Module 10

Agriculture and health

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MODULE 10 – AGRICULTURE AND HEALTH

Overview

Agriculture is the cultivation of animals, plants, fungi, and other life forms for food, fibre, and other products used to sustain life. Agriculture and health have intrinsically close and complex links; on the one hand, agriculture provides the nutritional basis for good health. On the other hand, in a heavily populated and globalized world, the way agriculture is practised has become a source of environmental degradation and ill-health. Health is a goal and also precondition of human development, which is well reflected by the Millennium Development Goals (MDGs), of which almost all development goals are health or health-related.

This module is about developing an Ecohealth-based understanding and strong analytical and action capacity to address the links between agriculture and health, with a focus on an Asian context. The module is designed in a way that allows participants to apply what they have learned about Ecohealth approaches in other modules of this training course to a specific area, namely agriculture and health.

The complex and diverse patterns of agriculture practices – which range from subsistence farming to intensive modern agriculture, and their multiple, dynamic, and complex interactions with the health of humans, animals, and ecosystems – provide a rich field for the application of Ecohealth approaches that include systems thinking, transdisciplinarity, participation, and social and gender equity, etc. Agricultural activities are so diverse that it is impossible to cover every issue in a training course in a limited time. Thus, selection is essential and a few key agriculture and associated health issues should be selected as examples or case studies to help participants gain knowledge and develop capacity.

This module will first give participants a broad overview of the connections between agriculture and health and then select some key issues in Asia for in-depth case studies.
Ecohealth Trainer Manual (FBLI) Module 10: Agriculture and Health

Conceptual Map: Module 10

Learning Objective:
Create conceptual images to represent the links between agriculture and health.

Activity 2:
Class or group discussion

Learning Objective:
Identify and understand the diverse, dynamic, and complex links between agriculture and health.

Activity 1:
Brainstorming

Activity 3:
Lecture; handout

Activity 6:
Summary evaluation

Learning Objective:
Approach agriculture and health issues with an Ecohealth perspective and use Ecohealth principles to understand the relationships between them.

Activity 4:
Small group discussion; case study

Learning Objective:
Understand case studies that use an Ecohealth approach and be able to draw experience and lessons.

Learning Objective:
Engage with others from different disciplinary backgrounds and work collaboratively to address an agriculture-related health issue using an Ecohealth perspective.

Advanced Learning Objective:
Design the key elements and methodologies for an Ecohealth research project to investigate an issue where there appears to be a significant link between agriculture and health.

Activity 5:
Small groups; design a research project; discussion
Module Aims

This module provides an opportunity for the participants to apply what they have learned about Ecohealth approaches in a specific arena: agriculture and health. The aims and goals of this module are to expose participants to the many complex, diverse, and dynamic links between agriculture and health. This is accomplished by introducing a few key conceptual frameworks and practical examples, conducting in-depth case studies and group discussion to equip participants with new insights about the connections between agriculture and health and to help learners develop capacity of conducting research in this important area from an Ecohealth perspective.

Why is this topic important?

At present, agriculture still employs around 50% of the world population. In developing countries in Asia, where agriculture is the main livelihood for many people, the percentage is higher. Links between agriculture and health in Asia have been manifested by the endemics of several emerging infectious diseases such as Avian Influenza, SARS, and the Nippah virus.

Agricultural intensification, defined as an increase in the productivity of crops and livestock per unit of input, was selected as the focus of a 5-year project to build the field of Ecohealth in Asia (the Field Building Leadership Initiative: Advancing Ecohealth in Southeast Asia), which supports the development of this manual. This topic was identified as important because agricultural intensification can bring many benefits to society, such as improved food security and nutrition, adaptation to urban or peri-urban environments, improved livelihoods, and export-oriented production. At the same time, it can negatively affect the natural resource base that supports productive capacity in farming areas, and is often a causal factor in human and animal health problems. Moreover, agricultural intensification imposes external costs on society, such as biodiversity loss, pesticide and chemical fertilizer use, nutrient runoff, excessive water usage, and (re)emergence and spread of infectious diseases. The impacts of agricultural intensification, coupled with climate change, pose critical problems for ecosystems and human health at local, regional, and global levels.

There are many issues of relevance to Ecohealth in an agricultural setting, including livelihoods, rural-urban connections, poverty, host-parasite relationships, and human and animal health.

