IDENTIFICATION OF AGROECOLOGICAL FARMING
AND OTHER AGROECOLOGY RELATED ACTIVITIES IN KYRGYZSTAN

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Agroecology Europe (AEEU)

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SUMMARY

Agriculture in Kyrgyzstan is a significant sector of the economy. According to the CIA World Factbook\(^1\), it represents 18% of the total GDP and occupies 48% of the total labour force. Only 6.8% of the total land area is used for crop cultivation, but 44% of the land is used as pastures for livestock. Because of the mountainous relief of Kyrgyzstan, animal husbandry remains a significant part of the agricultural economy.

As far as the agricultural surface is concerned, the main crop is legume-based temporary grassland that is used for feeding livestock. The second largest crop is winter wheat, followed by barley, potato, maize, sunflower, cotton, vegetable, fruits and pulses\(^2,3\).

The most important animal species for meat and dairy productions are cattle, sheep, and goats. Chickens, horses, and pigs are also present. In some mountain regions, yaks are bred\(^4\).

Currently, agriculture is considered as the most priority activity for increasing income of rural population (more than 60% of the total population), most of whom live below the extreme poverty line. It is not only food security that depends on the development of agricultural production, on soil fertility and water access, but also a large part of the population’s income.

Agroecology as a science, a practice and a movement, covers all three spheres of sustainable development, social, economic and environmental. It offers prospects for better income and quality of live for farmers through the development of a natural resource-based agriculture that goes along with minimization or limitation of commercial inputs, chemicals and anthropogenic pressure.

The Letter of Agreement signed by FAO and Agroecology Europe in December 2017 aims at facilitating knowledge exchange, increasing capacity building, defining a survey method and initiating a mapping of agroecological initiatives in order to promote agroecology across Europe and Central Asia (ECA) region. Kyrgyzstan has been chosen by FAO as a pilot country in Central Asia.

This project developed a survey method and an indicator system for assessing to what extend farms are agroecological. These methods provided a lot of data and preliminary conclusions on the state of agroecological practices and systems in the Kyrgyz agricultural sector. Desk studies and contacts with non-farmer stakeholders completed the source of information. Field research, the analysis of secondary documents and stakeholder interviews showed a great potential for the development of agroecological approaches in Kyrgyzstan.

Current agricultural practices with a limited use of synthetic fertilizers and pesticides for more than 20 years, low intensity soil works, diversity of crops including legume-based temporary grasslands, integration of crop and livestock, and family farming are some characteristics that make possible to actively develop this approach in Kyrgyzstan.

The existing difficulties and gaps associated with the lack of specialists, knowledge and experience, and appropriate regulatory framework, are challenges and at the same time opportunities for the governmental and agricultural sectors.

\(^2\) [https://en.wikipedia.org/wiki/Agriculture_in_Kyrgyzstan](https://en.wikipedia.org/wiki/Agriculture_in_Kyrgyzstan)
\(^4\) [http://www.stat.kg/ru/](http://www.stat.kg/ru/)
Additional attention needs to be paid for finding potential solutions and opportunities for introducing innovative approaches and spreading best practices.

This report is a first step for enhancing the integration of agroecological works and initiatives across the region and filling the knowledge gap on agroecology between Central Asia and other parts of the World.
ACKNOWLEDGEMENTS

This report was prepared as a background research for the FAO Regional Office for Europe and Central Asia in collaboration with Agroecology Europe for identifying agroecological insights and activities in Central Asia to enhance integration of all agroecological work across REU region.

The authors are most grateful to farmers and all organization representatives for the valuable input they provided to this study. They thank FAO teams in Budapest and Bishkek for their precious support.
ACRONYMS

