LEARNING AgriCultures

Insights from sustainable small-scale farming

MODULE 4

Livestock systems

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Please note:
This module is a first edition. We welcome comments and suggestions for improvement.

This publication forms part of the **Learning AgriCultures** series for educators, providing insights on sustainable small-scale agriculture.

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Foreword to Learning AgriCultures series

Why Learning AgriCultures?

Over the years, the readers of ileia's magazines, as well as our international network of partners, have asked for support material explaining the principles behind sustainable small-scale farming. With 26 years of publishing practical cases from around the world, ileia has a wealth of material for exploring this subject. The Learning AgriCultures series is our response to these requests. Sustainability translates differently under specific local conditions so this series does not intend to offer solutions to all the problems. Its objective is to stimulate a culture of learning about sustainable small-scale farming. Through probing questions, and a variety of educational resources, we hope that this material will feed into and provoke discussions and deeper reflections over the important contributions of small-scale farming, and what sustainability means in different contexts. The series is not intended as a field guide nor does it focus on technical details about farming methods. It does however suggest further references for digging deeper into technical questions.

Who is it for?

Learning AgriCultures is a learning resource particularly aimed at educators seeking support material for explaining about sustainable agriculture in their courses, at a university or college level, in special NGO training courses or other professional environments. Courses in which this series could be useful include agriculture, rural development, environmental studies, research & extension, agricultural policy-making, with students who will primarily, but not exclusively, be working in developing countries.

What is in it and how can it be used?

The Learning AgriCultures series has seven modules (see list below). It explores small-scale (family) farming and how it can become more sustainable. Each module has three learning blocks, looking at its theme from the perspective of: 1) the farm, 2) key issues in the wider context, and lastly 3) governance issues that affect farming sustainability. These learning blocks are followed by a section of educational support materials: practical cases (mostly drawn from 26 years of articles in ileia's archive), exercises, games, photos, videos, checklists for farm visits as well as further references (free books and websites). Illustrations and diagrams as well as a separate glossary of difficult terms provide further support to the series. Educators can draw on what is relevant to their own regional context and student group.

Learning AgriCultures: Insights from sustainable small-scale farming

Module 1 • Sustainable small-scale farming
Module 2 • Soil and water systems
Module 3 • Cropping systems
Module 4 • Livestock systems
Module 5 • Labour and energy in farming
Module 6 • Markets and finance for small-scale farmers
Module 7 • Knowledge for small-scale farming

Summary of this module

Figure 1: Two sides of small-scale livestock keeping: a mixed farm and an extensive grazing system.

Over half of the world's one billion extreme poor are estimated to fully or partially depend on livestock for their livelihoods. Livestock products make a substantial contribution to nourishing people around the world, providing almost one-third of humanity's protein intake. Furthermore, the livestock sector has a substantial economic role, accounting for some 40 percent of agricultural GDP. At the same time the demand for livestock products continues to expand due to growing populations and incomes, along with changing food habits and preferences.

These figures show the crucial role of livestock, both in supporting the livelihoods of farmers and herders around the world as well as the opportunities that exist for them to meet increasing demand. Yet, there are also many indications that an increase in animal production is unsustainable. Intensification of livestock systems can yield more output, but it can also harm natural resources such as water and soil. Livestock systems have also been shown to contribute a large percentage of greenhouse gas emissions that increase the effects of climate change. Well-managed "factory farms" can reduce polluting emissions, yet these systems push small-scale herders and farmers aside, while creating questionable conditions of animal welfare and of rural societies. The current global trend is to focus on maximising the production of livestock products. However, small-scale livestock keepers value animals for other functions as well. Livestock provide inputs that can increase soil fertility and the productivity of cropping systems, they are sources of power and transportation, they can play an important cultural role, and provide insurance in case of emergencies. Local breeds have been developed to meet these many functions and to be resilient in often harsh and varying local conditions.

Despite this, policy environments around the world show an inherent bias against small-scale livestock systems, and especially against pastoralist systems. Research, extension, conservation, breeding development programmes, infrastructures and markets, and, in many cases, subsidies currently favour high-output large-scale livestock systems. These trends are contributing to the disappearance of valuable local breeds, knowledge and ecosystems. All these issues come up in this module, to engage students in discussions about small-scale livestock systems.

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Guide to educators

PURPOSES OF MODULE 4

Figure 2: Educators, the target group of Learning AgriCultures

For educators:

- to provide a systems approach to teaching about sustainable livestock production as part of small-scale farming systems.

For students:

- to understand about livestock production dynamics in small-scale farming; and
- to learn about increasing the sustainability of livestock production practices in small-scale farming and how to support the efforts of livestock farmers and herders.

How to teach Module 4

About 24 contact hours will be needed to teach this entire module. This does not include time for conducting interviews with farmers, or the time that students will spend on assignments. Educators will need to decide for themselves whether to use the entire module or parts of it when making their lesson plans.

At the end of this section, an example is given of how to make a lesson plan from the material included in this module. The total time required and duration of each lesson will vary depending on the level of the students, the knowledge of the educator and how many exercises and assignments you choose to include in the course. A very important component of the module is to visit and interview at least one farmer – so that students can better understand the practical realities of farming systems in their area.

What is in Module 4?

This module is the fourth one in the Learning AgriCultures series. As with the other modules, it includes three Learning Blocks with theoretical information and a section of Educational Resources that provides support material. Specifically, the content of this module is as follows:

LEARNING BLOCK 1:
Livestock systems on the farm/range

This block introduces basic characteristics of livestock systems, particularly focusing attention on small-scale systems of mixed farming and pastoralist herding.