There is a need for human resource development to improve knowledge and skills in the links between agriculture and health and better manage associated health risks. At the time of writing, curricula of both medical or public health universities and agricultural universities in Southeast Asia contain limited content on this important topic. It is hoped that a module on agriculture and
health in the context of Ecohealth in Southeast Asia will help fill this gap in current teaching in universities in the region.

Key Concepts

Agriculture is a very broad field that covers many different practices, patterns, and technologies. The concept of health embodies a wide range of issues that are affected by many biological, ecological, and social determinants, which have been discussed at length in this course.

Some key concepts for this module include, but are not limited to subsistence farming, green revolution, agricultural intensification, animal husbandry, zoonotic diseases, sustainable agriculture, nutrition, food safety and security, and the health of environment and ecosystem.

An understanding of the interactions between agriculture and health should be one of the major learning objectives for the participants of this module.

Several key themes are selected for in-depth case studies for participants to develop needed knowledge and capacity:

- Crops and health: will cover important and relevant issues such as pesticide and fertilizer use and overuse, and food safety.
- Livestock rearing and health: will cover issues such as zoonotic diseases, emerging infectious diseases, and food safety.
- Agricultural water development and health: will cover water-related and water-borne diseases such as malaria and schistosomiasis.
- Agroforestry, agro-biodiversity, nutrition and health: will cover food security, food safety, and nutrition.

Several other topics could be included, such as antimicrobial resistance, and the resistance of pests to pesticides, but the module cannot attempt to address all topics related to agriculture and health.
This module refers to Ecohealth research and the design of research frameworks. In discussing research design, learners should be encouraged to think through the whole process, including the following steps:

1. Determining the problem statement
2. Determining the research objective
3. Defining the research question or hypothesis
4. Establishing the methodology, sampling strategy, data collection, and analysis process
5. Determining the dissemination of research findings and the integration of knowledge to action.

Guiding Questions

These questions can be provided to the learners at different stages of the module. They can also be listed in table form, and learners encouraged to write down their thoughts as they proceed through the module.

1. What are the conceptual frameworks that can help us to better understand the links between agricultural practices and the health of humans, animals, and ecosystems?
2. What are the practical and theoretical connections between agriculture and human health?
3. What are some of the skill sets required to approach agricultural issues using an Ecohealth approach?
4. What are the major agricultural practices in the place where you live?
5. What kind of implications, both positive and negative, do these practices have or potentially have for the health of people, animals, and ecosystems?
6. What are the practical solutions to address negative impacts from an Ecohealth perspective?
7. How can we design research about agriculture and health that uses an Ecohealth approach?
8. Who should be involved in designing such a project? Why?
Basic Learning Objectives

After completing this module, learners will be able to:

• Identify and understand the diverse, dynamic, and complex links between agriculture and health
• Create conceptual images to represent the links between agriculture and health
• Approach agriculture and health issues with an Ecohealth perspective and use Ecohealth principles to understand the relationships between them
• Understand case studies that use an Ecohealth approach and be able to draw experience and lessons from them
• Engage with others from different disciplinary backgrounds and work collaboratively to address an agriculture-related health issue using an Ecohealth perspective.

Advanced Learning Objectives

Advanced learners will be able to:

• Design the key elements and methodologies for an Ecohealth research project to investigate an issue where there appears to be a significant link between agriculture and health.

Practical Notes

Because this module covers two very broad fields, namely agriculture and health, it puts high requirements on the trainers. If possible, at least two trainers are needed with complementary expertise in agriculture and health. Ideally, trainers should also have experience in Ecohealth research.

Another option is for course organizers to ensure that the class participants come from a variety of health and agricultural backgrounds. In this case the trainers, who should in any case have good facilitation skills, can draw out the complementary knowledge from the class members themselves. In this case, the trainers should prepare themselves in advance by reading books and papers on agriculture or health to fill in gaps in their knowledge and skills.

In any case, it is desirable that the participants come from diverse disciplinary backgrounds such as agricultural science, public health, ecology, and social science.
This module is not a stand-alone module; it builds on all the modules that have come before it as part of the Ecohealth Trainer Manual. The previous modules lay the foundations for this one, which provides a chance for the learners to apply their learning about Ecohealth to an set of issues. **This module should therefore be delivered after the other modules, at minimum after Module 2: Introduction to Ecohealth, and the trainers should be familiar with the overall contents of all modules. As in other modules, participants should reflect on how this work relates to the overall vision and principles of Ecohealth, as described in the manual’s Preface.**

This module starts by facilitating a broad overview on the connections between agriculture and health, and then looks at specific case studies. It can be used as a complete one-day class, or it can be tailored to fit a course given over a period of time.