ADB  Asian Development Bank
AEEU  Agroecology Europe
AWU  Agricultural Work Unit
CAIAG  Central Asian Institute for Applied Geosciences
CIA  Central Intelligence Agency
CSA  Climate Smart Agriculture
EBA  Ecosystem Based Adaptation
EBRD  European Bank for Reconstruction and Development
ECA  Europe and Central Asia
EFTA  European Free Trade Association
FAO  Food and Agricultural Organization of the United Nations
FFS  Farmers Field School
GIZ  Deutsche Gesellschaft für Internationale Zusammenarbeit
JICA  Japan International Cooperation Agency
KNAU  Kyrgyz National Agrarian University named after K.I. Skryabin
MoAIPM  Ministry for Agriculture, Food Security and Land Reclamation of the Kyrgyz Republic
NGO  Non-Governmental organizations (of Kyrgyz Republic)
REU  Regional Office for Europe and Central Asia (FAO)
SAEPF  State Agency of Environmental Protection and Forestry under the government
SDGs  Sustainable Development Goals
SKaP  National system of short-term courses for farmers (“Skills, Knowledge and Practices”)
UCA  University of Central Asia
UNDP  United Nations Development Programme
USAID  United State Agency International Development
WB  World Bank
WFP  World Food Programme
Chapter 1 INTRODUCTION

Most countries in Central Asia are developing middle-income economies and show a great reliance on agriculture. Climate change is a growing threat to food security and ecosystem services in this region. In this context, agroecology can provide a higher resilience to farms to climatic events, mitigate vulnerability and make agriculture more sustainable in the medium and long term.

To respond to the challenge of the need of evidence based for policy makers, and the need to assess the performance of agriculture in a more holistic way, beyond productivity, FAO is developing a global knowledge product and organised an Expert Workshop in Rome (Italy) on the ‘Multi-dimensional Assessment of Agroecology’ on 8 and 9 October 2018.

Knowledge sharing and platform of agroecological activities is more developed in Europe so far, and thus it is an urgent task to integrate other countries in the Europe and Central Asia (ECA) region into the regional and global arena for discussions on agroecology and evidence based collection. In this context, identifying agroecological activities (farms, villages, development projects, teaching and research activities, NGO activities, etc.) in other part of the region is of crucial importance for mapping initiatives and creating connections between Central Asia initiatives and Europe.

In Europe, the “Agroecology Europe” association, a European Association for Agroecology, has a non-profit and international goal. It aims to analyse, design, develop and promote the transition towards agroecology-based farming and food systems. The overall goal of the Association is to: support agroecological research, education and training; share and disseminate agroecological knowledge; promote agroecology in the farming and food sectors and in society.

The Letter of Agreement signed by FAO and this association in December 2017 aims at facilitating knowledge exchange, increasing capacity building, defining a survey method and initiating a mapping of agroecological initiatives in order to promote agroecology across the Europe and Central Asia (ECA) region. Kyrgyzstan has been chosen by FAO as a pilot country in Central Asia.

This report is a first step for enhancing the integration of agroecological works and initiatives across the region and filling the knowledge gap on agroecology between Central Asia and other parts of the World.
Chapter 2 METHODOLOGY

2.1. General organisation of the project

The overall period of work preparation, field survey and data analysis was carried out from May till November 2018.

This research applied an expert approach utilizing three types of activities:

- Design of an indicator system and a survey method (questionnaire);
- Survey of 30 farmers in all seven provinces of the country;
- Interview of six non-farmer stakeholders from key-organizations;
- Desk research (analysis of secondary information: statistical data, reports, legislation, policy and other project documents).

The team was composed of two national consultants:

- Mrs Tatjana Semenova (Agroecologist), responsible for the economic, social, administration, policy and legal aspects of the project;
- Mr Elaman Diusheev (Agro-economist), responsible for the farm survey, the interviews of non-farmer stakeholders and the organisation of the international mission in Kyrgyzstan.

and three international consultants:

- Mrs Paola Migliorini (Professor in Agronomy and Plant Production Systems at the University of Gastronomic Science (UGC), Pollenzo, Italy);
- Mr Alexander Wezel (Professor for Agroecology and Landscape Ecology, Head of the Department of Agroecology and Environment in ISARA, Lyon, France);
- Mr Alain Peeters (Professor for Agroecology and Agronomy, Director of the RHEA Research Centre, Corbais, Belgium), project leader.

