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MODULE 2: **Sustainable Agriculture**

LESSON 2: **Management of Agricultural Resources**

TIME: **1 hour 36 minutes**

AUTHOR: **Dr Maina Muniafu**



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

**MODULE 2**

**Sustainable Agriculture**

**2**



**MANAGEMENT OF**

**AGRICULTURAL RESOURCES**

By the end of this lesson you will be able to:

* Describe vital agricultural inputs and resources.
* Balance out agricultural outputs with input requirements.
* Understand improvement measures for agricultural resources available to them.

These case studies can be accessed from the course CD ROM under
*Resources Index | Module 2 | Lesson 2 | Case Study*

In Kenya’s agricultural regions, there is a certain range of resource options available for use by the farmers. Some regions have more abundant resources than others but what is more critical to production is how these resources are managed. If this is done in a sustainable manner, there is both a short and long-term impact on a number of variables in the production system.

Three case studies are presented for farmers in Mwingi, Athi River and in Chepsonoi.

## INTRODUCTION:

## :

## OUTCOMES:

## :

**LESSON**

**Dr Maina Muniafu**

## AUTHOR:

## TIME:

## 1 hour 36 minutes

## OUTCOMES:

## :

## INTRODUCTION:

## :

**Agricultural inputs and resources**

Each farming activity has vital inputs and resources that are crucial to its production systems. Before we can consider sustainable management practices we need to identify what these vital items are.

## icon_activity.png

## Activity 1

## icon_time.png

Inputs & Resources (20 Minutes)



See the Feedback section at the end of this lesson to see a completed table.

|  |  |  |
| --- | --- | --- |
| **Agricultural activity** | **Inputs** | **Resources** |
| Sugar cane farming |  |  |
| Poultry rearing |  |  |
| Potato growing |  |  |
| Maize (large scale) |  |  |
| Maize (subsistence) |  |  |
| Tea growing |  |  |
| Commercial livestock |  |  |
| Horticulture (vegetables) |  |  |

Work in groups of four and complete table 1 based on your discussions.

**Table 1: Inputs and resources for agriculture**

**Agricultural Outputs Versus Input Requirements**

Even a cursory glance at the online encyclopaedia, *Wikipedia*, reveals that the environmental impact of agriculture is of global significance.

**Article 1: Agriculture, Environmental Impact**

Agriculture imposes external costs upon society through pesticides, nutrient run-off, excessive water usage, and assorted other problems.

**Water Usage**

Agriculture accounts for 70 per cent of withdrawals from freshwater resources. However, increasing pressure being placed on water resources by industry, cities and the involving biofuels industry, means that water scarcity is increasing and agriculture is facing the challenge of producing more food for the world's growing population with fewer water resources.

**Livestock**

Senior UN official and co-author of a UN report detailing livestock issues, Henning Steinfeld, said "Livestock are one of the most significant contributors to today's most serious environmental problems". Livestock production occupies 70% of all land used for agriculture, or 30% of the land surface of the planet. It is one of the largest sources of greenhouse gases, responsible for 18% of the world's greenhouse gas emissions as measured in CO2 equivalents. By comparison, all transportation emits 13.5% of the CO2. It produces 65% of human-related nitrous oxide (which has 296 times the global warming potential of CO2,) and 37% of all human-induced methane (which is 23 times as warming as CO2. It also generates 64% of the ammonia, which contributes to acid rain and acidification of ecosystems.

**Land Transformation**

Land transformation, the use of land to yield goods and services, is the most substantial way humans alter the Earth's ecosystems, and is considered the driving force in the loss of biodiversity. Estimates of the amount of land transformed by humans vary from 39–50%. Land degradation, the long-term decline in ecosystem function and productivity, is estimated to be occurring on 24% of land worldwide, with cropland over-represented. The UN-FAO report cites land management as the driving factor behind degradation and reports that 1.5 billion people rely upon the degrading land. Degradation can be deforestation, desertification, soil erosion, mineral depletion, or chemical degradation (acidification and salinization.)

**Pesticides**

Pesticide use has increased since 1950 to 2.5 million tons annually worldwide, yet crop loss from pests has remained relatively constant. The World Health Organization estimated in 1992 that 3 million pesticide poisonings occur annually, causing 220,000 deaths. Pesticides select for pesticide resistance in the pest population, leading to a condition termed the 'pesticide treadmill' in which pest resistance warrants the development of a new pesticide.

An alternative argument is that the way to 'save the environment' and prevent famine is by using pesticides and intensive high yield farming, a view exemplified by a quote heading the Center for Global Food Issues website: 'Growing more per acre leaves more land for nature'. However, critics argue that a trade-off between the environment and a need for food is not inevitable, and that pesticides simply replace good agronomic practices such as crop rotation.

Wikipedia <http://en.wikipedia.org/wiki/Agriculture> CC: BY SA

**Article 1: Agriculture, Environmental Impact continued**



**Economic and environmental costs of agricultural activities**

See the Feedback section at the end of this lesson to see a completed table.