To understand the links between agriculture and health and be able to develop capacities for dealing with health problems associated with agriculture, both the trainers and their learners need to have some basic knowledge about the two fields. Given the fact that current curriculum of medical universities includes little content about agriculture, and the textbooks of agricultural and other universities offer little information about human health, participants may lack basic knowledge about one or other of the fields. In this case, they should be encouraged to read about them in advance.

To teach this module, trainers need to prepare themselves well by reading books and materials on agriculture and health. The two companion texts (Charron 2012; Waltner-Toews 2011) are good references for this purpose. In addition, the essential reading material listed in this module also provides background information and teaching materials.

Trainers will need to provide handouts of case study materials and presentations. This module is designed to be delivered over a 5- to 7-hour period, in one day or over a number of classes.

### Notes about Case Studies

Case studies are an important learning activity in this module; they provide real scenarios for participants to learn how Ecohealth approaches can be applied. Initially, a case study should be developed together with class participants, based on their own experiences. This participatory exercise will “prime” the thinking of the participants and enable them to better explore several published case studies, which we provide. The published studies cover key agriculture and health issues in this region, which are the focus of this module, including crops and health; livestock rearing and health; agricultural water development projects and health; agroforestry, agro-biodiversity, nutrition, and health. Some case studies were research projects conducted
using an Ecohealth approach, whereas some were not undertaken from an Ecohealth perspective; both are good learning materials for learners. All case studies or stories are from Asia and trainers can select several cases for this module. Trainers should be familiar with these case studies so they can provide additional information when needed.

One such study was published in the Journal of Ecohealth. The paper introduces an Ecohealth framework and applies the framework in three case studies located respectively in Vietnam, Thailand, and West Africa (Cote d’Ivoire). It may be hard for the learners to read and understand this academic paper. If this is the case, then trainers can simplify the text and tailor it into short and an easily understood account for use in training.


Another study is based on an Ecohealth research project conducted in Yunnan Province, China. The paper used water to link a number of important health issues associated with agriculture intensification.


A short story on malaria is provided by Dr. Umar-Fahmi Achmadi from Indonesia. The text is written in simple language and thus it can be used to teach learners who have less experience in research and practice.

- **Umar-Fahmi Achmadi.** Case study on malaria from Indonesia. University of Indonesia.

An article published in the journal Lancet more than 20 years ago describes a problem that remains in many parts of Asia. The paper is about pesticide use and its health consequences and was written from the perspective of epidemiology. Although the paper was not written from an Ecohealth perspective, the trainers can use this paper to facilitate the discussion about the possible research if an Ecohealth approach were used.


**Background information**

In Southeast Asia, the “Green Revolution,” which began in the 1960s, promoted the widespread use of high yielding varieties, requiring high inputs of inorganic fertilizers, pesticides, herbicides, fungicides, and water to boost productivity. Although it has contributed substantially to meeting the growing demand for food over the past half century, it has also led to serious environmental and human health consequences.
Intensified livestock development has also occurred in Southeast Asia for the last three decades, and has improved diets and the nutritional status of populations, but also causes health and environmental problems. With increasing incomes and demand for meat, dairy, and egg products, livestock has become the fastest growing component of the agricultural sector. This in turn has led to structural changes in livestock production – from subsistence systems to intensive, commercial production systems. Livestock intensification is characterized by high-input practices, including the use of industrial feeds, which cause both environmental and public health problems, while also neglecting the needs of poor farmers who still rely on subsistent livestock production.

According to the World Health Organization (WHO), about 75% of new diseases affecting humans over the past decade have been caused by pathogens originating from animals or animal products (WHO 2011). This can be affected by how livestock are managed, which can potentially increase risks for human health. Zoonotic emerging infectious diseases threaten human, animal, and environmental health, representing one-quarter of the overall infectious disease burden in least developed countries (Grace et al 2010). However, the positive effects of livestock intensification also need to be considered, such as reducing the price of protein for urban consumers, and improving biosecurity and disease control measures on well-managed farms, reducing the risk to human health.
Activity 1

*Initial brainstorming session on agriculture and health*

**Learning Objective:**
- Identify and understand the diverse, dynamic, and complex links between agriculture and health.