The survey method and the indicator system were designed by the project leader from May to August 2018. It was then intensively discussed and improved by email among the team of national and international consultants. The questionnaire was tested and progressively improved during the 10-day field mission of the project leader from 20 to 29 August 2018 in Kyrgyzstan during which 12 farms were interviewed with the national consultant on agro-economy. This allowed also a training of the national consultant who was able to perform the remaining 18 interviews by himself in September 2018. The 30 farm portraits were drafted in close collaboration between the national consultant on agro-economy and the project leader. They analysed the indicator data together.

The selection of interviewed farmers was done mainly with the help of experienced colleagues from FAO in Bishkek. All these farmers had had at least some contacts with FAO in the past. Some of them were beneficiaries of development projects. Other farmers were recommended by advisory services of the Kyrgyz Ministry of Agriculture. The former personal relationships developed a trust relationship with these two organizations which facilitated appointments and interviews for this mission.

The work methodology related with ‘interviews of non-farmer stakeholders’ and ‘desk research’ was discussed in Bishkek with national consultants during the mission of the project leader in Kyrgyzstan.

Six key stakeholders were selected and interviewed by the project leader and the national consultant on agro-economy including responsible persons from three NGOS, two public administrations and a University. People were selected for having a stake in the implementation of agroecological approaches or having relevant activities in agroecology, organic farming and related activities.
The desk research work was then performed by the national consultant in agroecology. She had also contacts with colleagues from the Ministry of Agricultural, Agrarian University, Manas University, and Academy of Sciences. She provided a text on Country description, Agroecology, and Public structures, Policies and Legislation.

Data were first analysed by national consultants and each of them wrote a draft report on their sections of the text. This draft report was reviewed by the two international consultants from ISARA and UGC. The project leader then worked again on data analysis, reviewed and completed the text and provided the final version of the report.

2.2. Design of an analysis system for assessing the degree to which a farm is agroecological – OASIS. The farm survey and indicator system

Assessing the development state of agroecology in a country and in the world is a preliminary and necessary step if agroecology has to be scaled up. This assessment is a challenge that requires the definition of relevant indicators and the design of a survey method that should be fast, easy, cheap, reliable and applicable at large scale for collecting these indicators. An identification and a mapping of agroecological and transition farms would be important for studying these farms, recording their performances, and using them as pilot or demonstration farms for stimulating the transition of other farms towards agroecology.

In the framework of this project, an indicator system and a survey method for collecting these indicators have been designed. It has been named ‘OASIS’ (the Original Agroecological Survey and Indicator System). It provides a measurement of the degree of transition of a farm towards an agroecological system.

The five components of Sustainable Development (Seghezzo 2009), the Sustainable Development Goals (www.un.org/sustainabledevelopment/sustainable-development-goals), and the ten Elements of Agroecology defined by FAO (FAO 2018) were important sources of inspiration for the development of the indicator system. Other indicator systems such as the SAFA (FAO 2013 and 2014), MESMIS (Masera et al. 1999; López-Ridaura et al. 2002; Astier et al. 2012), RISE (Grenz 2013) and SAFE systems (Van Cauwenbergh 2007) were consulted and their structures were as much as possible integrated in the OASIS indicator system. It has been estimated however that a new, synthetic indicator system was necessary because none of the existing indicator systems sufficiently covered the range of agroecological strategies, principles and practices and none could be used at large scale with a reasonable effort.

OASIS is among the first or even the first analysis framework to be specifically designed for assessing agroecological systems at country level. The survey method has been designed in such a way that data on a farm can be collected in one and half hour interview, making large surveys possible at a country level. Investigators can be trained in three days.

The OASIS analytical framework is based on a P, C & I hierarchical structure. It defines hierarchical levels to facilitate the formulation of sustainability indicators in a consistent and coherent way. The structure of the hierarchical framework is shown in Figure 1 (adapted from Lammerts van Bueren & Blom 1997, Van Cauwenbergh 2007) and table 1. The general aim of the framework is to evaluate sustainability in agriculture and this aim is progressively reached by defining successively ‘Principles’, ‘Criteria’ and ‘Indicators’:
1. **Principles** - The first hierarchical level relates to the multiple functions of the agro-ecosystem, which go clearly beyond the production function alone (de Groot et al., 2002) and encompasses the three pillars of sustainability: environmental, economic and social.

2. **Criteria** – The resulting states of the agro-ecosystem when its related Principles are respected. Criteria are more concrete than Principles and thus easier to link to indicators.