LEARNING BLOCK 2:
Livestock issues in the wider context

Moving beyond the farm or range, this block presents a number of critical global trends that are affecting the functioning of livestock systems around the world. Key issues are changes in demand as well as supply, developments in livestock breeding, climate change and other environmental conditions.

LEARNING BLOCK 3:
Governance and livestock systems

The sustainability of small-scale livestock systems is also affected by different governance structures and conditions. This block looks at how small-scale farmers and herders could better be supported in improving the sustainability of their livestock systems.

EDUCATIONAL RESOURCES:

This section provides information about different kinds of support material that can stimulate deeper insights and discussions through in-class work or assignments. Throughout the main texts, boxes suggest links to these resources and to probing questions. These are indicated by the symbols found in Figures 3 and 4. The resources include:

- **Exercises and games:** for in-class use, to help deepen understanding of livestock systems.
- **Cases:** suggestions for further reading and assignments based on articles from ileia's magazine archive, to expose students to different practical examples of methods farmers use and to stimulate discussion.
- **Photographs:** for in-class use, to raise practical implications of different issues raised in the module.
- **Videos:** for in-class use, to complement the teachings with visual examples from around the world.
- **Farmer interview(s):** suggested visit with small-scale farmers/herders (checklist and on-farm exercise).
- **Further references:** suggestions for other freely available books, articles and relevant websites.

Figure 3: Symbol to indicate link to suggested questions.

Figure 4: Symbol to indicate link to educational resources.

Glossary for the whole series

This is separate from the module and includes definitions for difficult terms for the whole Learning AgriCultures series.

Making a lesson plan

Three basic questions need to be asked when preparing a lesson plan:
- What do you want your students to learn?
- How are they going to learn it?
- How will you know if they have learned it?

A lesson plan therefore needs to reflect these questions by setting out the learning objectives, aims, or goals of the unit, and how it relates to the whole course. The lesson plan should also include a list of the materials needed and the learning aids and references that you will use. See the example on the next page:

Example of a Lesson Plan

Lesson	Focus on pastoralism
Time	3 hours
Objectives	After completion of this session participants are able to: • Explain some unique characteristics of pastoralist systems, how they differ from other livestock-keeping systems. • Understand changing relationships between pastoralist and sedentary farming systems and how pastoralists are adapting. • Relate these systems to the students' own contexts.
Prerequisite	Different types of livestock production systems
References	Sub-sections 1.2.1, 1.2.2, 1.4.5, 1.4.6, 2.4.3; also see R6 Further resources

Time	Content	Teaching method	Teaching aid
15 min	*Central question:* Why/how has pastoralism developed as a livestock keeping system?	*Introduction:* Make a link to last lesson by asking students to summarise about different types of livestock production systems. *Plenary discussion*: Brainstorm about what students understand by pastoralism.	Blackboard, chalk Refer to classifications and definitions by FAO
45	*Central question:* What are different practices of traditional pastoralists? *Important points:* • Drylands – marginal lands • Dealing with feed and water scarcity • Types of livestock • Gender roles	*Introduction:* Pastoralist practices	Show pastoralist photos in module or elsewhere.

Time	Content	Teaching method	Teaching aid
10	BREAK		
45	*Central question:* What is the situation with pastoralists in your country or region?	*Exercise in small groups:* Discuss together where pastoralists live in your country (or region, if not in your country). Write down as much as you can about their systems and challenges. *Plenary discussion:* Compare results and lead into next point	Exercise, Sheets
60	*Central question:* How have pastoralists and non-pastoralist livestock systems functioned alongside each other – and how is this changing? *Important points:* • Traditional agreements • Changes due to populations increasing, land scarcity, climate change • Pastoralist (non-)coping strategies	*Plenary session:* Building on last discussion, add points missing and broaden with information on the important points. *Read and discuss an article:* Choose one or two of the articles on pastoralism.	Blackboard, chalk Articles R2.3 Iran)or R2.4 (West Africa or India). Or find one from your region. Fig. 29
5	*Concluding remarks*		
Next lesson: Governance and pastoralists (see Learning Block 3)			

LEARNING BLOCK 1

Livestock systems on the farm/range

Small-scale farmer feeding grain to her mixed poultry in Paraíba, northwestern Brazil, photo by AS-PTA

How do small-scale farmers and herders around the world manage livestock to provide themselves with productive livelihoods? What are different functions of livestock and how do they contribute to the livelihoods of farmers and herders? What are the important elements of livestock systems and how do they interact at the level of the "farm"? How do livestock systems differ from one another? And what are the differences and complementarities between small-scale livestock farming and pastoralist systems in particular?

1.1 Introduction

The important roles that livestock play within the agricultural sector and in contributing to rural livelihoods are well recognised. Over 880 million of the 1.1 billion extreme poor, defined as those who have to make a living on less than $1 a day, live in rural areas. Of these, 555 million are estimated to fully or partially depend on livestock for their livelihoods (Pica-Ciamarra *et al.*, 2010). Aside from being important for poor people, livestock play a substantial economic role, accounting for some 40 percent of agricultural gross domestic product (GDP). Livestock products (e.g. eggs, milk, meat) provide almost one-third of humanity's protein intake; they provide 15 percent of total food energy, 25 percent of total dietary protein, as well as essential amino acids and micro-nutrients that are not easily obtained from plant-based food (FAO, 2009). The demand for livestock products continues to expand, due to growing populations and incomes, along with changing food habits and preferences.

This learning block provides an introductory overview of the importance of livestock within different farming systems around the world. It starts with a brief description of the main types of livestock found around the world, and the different kinds of livestock systems. The functions of livestock and the trade-offs between these differ all over the world. As well as providing "outputs", livestock are also seen as an integral part of farming systems and particular among herders as the foundation of their culture. In both cases they are an integral part of people's livelihood systems. Livestock play many different roles in small-scale farming and are much more than a means of production to farmers and herders. A discussion of four functions shows how livestock are valued for far more than the market price of their milk or meat.