In this exercise, encourage learners to draw from their own life experiences to understand the connections between agriculture and health, and the links between different themes within these areas.

You will help build a recognition amongst learners of why this topic is so important.

**Instructions**

(20 minutes)

1. Ask participants to list agriculture activities that they know and then group those activities into themes such as crops, animal husbandry, fishery, and aquaculture, etc.

2. Then, ask participants to list the environmental and health impacts (both positive and negative) which those agricultural activities may have.
Activity 2

Participatory creation of a scattergram or rich picture of issues in agriculture and health, and how they are related

Learning Objective:

- Identify and understand the diverse, dynamic, and complex links between agriculture and health
- Create conceptual images to represent the links between agriculture and health.

INSTRUCTIONS

(60 minutes)

Building on the previous brainstorming session, ask learners as a class, or in small groups, to create their own rich understanding of Ecohealth and agriculture.

1. Instruct participants to begin with a particular agricultural “commodity” (e.g. chickens or other livestock, or a particular crop).

   Ask them to write this in the centre of a large piece of paper, then ask them to write, without guidance, all the things that are related to raising, say chickens. We are looking for inputs (feed, water, disease case), outputs (manure, food, other products), and outcomes (human nutrition and health – farmers and non-farming consumers, human disease, farmers’ income, etc). Learners could write on a large sheet, unstructured, as a kind of messy scattergram, or it could be created as a “rich picture,” as described in Module 4: Using Systems Concepts in Ecohealth.

2. Lead a discussion about, or ask learners to draw the links between the various items they have listed, and talk about who is responsible for those things, and what gender and power issues arise. This draws on the expertise and experience of the group, and begins to open up the discussion. The discussion should also include the reasons why people do the things they do (e.g. why do people raise chickens, why do they raise them in certain ways, why do they manage manure in certain ways, etc).

   At this point there is no intention of creating a model or theory. We are simply trying to expand the participants’ ideas about issues associated with agriculture and to link this module with the previous core modules.
Activity 3

**Conceptual frameworks of agriculture and health (lecture)**

**Learning Objective:**

- Identify and understand the diverse, dynamic, and complex links between agriculture and health
- Approach agriculture and health issues with an Ecohealth perspective and use Ecohealth principles to understand the relationships between them.

**INSTRUCTIONS**

(30-40 minutes)

Deliver a lecture to introduce some conceptual frameworks on the links between agriculture and health and to provide some real research examples on this topic.

The purpose of this activity is to equip participants with some theoretical frameworks and practical examples. The learners will be reminded to view those frameworks and examples from an Ecohealth perspective and to compare them with ideas they developed in the first two exercises.

**Handout**

Print out your PowerPoint presentation.

The frameworks on the links between agriculture and health can be taken from the Key References, e.g. “Understanding the links between agriculture and health” (Hawkes and Ruel); and “For sustainable architecture, think bug.” (New Scientist).
Activity 4

Small group discussion on local agriculture and health issues

Learning Objective:

- Understand case studies that use an Ecohealth approach and be able to draw experience and lessons from them.

- Engage with others from different disciplinary backgrounds and work collaboratively to address an agriculture-related health issue using an Ecohealth perspective.

INSTRUCTIONS

(2 hours)

1. Divide participants into small groups (about five participants per group). Ideally each group should contain participants from different disciplinary backgrounds. Each group is given a handout of case study materials on specific topics, for example, pesticide use related to a health issue, or animal husbandry related to a zoonotic disease, and some guiding questions.

   Each group will be asked to conduct in-depth analysis of those case studies from an Ecohealth perspective and then to share their findings by reporting back to the plenary.

   The purpose of this activity is to provide a chance for participants to apply what they have learned about Ecohealth to a real research project and to deepen their understanding about the principles of Ecohealth.

   The cases suggested would provide good materials for this exercise. The selected cases should not only provide the results of the study, but also the process of the research, including lessons learned and barriers encountered as well as coping strategies in overcoming the barriers during the process, so as to provide a real sense of how an Ecohealth approach was applied in reality. This activity likely needs 2 hours including group work and plenary feedback.

2. Summarize lessons from the case studies and bring out key learning points that may have been missed in the learners’ discussion.

   Handout

   Case study materials provided by the manual or other case study materials selected by trainers.
Activity 5

Small group discussion on local agriculture and health issues

Advanced Learning Objective:

- Design the key elements and methodologies for an Ecohealth research project to investigate an issue where there appears to be a significant link between agriculture and health.