3. **Indicators** - Variables of any type that can be assessed in order to measure compliance with a Criterion. A set of indicator values should provide a representative picture of the sustainability of agricultural systems in all its environmental, economic and social aspects.

4. **Reference values** - The desired level of sustainability for each indicator. They give users guidance in the process of continuous improvement towards sustainability (Mitchell et al., 1995; Girardin et al., 1999; Wefering et al., 2000; Piorr, 2003).

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**Figure 1. Structure of the OASIS hierarchical framework (Adapted from Lammerts van Bueren & Blom, 1997; Van Cauwenbergh 2007).**
Table 1. The OASIS hierarchical framework: Principles and Criteria.

<table>
<thead>
<tr>
<th>PRINCIPLES</th>
<th>ECONOMIC PILLAR</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production function</td>
<td>Dependency of the farm system to commercial inputs is minimized</td>
<td>Variable costs are reduced</td>
</tr>
<tr>
<td></td>
<td>Agroecological techniques are adopted</td>
<td>Fixed costs (investments) are reduced</td>
</tr>
<tr>
<td>Economic function</td>
<td>Product quality is increased</td>
<td>Product processing is optimized</td>
</tr>
<tr>
<td></td>
<td>Products are sold in short marketing chain</td>
<td>Products are sold in local marketing chain</td>
</tr>
<tr>
<td></td>
<td>Income is optimized by the combination of low costs and high revenues</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOCIAL PILLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological well-being of the farming community function</td>
</tr>
<tr>
<td>Physical well-being of the farming community function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL PILLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER AND SOIL POLLUTION</td>
</tr>
<tr>
<td>Supply of quality water function</td>
</tr>
<tr>
<td>Stock of quality soil function</td>
</tr>
<tr>
<td>ATMOSPHERE</td>
</tr>
<tr>
<td>Climate mitigation function</td>
</tr>
<tr>
<td>SOIL</td>
</tr>
<tr>
<td>Stock of soil function</td>
</tr>
<tr>
<td>Stock of quality soil function</td>
</tr>
<tr>
<td>Soil salinization is controlled</td>
</tr>
<tr>
<td>BIODIVERSITY</td>
</tr>
<tr>
<td>Stock of biotic resources function</td>
</tr>
<tr>
<td>High-nature value habitats are adequately managed and integrated in farm management</td>
</tr>
</tbody>
</table>

In the OASIS system, selected indicators are simple and easily understandable. They are looking at farming activities from a farmer’s perspective while being useful for other stakeholders such as decision makers, advisers, researchers, students, and citizens.

Two types of indicators were taken into account: description (structure) and impact (performance) indicators. Description indicators are: farm type and dominant productions, farm size, farming system and farming practices. Impact indicators are related with economic, social and environmental aspects (annex 2 and description of the sections below).

Several data are collected as multiple choices (e.g. farm type or farming system type) or quantitative data (e.g. farm size or farmer’s age) but most indicators are assessed in a semi-quantitative way on a scale ranging from 1 to 5. The maximum score is the reference value. It corresponds to the highest degree of agroecological practice or system.
The system is flexible. It can assess a large range of agricultural systems. It can also be easily completed for specific situations.

The indicator system and the related questionnaire have been designed and tested on 30 farms in Kyrgyzstan. The questionnaire has been iteratively improved. The final version is presented in annex 2. It includes the following sections:

1. Farm type and dominant productions
2. Farm size
3. Farming system
4. Economic pillar (Farming and economic practices)
   4.1. Dependency of the farm system to commercial inputs
   4.2. Adoption of agroecological techniques
   4.3. Production costs
      4.3.1. Importance of variable costs
      4.3.2. Importance of fixed costs (investments)
   4.4. Revenue importance
      4.4.1. Product quality
      4.4.2. Product processing
      4.4.3. Short marketing chain
      4.4.4. Local marketing chain
   4.5. Income importance
5. Social pillar (Farm viability, Quality of life, Food security)
   5.1. Farmer’s age
   5.2. Farm viability
   5.3. Quality of life
   5.4. Self-consumption of food products
   5.5. Food security
6. Environmental pillar (Farm impact on the environment and biodiversity)
   6.1. Pollution
   6.2. Soil carbon management
   6.3. Wind or water erosion
   6.4. Soil salinization
   6.5. Biodiversity
7. Farm description and location