Subsequent sections of this learning block discuss different management considerations that involve interactions with the wider "system", including access to fodder and water and the use of manure as a fertiliser. The block concludes with a special focus on pastoralism as a key and unique small-scale livestock keeping strategy in dryland ecosystems. This also takes a look at how pastoralism and more sedentary farming can interact.

1.2 The importance of livestock

Unlike crops, farm animals need daily care seven days a week: they require watering, feeding, protection from predators, attention to their health and daily routines, such as milking schedules for dairy livestock. In general, women play a pronounced role in animal care. However, it can also be observed that the more animals are taken as a production factor, implying that the management is geared towards maximum performance and economic gain, the more the role of men increases. Traditionally, animals are not seen primarily as a means of production

but more as an integral part of farming and herding cultures. Folk stories and songs highlight the relationships between people and animals. Animals provide protein but are also kept to minimise risks and ensure long-term survival. They often have ritual and religious meanings and form important items in social exchanges.

Livestock are highly efficient users of available biomass. They consume grasses and other plants that cannot otherwise be consumed by humans and convert it to a range of valuable products: milk, meat, wool, leather, manure and draught power. They contribute to grassland systems by dispersing grass seeds, keeping unnecessary weeds in check and fertilising the soil with their dung and urine. In many places natural grasses are not available throughout the year, and migratory or semi-migratory systems of livestock rearing have emerged. Sometimes these are practised by pastoralists who may face acute seasonal scarcities of water and fodder. Sometimes they are practised by farmers engaged in more settled mixed crop-livestock farming, who send their cattle out to remote pastures for some months at a time.

1.2.1 Different types of livestock

Most domestic animals are mammals. This means that, like people, the females nurse their offspring with milk produced in their mammary glands or udders. Larger farm animals with hooves, such as cows, goats, horses or pigs are part of a family known as "ungulates". Most ungulates are herbivores with plant-based diets, with the exception of pigs which are omnivores and therefore eat both meat and plants. Poultry, including turkeys, chickens and ducks are part of another important class of farm animal called "aves". In general, animals that are closely related zoologically require similar feeding and management practices.

The following paragraphs describe the major categories of farm animals (all figures from FAO 2005):

- *Bovines – Big Ruminants:* include cattle and buffaloes. The term "ruminant" comes from the Latin *ruminare*, which means "to chew over again" as these animals regurgitate their food, chewing it once again to be able to digest it. Cattle are kept for both meat and milk, and are often seen as a sign of wealth and used as an alternative to cash. In North, Central and South America cattle dominate the ruminant populations. In Africa, the main concentrations of cattle are in the highland regions of Ethiopia, East and Southern Africa. India is the world's biggest milk producer, but industrialised countries are the most efficient in terms of yield per animal. Most buffaloes (97%) in the world are found in Asia. They are mainly kept for milk and tend not to be herded like cattle, but kept close to the village throughout the year. A major function of cattle and buffaloes in cultivated areas is to provide traction power. Pakistan and Southeast Asia have more buffaloes than cattle.

Figure 5: Cows are important to livestock systems on every continent except Arctic regions.

Figure 6: Goats and sheep (or "shoats") are far more predominant than cattle in hot, dry regions.

- *Small Ruminants:* consist of sheep and goats (or "shoats"). They can be kept in villages, but generally require a modest amount of land to support them - either for direct grazing or, in a limited number of situations, to provide fodder which is "cut and carried" to enclosed animals. Tethering a few sheep and/or goats around the house, near streams or along roadsides is a common practice. Shoats are also often kept alongside free-ranging cattle or camel herds. They can be kept in a wider range of environmental conditions than large ruminant species. Shoats are much more important than is often assumed - they are more common than cattle throughout a large part of the hotter, drier regions north of the tropics - in a band stretching from Spain and Libya to China. Goats are more common than sheep near the equator, and are known for being able to forage from even the most hostile, prickly plants. Goats are primarily found in Asia (63%) and Africa, while 39% of the world's sheep are found in Asia.

- *Monogastrics:* is a group that includes poultry (chickens, turkeys, ducks, geese, guinea fowl and pigeons) and pigs. The term refers to livestock that have only one stomach. They tend to have white meat and are generally easier to keep than larger animals. Many are left to forage for their own food within the smallholdings and are usually provided with protective housing at night. As human populations have increased and people have become more concentrated in villages and towns, they have started to rear more pigs or poultry (particularly chickens). As a result, monogastrics are now found almost everywhere. The world poultry population is estimated to be 16 billion, which is fairly evenly distributed across regions, although Asia has the largest share. Asia also keeps 60 percent of the world's swine population, half of which are found in China.

Although the above categories are the main focus of this module, other categories deserve mention as they are also very important:

- *Camelids:* include camels, dromedaries, llamas and alpacas. These are large animals with slender necks and long legs. They are "even-toed ungulates" that do not have hooves, but rather a two-toed foot with toenails and a soft footpad. Camelids are kept for milk (in the case of camels), meat, wool and transport. Of the 19 million camels in the world today, most are found in Africa. The large majority of smaller camelids such as llamas and alpacas are kept in South America.

- *Bees:* play an important role in pollination and in producing honey and beeswax, and help support small-scale farming around the world. There are over 20,000 known species of bees, although the actual number is probably higher. Bees are found on every continent except Antarctica, in every habitat that contains insect-pollinated flowering plants.

- *Fish:* are important to many small-scale farmers and fishermen. This module makes some mention of fish as part of small-scale cropping systems, such as mixed with rice, or small-scale (sweet-water) aquaculture systems (see exercise next page).