INSTRUCTIONS

This session will need at least 2 hours including the reporting back session.

1. Participants are divided into small groups. This time participants from the same geographic location will be put in one group. Each group should be given a handout with questions and asked to discuss the questions. Encourage learners to reflect back on the whole course and to integrate tools and ideas from the other modules.

2. Learners are then asked to design a small Ecohealth research project on one of the identified issues. The purpose of this task is to link the knowledge and skills of Ecohealth to the reality participants face in their own contexts, and to encourage them to apply what they have learned.

3. Groups report back to the class.

Handout: Module 10 – Handout 1

See the Handout provided: “Small group work on local agriculture and health issues.”
Activity 6

Summary and evaluation of the module

Learning Objective:

- Approach agriculture and health issues with an Ecohealth perspective and use Ecohealth principles to understand the relationships between them.
- Summarize the module activity and evaluate the learning of participants.

INSTRUCTIONS

(30-40 minutes)

An effective evaluation activity would be to use the group work from the previous exercise as a basis for exploring what participants have learned and how they have worked as teams to develop new understandings.

Alternative evaluation methods can be used.

This may also be an opportunity to evaluate the whole course, in which case more comprehensive evaluation tools should be used such as quizzes, evaluation forms, etc.

Sample Timetable: Module 10

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
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<tbody>
<tr>
<td>20 minutes</td>
<td>1. Initial brainstorming session on agriculture and health.</td>
</tr>
<tr>
<td>60 minutes</td>
<td>2. Participatory creation of a scattergram or rich picture of issues in agriculture and health and how they are related to each other.</td>
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<tr>
<td>30 minutes</td>
<td>3. Lecture to introduce conceptual frameworks on the links between agriculture and health.</td>
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<tr>
<td>2 hours</td>
<td>4. Small group work on case studies and report back to the plenary.</td>
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<tr>
<td>30 minutes</td>
<td>5. Plenary discussion facilitated by trainers on how to apply for lesson learned from the case studies to local issues face participants or learners.</td>
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<tr>
<td>2 hours</td>
<td>6. Small group discussion to work on local agriculture and health issues.</td>
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<tr>
<td>40 minutes</td>
<td>7. Summary and evaluation of the module.</td>
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<td>Total: 7 hours</td>
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Evaluation

Various methods can be used to evaluate the learning of participants. For example, a simple quiz can be used to test whether participants understand the links between agriculture and health. Open-ended questions can be distributed to participants to obtain their reflection on this module. Other participatory evaluation methods can be used to do the evaluation.

Trainers should select the methods based on their experience and needs.

Refer to Module 2: Introduction to Ecohealth and Module 1: Approaches to Designing and Teaching Ecohealth courses for more details.

Terminology

Subsistence Farming

Farmers are engaging in subsistence farming when they grow only enough crops for themselves and their families. They face different problems than commercial farmers, (e.g. a rise in fuel costs may not affect them, but problems like droughts and being sick or injured for a few days would). Subsistence farming is usually on a small plot of 1-3 acres. These farms have simple tools (e.g. hoes, machetes, and digging sticks). The work is done by the farmer and family and the produce is eaten by the farmer and family (Wikipedia).

Green revolution

A great increase in production of food grains (especially wheat and rice) that resulted in large part from the introduction into developing countries of new, high-yielding varieties, beginning in the mid-twentieth century. Its early successes were in Mexico and the Indian subcontinent. The new varieties require large amounts of chemical fertilizers and pesticides to produce high yields, raising concerns about cost and potentially harmful environmental effects. Poor farmers, unable to afford the fertilizers and pesticides, have often reaped even lower yields with these new grains than with the older strains, which were better adapted to local conditions and had some resistance to pests and diseases (www.answers.com).

Agricultural intensification or intensive farming

The cultivation of land where there are very high inputs of labour, fertilizers, pesticides, herbicides, and fungicides to obtain the maximum output. Examples include mono cropping (plantations) of coffee, tea, or cattle ranching in Amazonia.
Intensive farming or intensive agriculture is an agricultural production system characterized by high inputs of capital, labour, or heavy use of technologies such as pesticides and chemical fertilizers relative to land area.