Data collected with the questionnaire are introduced in an Excel sheet that produces six radar charts relative to:

1. Adoption of agroecological practices
2. Importance of variable costs
3. Importance of fixed costs
4. Importance of revenue
5. Farm prospects
6. Farm impact on the environment

The first four charts are related with farm economic strategy. The fifth chart corresponds to the social dimension and the sixth to the environmental aspect.

The radar charts are made of axis that correspond to individual indicators (figure 2). The periphery of the
radar represents the maximum score that can get an agroecological system.

![Figure 2. Example of radar chart for one farm on its ‘Adoption of agroecological techniques’.](image)

Radar charts can cluster data from several farms in order to compare them, for instance data from farms belonging to the same farm type or the same farm size. They can also include data from consecutive years for the same farm in order to analyse its evolution.

Each farm is also described in a two-page text by tackling the following aspects:

- **Essential features:**
  - Short farm description and functioning
  - Farm agroecological characteristics

- **Additional information:**
  - Farm location
  - Farmer’s family
  - Farmer’s education and motivation for agriculture
  - Farm infrastructures, machinery and garden
  - Relationship with international and national organizations (e.g. UN, State, NGO), and private companies
  - Farm evolution, objectives and expectations

- **Farm location on a country map.**

Interviews were carried out in all regions and the seven provinces (oblast) of the country in order to cover a wide range of agro-climatic zones, soil types, farming systems, and socio-economic conditions. The survey form and the choice of indicators were tested on 30 farms.
2.3. Stakeholder interviews

The following people from three NGOs, two public administrations and one university were interviewed. Their organization name is mentioned below.

Three NGOs:
- CAMP Alatoo Public Foundation
  Mr Azamat Isakov, Project Coordinator
- Chui-Talas Rural Advisory Service (RAS)
  Mr Sherip Berdaliev, Head
- Rural Development Fund
  Mrs Kuluipa Akmatova and Albina Rysmendieva

Two public administrations:
- Agro Bio Center, Ministry of Agriculture of the Kyrgyz Republic
  Mr Janybai Tumanov and Mrs Janarkan Tokonovna Bakirova
- Department of Chemicalization and Plant Protection, Ministry of Agriculture and Melioration of the Kyrgyz Republic

One University:
- Kyrgyz National Agrarian University
  Professor Abdybek Asanaliev, Secretary of the Science Council of the University

2.4 Desk studies

Data from statistic, administrative, scientific and internet sources were used and analysed to prepare the report. Most data sources are in open and free access. They are listed in annex 1.

For policy and legal aspects, the most important web sites are the following:
- Website of the Government of the Kyrgyz Republic (legislative base, normative acts, etc.): www.gov.kg/?lang=ru
- Ministry of Agricultural of the Kyrgyz Republic: www.agroprod.kg/
- State Agency for Environmental Protection under the Government of the Kyrgyz Republic: www.ecology.gov.kg/
- Information and legal portal: online.toktom.kg/NewsDivision/Division/1?page=0&size=10
- FAO on Kyrgyzstan: www.fao.org/countryprofiles/index/ru/?iso3=KGZ
Chapter 3 COUNTRY DESCRIPTION

3.1. Introduction

Kyrgyzstan is a landlocked country in Central Asia with a total area of 199,949 km$^2$. It is bordered to the north by Kazakhstan, to the east and southeast by China, to the southwest by Tajikistan and to the west by Uzbekistan (Figure 3). It became independent from the Former Soviet Union in August 1991. The country is divided into seven provinces (oblasts), which are Batken, Chu, Jalal-Abad, Issyk-Kul, Naryn, Osh and Talas$^5$.

Largely mountainous, the country is dominated by the western reaches of the Tien Shan range in the northeast and the Pamir-Alay in the southwest. The highest mountain is Victory Peak (Tomur Feng, 7,439 m above sea level) at the eastern tip of the country, on the border with China. About 94% of the country rises over 1,000 m, and 40% at more than 3,000 m above sea level. Much of the mountain region is permanently covered with ice and snow and there are many glaciers, covering about 4% of the territory.