Ask students to identify the farm animals commonly kept by farmers/herders in their region. Rank them according to population size, relevance for poor people, relevance for women/men, farmers/herders, and their economic importance to their country. FAO's DAD-IS site (see resources section) has lots of information about the importance of domestic animals in individual countries.

Figure 7: Bees play an important role in supplementing the diet and incomes of small-scale farmers around the world.

Many other domesticated animals fall outside these categories. Some have small populations but can play very important functions in particular cultures and locations. For example, dogs have many functions that take on varying importance in different cultures; these range from herding, hunting, guarding, pulling, or being kept as pets. In East Asia dog meat is appreciated as a delicacy. Guinea pigs are another example. They are reared solely for meat in their centre of origin (the South American Andes) while in other countries they are kept solely as pets. The same is true of rabbits which are found in many small-scale systems for food, whereas they are kept as pets in other cultures. In addition, what are sometimes known as "micro animals" (snails, locusts, rats, etc.) can be important in certain cultures and/or systems.

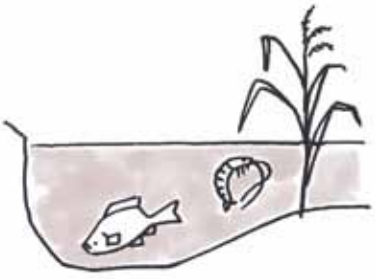

Figure 8: Fish and other water-living animals can be integrated into small-scale mixed farming systems in wetter areas.

The relative importance of different livestock

Livestock populations are most densely concentrated in India, China and Europe – which are also the areas of high human population density. In general, livestock numbers - particularly of pigs and chickens - are increasing worldwide. However, in some places livestock numbers are falling, for example: pigs in parts of Europe; cattle in most of Europe; poultry in Scandinavia and Eastern Europe; and sheep and goats in central Europe and the former USSR. These declines are usually being offset by increases in productivity, so overall production levels in these regions remain more or less stable. The biggest change happening to the world's livestock is a move away from traditional extensively-farmed poultry and pigs towards very intensive rearing systems that are more commercial and industrial. Nevertheless, ruminant species remain integrated in many farming systems within less developed regions, and their numbers are increasing. Small animals (shoats, poultry, etc.) continue to be critically important to the rural poor.

Go to Exercise R1.1 to find out more about aquaculture systems.

The patterns of global animal production have changed considerably over recent decades. For instance, the dynamic development of the pig and poultry industries in Asia and South America have meant that Europe's share of cattle, pig and poultry stocks and its contribution to global meat and egg production has decreased continuously since the 1970s. Nevertheless, European countries are still a major centre of livestock and poultry husbandry with high technological, quality and safety standards (Windhorst, 2006). Different animals are important in different contexts. In terms of meat production, poultry, cattle, shoats, and pigs are the most important. In terms of milk production, dairy cattle are by far the most important. From a poverty perspective, small animals such as poultry and shoats are the most numerous. From a dryland ecosystem perspective, people make use of camels and goats as the species best-suited to sustaining the environment as long as people practise sustainable herding strategies.

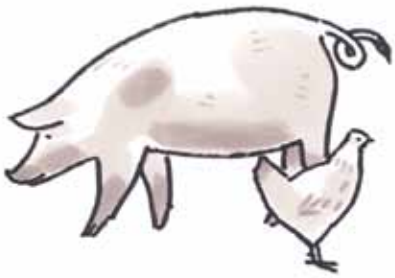

Figure 9: Pig and chicken numbers are rising the fastest worldwide.

EDUCATIONAL RESOURCES
for Module 4

This section contains resources that can help students develop a deeper understanding about small-scale livestock systems and sustainable livestock practices. In the following pages you can find all the educational resources mentioned in the three learning blocks as ways of stimulating discussion or as materials for assignments. These include exercises, games, articles, photos, videos, a farmer interview checklist and field exercises, as well as references for further reading.

Contents of this section

R1. Exercises and Games

This section includes one exercise and three games to support different lessons from the three learning blocks.

Figure 33: Exercises and games can help students understand issues better.

R1.1 Aquaculture: Drawing a fish farming system

Objectives of the exercise: To learn about the characteristics of aquaculture
Time involved: 1-2 hours
Suggested use: Learning Block 1
Number of participants needed: Minimum 2
Materials: computer/dvd player, pen, paper, books

Methodology:

- Watch the video about fish farming systems (**Video R1.1: An Introduction to Recirculating Aquaculture**).
- Pick a fish species suitable for fish farming and draw your own fish farming system.
- Make sure you explain the connections between different parts of the system.

Discussion:

- Discuss the main elements of the system.
- Discuss differences between systems.
- Discuss these issues:
  - Diet
  - Pollution
  - Fish density
  - Diseases and parasites
  - Use of drugs (antibiotics)
  - Destruction of surrounding habitat
  - Profitability
  - Labour tasks and time needed.

R2. Articles about practical experiences

Figure 35: Using articles from ileia's archive to stimulate discussion on practical aspects of the three Learning Blocks.

Objectives: To use articles about small-scale livestock-keeping experiences from around the world to deepen the lessons from the three Learning Blocks.
Materials: All articles can be retrieved from the LEARNING pages on ileia's website (www.ileia.org), and a selection of articles (indicated by a page number) is included at the end of this section.
Methodology: These articles can be used as additional reading material, as part of classroom discussions, or as part of student assignments. For example, students might use the article to prepare presentations addressing specific questions raised in the learning blocks. Some questions are suggested.

R2.1 The advantages of small animals in farming systems (Global 2005)

See page 86.

