

MODULE 2: **Sustainable Agriculture**

LESSON 2: **Management of Agricultural Resources**

TIME: **1 hour 36 minutes**

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LESSON

2

MANAGEMENT OF
AGRICULTURAL RESOURCES



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INTRODUCTION:

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.

OUTCOMES:

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

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.

Activity 1



Inputs & Resources (20 Minutes)



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

Table 1: Inputs and resources for agriculture

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



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

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.)

Article 1: Agriculture, Environmental Impact continued

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

Activity 2



Costs (20 minutes)



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.

Economic and environmental costs of agricultural activities

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)			

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



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

IMPROVEMENT MEASURES FOR AGRICULTURAL RESOURCES

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.

Activity 3



Improvement measures (20 minutes)



1. Work in groups of 4, consult your completed version of Table 1 above and suggest improvement practices in terms of soil, water and energy conservation. Record these practices in the table below.

Exercise on impact of agriculture

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

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

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

2. Pick out sustainability measures that you can observe in the presented case studies.

Conclusion



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.

Enrichment Resources

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 ©

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<http://en.wikipedia.org/wiki/Agriculture>.
Accessed: 03/02/11. CC:BY-SA

Feedback



Feedback Activity 1

Table 1: Inputs and Resources for Agriculture

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

Feedback



Feedback Activity 2

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