## Activity 2

1. Select one agricultural activity and make a one page report on your impressions of economic versus environmental costs of the activity.

|  |  |  |
| --- | --- | --- |
| **Agricultural activity** | **Economic Cost** | **Environmental Cost** |
|  | **Input** | **Output** |
| Sugar cane farming |  |  |  |
| Poultry rearing |  |  |  |
| Potato growing |  |  |  |
| Maize (large scale) |  |  |  |
| Maize (subsistence) |  |  |  |
| Tea growing |  |  |  |
| Commercial livestock |  |  |  |
| Horticulture (vegetables) |  |  |  |

1. Identify input/output economic costs in columns 2 & 3 in Table 2 below. Use the information your group generated in Table 1 above as an aid.
2. Do the same for the environmental costs column.

Costs (20 minutes)



Exercise on impact of agriculture

1. Work in groups of 4, consult your competed version of Table 1 above and suggest improvement practices in terms of soil, water and energy conservation. Record these practices in the table below.
2. Pick out sustainability measures that you can observe in the presented case studies.

Need some help? Check out the wikiHow site on *How to Practice Sustainable Agriculture* for some ideas:

<http://www.wikihow.com/Practice-Sustainable-Agriculture>

|  |  |
| --- | --- |
| **Agricultural activity** | **Sustainability improvements** |
| Sugar cane farming |  |
| Poultry rearing |  |
| Potato growing |  |
| Maize (large scale) |  |
| Maize (subsistence) |  |
| Tea growing |  |
| Commercial livestock |  |
| Horticulture (vegetables) |  |

Improvement measures (20 minutes)

## Activity 3

There are ways improvements can be made at an individual and community level. These are always a challenge due to the attitudes of people that may be motivated solely by short term interests to the detriment of the environment.

**IMPROVEMENT MEASURES FOR AGRICULTURAL RESOURCES**



To ignore sustainable farming practices is irresponsible and affects your family, the community, not to mention future generations. With a bit of effort, though, it is possible to start implementing environmentally friendly practices. The trick though is to integrate these practices into your everyday practices.

NSAIS. (2005). *Sustainable Agriculture: An Introduction*. Available online: <http://attra.ncat.org/attra-pub/sustagintro.html>. Accessed 03/03/2011 ©

University of California. (2011). *What is sustainable agriculture?* Available online: <http://www.sarep.ucdavis.edu/concept.htm>. Accessed 03/03/2011 ©

wikiHow. (2010). *How to Practice Sustainable Agriculture*. Available online: <http://www.wikihow.com/Practice-Sustainable-Agriculture>. Accessed 03/03/2011 CC: BY NC SA

# Enrichment Resources

# Conclusion

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Wikipedia. (2011). *Agriculture: Environmental Impact*. Available online: <http://en.wikipedia.org/wiki/Agriculture>. Accessed: 03/02/11. CC:BY-SA

# References

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| --- | --- | --- |
| **Agricultural activity** | **Inputs**  | **Resources** |
| Sugar cane farming | Seed, human labour, petrol for machinery, pesticides, fertilizer | Land, water (rainfall), soil nutrients, energy (fossil fuels) |
| Poultry rearing | Chicks (day old), human labour, energy for heaters, vaccines, water, feed | Energy (electricity), water, nutrients,  |
| Potato growing | Machinery, human labour, pesticides, fertilizer, water, seed | Land, water, nutrients |
| Maize (large scale) | Hybrid seed, water by irrigation, human labour, petrol for machinery, pesticides, herbicides, fertilizer | Land, energy (fossil fuels), water (rainfall), soil nutrients |
| Maize (subsistence) | Seeds, human labour, fertilizer, farming tools | Land, water (rainfall) |
| Tea growing | Seedlings, human labour, petrol for transportation, pesticides, fertilizer | Land, water (rainfall), nutrients |
| Commercial livestock | Fodder, human labour, pesticides, water, transport, vet services | Land, fodder, water |
| Horticulture (vegetables) | Seed, water, fertilizer, pesticides | Water, nutrients |

**Table 1: Inputs and Resources for Agriculture**

## Feedback Activity 1

# Feedback

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# Feedback

**Table 2: Environmental costs of agricultural activities**

|  |  |
| --- | --- |
| **Agricultural activity** | **Environmental Cost** |
| Sugar cane farming | Erosion from land clearing, pesticide and fertilizer run-offs, impacts of tractors and trucks |
| Poultry rearing | Manure run-offs, nutrient demands |
| Potato growing | Loss of soil fertility (monocropping), depletion of water resources, pesticide runoffs, soil erosion |
| Maize (large scale) | Erosion from land clearing, pesticide and fertilizer run-offs, soil physical structure changes |
| Maize (subsistence) | Erosion from land clearing, depletion of soil nutrients. |
| Tea growing | Erosion from land clearing, pesticide and fertilizer run-offs, depletion of soil nutrients, increased soil acidity |
| Commercial livestock | Manure run-offs, devegetation from trampling and overgrazing, soil erosion |
| Horticulture (vegetables) | Pesticide run-offs |

## Feedback Activity 2