Where to use this article: sub-Section 1.4.1 Livestock management system
What it is about: a general overview of the importance of integrating small livestock into farms, focusing on energy, feeding, the use of manure, housing and health.

Suggested questions:
- The author argues for more integrated systems – what are the connections between livestock, cropping systems and energy?
- Why does the author argue that smaller animal species are more appropriate for small-scale farming? Do you agree with these?
- What advantages could large livestock provide?
- What does a "cut and carry" system imply? Is this used in your country, could it be?
- How can the manure of different livestock (as well as of people) be managed advantageously?

R2.2 Managing manure carefully (2 articles)

Where to use these articles: sub-Section 1.4.4 Managing manure carefully

R2.2.1 FERTILISER FACTORIES: NUTRIENT RECYCLING THROUGH LIVESTOCK, NIGER (1992)

See page 88.

What it is about: how changes in livestock management are affecting nutrient cycling in crop-livestock systems in sub-Saharan Africa.

R3. Photo gallery

Objectives: These photos, from around the world, are intended to support the teachings, to stimulate discussions and help students to better understand the issues within the three learning blocks.

Total time involved: Presentation during class time (20-30 minutes)

Materials: Photo gallery as power-point presentation with a beamer, or printout (see pages 127-134 for larger photos)

Methodology:

- Present the photographs and ask a number of questions to stimulate students to make links with larger issues; for example, what do they observe in the photo, and what does it mean in relation to small-scale farming (encourage them to reflect on environmental, socio-cultural, economic and policy aspects)
- Use the photographs to discuss similar initiatives in your region.

Photo Nr	From	Story
	**Chicken-bamboo system, China**	Small livestock, such as chickens, can be successfully introduced into agroforestry systems. This photo shows a chicken-bamboo system that integrates previously separate production systems and fosters better nutrient recycling. The chicken excreta enrich the soil of the bamboo plantation and the chickens loosen up the soil surface while searching for food.
	**"Chicken tractor", Rio de Janeiro, Brazil**	In the Province of Rio de Janeiro farm families use a "chicken tractor". This is a moveable chicken run which allows chickens to be rotated between different beds or fields. The chickens are protected against predators, and work each area of the field by scratching for bugs, eating unwanted grass and weeds and leaving manure behind.
	**Beneficial ducks, Indonesia**	Ducks are small livestock kept by many households in Indonesia to provide additional income for the family. Ducks need fewer antibiotics than chickens and are beneficial in a rice-duck system. Results from field tests have shown that rice plots with ducks have significantly fewer weeds or insect infestations. Plant height and tiller number were also higher in fields where ducks were integrated. The rice-duck system lowers the costs of insecticides, weeding and fertilisers and is ecologically beneficial.
	**Guinea pigs in the Andes, Peru**	Guinea pigs are native to the Andes highlands (South America) and provide a good source of protein to people living in the region. It is too cold to keep chickens and these rodents (not pigs!) provide a good small livestock alternative. The animals are normally kept on a small-scale basis in the kitchen - or as shown in the photo - in cages in larger-scale production. They are fed on kitchen leftovers. Their manure can also be used to improve the fertility of the garden. The photo shows ten guinea pigs being kept together, to be sold at market when they are big enough.
	**Zero-grazing of dairy goats, Tanzania**	This woman was one of ten in the village to obtain a dairy goat as a means of improving her and her family's nutrition and thereby mitigating the effect of HIV/AIDS. Families raise the goats under zero-grazing conditions in a shed where it is less exposed to diseases and parasites. This practice also helps safeguard the environment by preventing uncontrolled browsing of trees. However, it often increases the workload of women, as it is usually they who perform most of the labour involved in caring for the animal.

R3. Photo gallery

See explanations for the photos on pages 124-126.

China
Photo by: L. Jianbo

PHOTO 1

R4. Videos

Objectives: To offer visual examples from around the world to complement the teachings and to deepen students' understanding of sustainable livestock practices in small-scale farming and practical initiatives towards sustainability.
Total time involved: See video durations below – add time for classroom discussion
Materials: The videos are available on CD-Rom or can be downloaded from the LEARNING pages on ileia's website; to present the videos, a computer and beamer are needed.
Methodology:
- Present the videos to illustrate points from the lessons and to stimulate discussions on them.
- Use the videos to discuss related issues and initiatives in your region.

R4.1 An introduction to recirculating aquaculture

Duration: 27 minutes
Suggested use: sub-Section 1.2.1 Different types of livestock
What it is about: an overview of recirculating aquaculture systems. It covers the separate components of aquaculture systems, stocking, feeding, maintenance, harvesting and record keeping. Over-fishing and environmental pollution are making aquaculture a more viable option for providing fish and seafood to consumers. If managed carefully, they can be a profitable venture. Not all systems are appropriate to their surrounding environments, for example some may use too much freshwater or cause nitrogen pollution. Recirculating aquaculture systems use 60 to 80 percent less water than conventional systems and can provide a nutrient source for crop production.
(Produced by the College of Micronesia and the University of Guam - Primary funding source: Western Sustainable Agriculture Research and Education (WSARE) Grant Programme, 2000)

Suggested questions:
- Discuss the environmental issues related to fish farming. Could they be overcome?
- Would aquaculture be a viable option in your region?

R5. Farmer visit and field exercises

Objectives: To get close to the practical realities of small-scale farmers in dealing with livestock; to better understand the lessons in the three learning blocks by observing different aspects on one or more farms and talking to at least one, but preferably more, farmer(s) directly; and to allow students to get practical experience in interviewing and synthesising information.
Time involved: Take time ahead of the interview to prepare questions and field exercises. The time needed for the visit will depend on how far the farmers live from the school; the interview should last at least 2 hours. Field exercises half a day.
Suggested use: Visits can take place once the lessons in Learning Block 1 have been completed. Waiting until completing Learning Block 2 will allow for more insights into the wider contextual issues that affect livestock keepers.
Materials: Pen and paper to take notes, tape recorder, camera and/or video camera.

