion, over seeding to reduce exposure of soil, soil conservation measures | Reduced soil erosion | Lower food outputs |
| Chemical applications to crops and animals | Integrated pest management | Less reliance on chemicals, promotion of alternative pest control | Maybe less effective on large scale applications |
| Addition of inorganic fertilizers | Fertilizer mixes of organic and inorganic | Better soil structure, lower nutrient run-offs | Reduced maximal outputs in the short-term |
| Rearing high livestock numbers in limited open space | Controlled livestock numbers | Lower land degradation | Lower pastoral incomes |
| Irrigation | Appropriate irrigation techniques | Reduced water losses in aquifers | Higher costs of irrigation equipment |
| Rearing high livestock numbers in limited closed space | Alternative manure usages | Lowered additions of manure run-offs into water | Lack of alternative manure usages |
| Intensive crop/animal production | Diverse crop/livestock varieties including polycultures | Biodiversity conservation | Resistance from large scale farmers |

Exercise on impact of agriculture

## Feedback Activity 3

# Feedback