Intensive livestock farming can involve large numbers of animals raised on limited land, that require large amounts of food, water, and medical inputs. Confined indoor intensive livestock operations are often referred to as factory farming and present issues related to animal welfare, pollution, and health (Wikipedia).

**Animal husbandry**

The agricultural practice of breeding and raising livestock.

**Zoonotic diseases**

Any disease or infection that is naturally transmissible from vertebrate animals to humans and vice versa is classified as a zoonosis, according to the PAHO publication “Zoonoses and communicable diseases common to man and animals.” Over 200 zoonoses have been identified and are caused by all types of agents: bacteria, parasites, fungi, viruses, and unconventional agents (http://www.who.int).

**Sustainable agriculture**

Farming that integrates ecological principles. Defined as “an integrated system of plant and animal production practices having a site-specific application that will last over the long term to: satisfy human food and fibre needs; enhance environmental quality and the natural resource base on which the agricultural economy depends; make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole” (Wikipedia).

**Food safety**

Food safety is the use of various resources and strategies to ensure that foods are properly stored, prepared, and preserved so they are safe for human consumption. One of the most important aspects of practising food safety involves preventing foods from becoming contaminated. Making sure foods are stored properly helps avoid any type of food contamination (http://www.wisegeek.com).

**Food security**

People are considered food secure when they have all-time “access to sufficient, safe, nutritious food to maintain a healthy and active life” (Definition adopted by the 1996 World Food Summit). Food security includes these three main elements:

- **Food availability**

  Food must be available in sufficient quantities and on a consistent basis. It considers stock and production in a given area and the capacity to bring in food from elsewhere, through trade or aid.
**Food access:** People must be able to regularly acquire adequate quantities of food, through purchase, home production, barter, gifts, borrowing, or food aid.

**Food utilization:** Consumed food must have a positive nutritional impact on people. It entails cooking, storage, and hygiene practices, individuals’ health, water and sanitation, and feeding and sharing practices within the household (World Food Program, [http://www.wfp.org/food-security](http://www.wfp.org/food-security)).

**Ecological health**

Ecological health, ecological integrity, or ecological damage are the symptoms of an ecosystem’s loss of carrying capacity, its ability to perform ecological services.

Measures of ecological health, like measures of the more specific principle of biodiversity, tend to be specific to an eco-region or even to an ecosystem. Some general symptoms of ecological damage include:

- The build-up of waste material and the proliferation of simpler life forms (bacteria, insects) that thrive on it – but no consequent population growth in those species that normally prey on them
- The loss of keystone species, often a top predator, causing smaller carnivores to proliferate, very often over-stressing herbivore populations
- A higher rate of species mortality due to disease rather than predation, climate, or food scarcity
- The migration of whole species into or out of a region, contrary to established or historical patterns
- The proliferation of a bio-invader or even a monoculture where previously a more bio-diverse species range existed.

Some practices such as organic farming, sustainable forestry, natural landscaping, wild gardening, or precision agriculture, sometimes combined into sustainable agriculture, are thought to improve or at least not to degrade ecological health, while still keeping land usable for human purposes.

Deforestation and the loss of deep-sea coral reef habitat are two issues that prompt deep investigation of what makes for ecological health (Wikipedia).
Key References


CASE STUDIES

Achmadi, U.-F. Case study on malaria from Indonesia, University of Indonesia.


Additional References


<table>
<thead>
<tr>
<th>QUESTION</th>
<th>ANSWERS/ POINTS FROM DISCUSSION</th>
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<tbody>
<tr>
<td>1. Briefly describe the place you are considering.</td>
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<tr>
<td>2. What are the main agricultural activities in your place and what are the current and potential consequences of those agricultural activities on the health of humans, animal, and ecosystems?</td>
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<tr>
<td>3. Is there any action taken by the government, community, or other stakeholders to deal with the adverse health outcomes of those agricultural activities?</td>
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<tr>
<td>4. To the best of your knowledge, has any research been done to look into those issues? If so, what kind?</td>
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</table>
5. This is the most important part of the exercise and should take most of your time.

   Reflect back on all the tools, ideas, strategies, and principles you have learned about during the Ecohealth course. See if you can apply any of those tools and ideas in this exercise.

   How could you undertake an Ecohealth research project to fill one of the gaps?

   How could the research outcomes be best applied to reduce the adverse health outcomes of those agricultural activities on human health, the health of animals and the environment?

<table>
<thead>
<tr>
<th>In developing a research idea, consider the following stages of research design:</th>
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