Methodology:

- If possible, arrange interviews with different farmers, to include both men and women farmers; it would be ideal to compare sedentary farmers (intensive or mixed) and nomadic pastoralists.
- Prepare a list of questions to ask the livestock keepers about different aspects of their livestock practices and their reasons behind them (see R5.1 for interview checklist)
- Take the opportunity to do some simple exercises with students, based on observations in the field during the visit (see R5.2 for some ideas)
- Following the visit, ask students to make presentations or a written report on their findings.

Figure 35: Visits to farmers bring practical realities alive.

R5.1 Interview checklist

Before going into the field:

- Considering the type of field situation you are going to visit, ask students to make a checklist of livestock-keeping issues you would like to discuss with the farmer or (agro-)pastoralist.
- Get the students to read as much as they can about the main livestock species that are being kept so that they have some background on the needs of the animal. Explain to students that it is important to get a good understanding about the farmers' priorities and parameters influencing which animal species and breeds they choose to include in their livestock system. Ask them to prepare a list of criteria to compare different breeds (e.g. different functions they fulfil, tolerance to specific conditions, productivity, taste, resistance to disease, cost and availability of breeding material, etc.)

During the visit:

- Ask farmers/pastoralists about what species and breeds of different species of

R6. Further references for Module 4

This section provides a list of freely accessible resources that can help educators and students dig deeper into the issues explored in this module, in addition to the references at the end of each learning block. This list includes books and guides, as well as websites that offer further resources, photos and videos.

R6.1 Books and field guides

Agromisa documents

Download from: www.agromisa.org

Agromisa (the knowledge centre for small-scale sustainable agriculture) has many useful manuals and publications (called "Agrodoks"and "AgroSpecials") on animal production and animal keeping. There are 16 manuals available about different aspects of animal production. Some examples are: snail farming, beekeeping, goat keeping, duck keeping, rabbit keeping, pig keeping, dairy cattle husbandry and fish farming. The information is downloadable in PDF format in English, French and Portuguese. Ordering hard copies involves costs or follows a system of points for members of CTA.

Two examples of Agrodoks in the livestock production series are given below:

- **Small-scale chicken production**

  By: N. van Eekeren, A. Maas, H.W. Saatkamp, M. Verschuur. 2006. Agrodok no 4 (ISBN 978-92-9081-347-7). Agromisa, P.O. Box 41, 6700 AA Wageningen, the Netherlands.

  Poultry play an important role on small-scale farms in almost all countries. They are an important source of animal protein, and can be raised in situations with limited feed and housing resources. Chickens are "waste converters," scavenging most of their feed and turning this into animal protein. In the opinion of the authors, chickens are by far the most important species for generating income for rural families. This Agrodok mostly describes semi-intensive farming. It can help beginners and experienced poultry-raisers to solve the problems that they are likely to meet.

- **Ethnoveterinary medicine – A practical approach for the treatment of cattle diseases in East and West Africa**

  By: Ngeh J. Toyang, j. Wanyama, M. Nuwanyakpa, S. Django. 2007. Agrodok no 44 (ISBN 978-90-8573-080-4) Agromisa, P.O. Box 41, 6700 AA Wageningen, the Netherlands.

  Traditional healing practices have been applied for centuries to keep animals healthy and have been passed down orally from generation to generation. These traditional practices are called Ethnoveterinary medicine. Ethnoveterinary remedies generally use locally available ingredients (such as plants, soil, minerals and animal parts) and are easy to prepare and administer, at little or no cost to the farmer. These age-old practices cover every area of

veterinary specialisation and all livestock species. Ethnoveterinary techniques include treatment and prevention of disease, extensive preparations, ecto-and endo-parasite control, fertility enhancement, bone setting and improving mothering.

Adding value to livestock diversity: Marketing to promote local breeds and improve livelihoods

By: Evelyn Mathias (ed.). 2010. LPP and LIFE Network / FAO, Rome, Italy.

Download from: http://www.fao.org/docrep/012/i1283e/i1283e00.htm

In spite of the many advantages of local breeds, they are at risk of extinction as a result of an increasing preference for "modern" breeds. Finding niche markets for their products may be one way to avoid this fate. This book looks in detail at two cases, together with six others, to identify the main advantages and challenges of niche livestock markets.

Guidelines for sustainable manure management in Asian livestock production systems

By: The International Atomic Energy Agency (IAEA). 2008. (ISBN 978–92–0–111607–9), Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna, Austria.

Download from:
http://www-pub.iaea.org/MTCD/publications/PDF/TE_1582_web.pdf

Livestock manures are a valuable resource that can be used as a substitute or alternative for chemical fertiliser. However, unless animal manure is managed carefully to minimise odour, nutrient losses and emissions, it becomes a source of pollution and a threat to aquifers and surface waters. This report shows the benefits of using manure in plant production and the consequences of its mismanagement. It sets out a number of guidelines for different aspects of manure production, collection, storage, processing and utilisation.

Improving village chicken production: A manual for field workers and trainers

By C. Ahlers, R. Alders, B. Cagnol et al, 2009 (ISBN 978-1-92153-157-6) Australian Centre for International Agricultural Research (ACIAR), GPO Box 1571, Canberra ACT 2601, Australia.

Download from: http://www.aciar.gov.au/publication/MN139

This manual focuses on chicken production in developing countries. It describes husbandry practices and biosecurity measures for village chickens that can be implemented using locally available resources. These measures will lead to both increased productivity and improved protection from disease in village chicken systems.

Livestock Farmer Field Schools – Guidelines for facilitation and technical manual

By: Groeneweg, K., G. Buyu, D. Romney, B. Minjauw. 2006. International Livestock Research Centre, Nairobi, Kenya.

Download from: http://www.infobridge.org/ffsnet/output_view.asp?outputID=3046

This guide provides examples of Farmer Field School (FFS) activities relating

specifically to livestock, together with basic technical information about livestock for facilitators. The FFS approach strengthens the capacity of farmers and the local communities to analyse their production systems, identify their main constraints and test possible solutions. By combining their own knowledge with existing information, farmers can identify and adopt the practices and technologies that are most suitable to their own farming system and needs and thereby become more productive, profitable and responsive to changing conditions.

Livestock's long shadow – environmental issues and options

By: H. Steinfeld, P. Geber, T. Wassenaar, V. Castel, M. Rosales, C. Haan. 2006. FAO

Download from: http://www.fao.org/docrep/010/a0701e/a0701e00.HTM

This report from the FAO aims to assess the full impact of the livestock sector on environmental problems, along with potential technical and policy approaches to mitigation. The livestock sector contributes to serious environmental problems both locally and globally. Problems include air and climate change, land and soil, water and biodiversity.

Livestock services and the poor - a global initiative: Collecting, coordinating and sharing experiences

By: IFAD, DANIDA, World Bank, DAAS, University of Reading and national institutions in Bangladesh, Bolivia, Denmark, India and Kenya. 2004. (ISBN 92-9072-037-9).

Download from: http://www.ifad.org/lrkm/book/english.pdf

Nearly one billion livestock are kept by more than 600 million small-scale farmers and herders in rural areas around the world. Livestock keeping can help alleviate poverty in many developing countries, especially as the demand for animal products such as milk and meat continues to rise. Still, most livestock keepers (about 95 percent) live well below the poverty line, and could not even afford to buy their own livestock products. This book demonstrates how present-day livestock policies and practices overlook the needs of rural small-scale farmers and herders, essentially preventing them from taking advantage of new market opportunities. It offers strategies to help provide rural livestock keepers with the tools they need to overcome their poverty. It assesses the possibilities available to poor livestock keepers to benefit from the market opportunities for livestock products. Access to quality livestock services is identified as one of the most critical avenues for the exploitation of this market potential.

Modern and mobile – The future of livestock production in Africa's drylands

By: IIED and SOS Sahel International UK. 2010. (ISBN 978-1-84369-752-7).

Download from: http://www.iied.org/pubs/pdfs/12565IIED.pdf

This book is about the critical role mobile livestock keeping plays in the economy of Africa's drylands. Across East and West Africa an estimated 50 million livestock producers support their families and their communities through a massive meat, skins and hides industry based on animals that feed solely on natural dryland

pastures. Where other land-use systems are failing in the face of global climate change, mobile livestock keeping, or pastoralism, is generating huge (but often hidden) national and regional economic benefits. It is only recently that the contribution that livestock mobility makes to poverty alleviation and development has been fully recognised. Supporting mobility does not require huge financial investment: it requires fresh thinking and clearer understanding.

Pro-poor livestock policy initiative: Livestock sector policies and programmes in developing countries

By: Ugo Pica-Ciamarra; Joachim Otte; Chiara Martini. 2010. FAO, Rome, Italy.

Download from: http://www.fao.org/docrep/012/i1520e/i1520e00.htm

The livestock sector contributes to the livelihoods of an estimated 70 percent of the world's rural poor. The increasing demand for animal protein in low and middle income countries provides an opportunity for the poor to improve their livelihoods. However, the nature of livestock farming is determined by policy and institutional frameworks that rarely favour the poor. This "Menu for Practitioners" provides a non-technical compilation of livestock sector programmes, including case studies. It is intended to assist policy-makers and development practitioners to formulate and implement plans for institutional reforms and livestock sector-related policies that will benefit livestock farmers and other stakeholders along the value chain.

Sustainable breeding programmes for tropical farming systems

By: J. Philipsson, J.E.O. Rege and A.M. Okeyo. 2006. Swedish University of Agricultural Sciences (SLU) Department of Animal Breeding and Genetics, PO Box 7023, S–750 07 Uppsala, Sweden; International Livestock Research Institute (ILRI) PO Box 30709, Nairobi 00100, Kenya.

Download from: http://agtr.ilri.cgiar.org/Module/module3/Module3.htm

This module on sustainable breeding programmes is part of the 'The Animal Genetics Training Resource' (AGTR) developed by the International Livestock Research Institute (ILRI) and the Swedish University of Agricultural Sciences (SLU). This online module discusses important factors to consider when designing sustainable genetic improvement programmes, especially under tropical conditions. Previous attempts to launch breeding programmes in developing countries have too often failed, although there are success stories to learn from as well. Long-term and simple strategies are required, as is the need to efficiently exploit the potential of indigenous breeds.

R6.2 Relevant websites

CGIAR Systemwide Livestock Programme

http://vslp.org/

The Systemwide Livestock Programme (SLP) of the Consultative Group on International Agricultural Research (CGIAR) is a consortium of 12 international agricultural research centres and the organisations that collaborate with them.

They focus on the role of food-feed crops as a key entry point for improving the productivity and sustainability of mixed smallholder farming systems, particularly small-scale crop-livestock producers. The website provides publications, a feed database and Livestock Feeding Strategies Simulation Models (LIFE-SIM).

Convention on Biological Diversity

www.cbd.int

The website of the Convention on Biological Diversity is a large resource, containing information about the convention itself and the Protocol on Biosafety. It describes various programmes, including Agricultural Biodiversity, Island Biodiversity and Mountain Biodiversity, each complete with updates, background information, activities and links. From the homepage you can sign up to receive various e-newsletters, and there is also a link to The Green Wave (http://greenwave.cbd.int), a global campaign to educate children and youth about biodiversity.

Domestic animal diversity information system

http://dad.fao.org/

Hosted by the FAO, this is an excellent source of information on animal genetic resources around the world. It provides searchable databases of breed-related information and images, management tools and a library of references, links and contacts of regional and national co-ordinators for the management of animal genetic resources. It also provides countries with a secure means to control the entry, updating and accessing of their national data.

Endogenous livestock development network

www.eldev.net

Endogenous livestock development focuses on livestock and people. It promotes animal production based on the initiatives of farmers, pastoralists and other livestock keepers. It relies on their own worldview, values, knowledge, institutions and resources, and mixes them with suitable outside resources.

Ethnovetweb

www.ethnovetweb.com

This website is about ethnoveterinary medicine: how people around the world keep their animals healthy and productive and the contribution that this knowledge can make to development. The site provides access to information resources and publications, some in full text. It also features a page with useful links to, and descriptions of, other websites on ethnoveterinary medicine and livestock development.

FAO publications on livestock production

www.fao.org/ag/againfo/resources/en/pubs_gen.html

FAO has a valuable selection of resources on livestock production, divided into ten topics, including animal health, feed and food safety, animal welfare and livestock and gender. All of the resources are available as PDF documents, while some are also accessible in HTML.

International Livestock Research Institute

www.ilri.org

ILRI focuses on livestock as assets of the poor - as agents of change and means to better lives. Based in Kenya and Ethiopia, ILRI works with partners in Africa and Asia to enhance livestock pathways out of poverty. The website contains excellent resources in different media: films, photographs, radio, presentations together with documents and news.

League for pastoral peoples and endogenous livestock development

www.pastoralpeoples.org

This is an advocacy and support group for pastoralists who depend on common property resources. LPP provides technical support, advisory services and advocacy for pastoral societies and other small-scale livestock keepers to help them pursue their own vision of development and to stand their ground in the face of unfavourable policy and marketing environments and potential encroachments onto, or deterioration of, their grazing grounds.

Livestock maps

http://www.fao.org/ag/againfo/resources/en/glw/GLW_dens.html

This website shows the global and regional distributions of livestock, some information about their productivity, and gives details of the rapid pace of change in livestock production. It also contains a number of graphs showing changes in animal rearing over time in various parts of the world (sub-Saharan Africa, Near East and North Africa, and eastern Asia, eastern and western Europe; China, India and the remaining Asian Countries). It shows how the balance of production is changing between the developed and developing worlds.

Pastoralists -The Pastoralist Communication Initiative

www.pastoralists.org

Pastoralist Consultants International is currently implementing a project (sponsored by UK's DfID) on Democracy, Growth and Peace for Pastoralists. The project focuses on Ethiopia's pastoralists but also extends across the Horn of Africa, seeking to promote new knowledge and innovation.

PigTrop

http://pigtrop.cirad.fr/home

PigTrop is an Internet portal for research and the sustainable development of pig production in tropical regions. PigTrop is a collective platform where people share experiences and exchange information with an emphasis on making it accessible to end users (farmers, rural organisations, NGOs, researchers and students) in southern countries.

Practical Action – animal husbandry, fish farming

http://practicalaction.org/practicalanswers/index.php?cPath=24_76

Practical Action is a development organisation specialised in helping people make best use of and develop technology. The organisation promotes sustainable development, innovations and solutions to eliminate poverty. The website

contains downloadable information on animal husbandry, beekeeping and fish farming. The organisation also provides a technical enquiry service.

Rare Breeds International

http://www.rarebreedsinternational.org/

RBI is an international NGO whose mission is to prevent the loss of diversity of the world's farm animal genetic resources (AnGR). It works with governmental and non-governmental groups and with individuals to help conserve AnGR in farm livestock. It provides advice and support programmes for genetic conservation. In particular, genetic impact studies are carried out to ensure that indigenous breeds are not endangered by the importation of exotic (improved) breeds. RBI conducts research at an international level. For example, breeds with a breeding population in more than one country are monitored by drawing on grassroots information from members.

Smallstock: The economic value of manure

www.smallstock.info/info/markets/manure.htm

The Smallstock toolbox provides a range of practical information and descriptions of techniques or "tools" to increase the efficiency of operations of smallholders and/or the productivity of their animals. Specifically, this website provides practical information about the management of manure in smallholder systems. It explains the different types of manure and the value of each. It also describes how to store, treat and use it in the most appropriate and environmental sound manner. It includes a series of cartoons featuring a young girl learning about various aspects of livestock keeping.

VetAid

www.vetaid.org

VETAID works with agricultural communities in East Africa who depend on animals for their survival. They have a diverse range of programmes, working with communities, local organisations and governments to develop strategies to help rural communities meet the challenges they face A key aspect of this is providing training for local people so they can provide basic animal health services in areas where there are no veterinary services.

Vetwork

www.vetwork.org.uk

Vetwork is a British NGO that promotes participatory livestock development. Their site presents information, an electronic magazine and contact addresses relating to community-based animal healthcare.

World Organisation for Animal Health (OIE)

http://www.oie.int/

The OIE is the intergovernmental organisation responsible for improving animal health worldwide, and fighting animal diseases at a global level. It is recognised as a reference organisation by the World Trade Organization (WTO) and in 2010, had a total of 176 Member Countries and Territories. With its Head Office in Paris, France, the OIE has regional and sub-regional offices on every continent.