The Fergana mountain range, running from the northwest across the country to the central-southern border region, separates the eastern and central mountain areas from the Fergana valley in the west and southwest. Other lowland areas include the Chu and Talas valleys near the northern border with Kazakhstan. The world’s second largest crater-lake, is Issyk-Kul, in the northeast with a surface area of 6,236 km$^2$.

The agricultural area is estimated at 10,670,000 ha, or 53% of the total area, including 9,179,000 ha of permanent pasture. In 2009, the cropped area was 1,351,000 ha, of which 1,276,000 ha of annual crops and 75,000 ha of permanent crops. The cropped area increased between 1995 and 2000$^6$.

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3.2. Climate, soils, water resources and agroecological regions

3.2.1. Climate

The climate is continental with hot summers and cold winters, during which frost occurs throughout the country. Average temperatures in the valleys vary from -18°C in January to +28°C in July. Average annual rainfall is estimated at 533 mm, varying from 150 mm in plains (Fergana valley) to over 1 000 mm in the mountains. Precipitation occurs during autumn and winter, mainly between October and April, when temperatures are low. Rain-fed agriculture is therefore limited. Snowfall forms an important part of total precipitation. About 10% of the territory, at the lowest altitude, is classified as arid (Atlas of the Kyrgyz Republic 1987).

Climatic conditions of Kyrgyzstan are determined by its geographical position. Most of the territory of the republic is located in the temperate climate zone, and southern areas are in the subtropical climate zone. Location of Kyrgyzstan, its remoteness from oceans and seas, neighbourhood of deserts predetermine acutely continental and dry climate.

Four different climatic areas clearly stand out in the territory of Kyrgyzstan: Northwest Kyrgyzstan (NWK), Southwest Kyrgyzstan (SWK), North-eastern Kyrgyzstan (NE) and Internal Tian-Shan (ITSH) (Figure 4).

Figure 4. Agro-climatic areas of the Kyrgyz Republic (data of “Kyrgyzhydromet”)7.

7 Climate profile of the Kyrgyz Republic, 2013
3.2.2. Soils

The main soil types are characterized by regularity of altitudinal zonality change presented by Turanian light grey soils, Turanian ordinary grey soils, Turanian dark grey soils, northern dark grey soils, meadows saline-alkaline grey soils, mountain valleys, grey-brown desert, rocky soils, mountain valleys, clay-coloured, chestnut chernozem.

According to geomorphological features, the following groups of soils are distinguished on the territory of the Republic:

- Soils of intermountain valleys and plains (from 500 to 3,000 m above sea level) which are subdivided into soils of low valleys and plains - grey Turanian soils, low-carbonate grey soils, meadow grey soils;
- Soils of medium-altitude intermountain valleys and depressions - grey-brown desert, light-brown, carbonate light-chestnut, dark-chestnut, meadow chestnut;
- Soils of high mountain valleys - chestnut soil of fescue steppes.

Soils of mountain slopes (from 1,000 to 4,500 m above sea level) are widespread on the following altitudinal zones:

- mountain steppe soils (from 1,000 to 2,500 m above sea level);
- mountain grey soils, brown, clay-coloured, chestnut, dark chestnut;
- mountain meadow steppe (from 2,000 to 2,800 m above sea level);
- chernozem, dark-brown walnut -fruit, dark-coloured juniper forests;
- chernozem-like spruce forests;
- subalpine mountain (from 2,800 to 3,500 m above sea level);
- mountain meadow-steppe, chernozem-like meadow;
- alpine (from 3,500 to 5,000 m above sea level);
- alpine meadow- steppe, meadow, semi-peaty soils of waste plots etc.
3.2.3. Water resources

Water resources of Kyrgyzstan play an important role in human life, for flora and fauna and for the economic production of the country (Figure 5).

Water resources are formed in closed undrained territory of Central Asia and cover 47.3 km$^3$. The main river network is a part of the Aral Sea basin and belongs to the hydro-geographic systems of such large rivers as the Syr Darya, the Amu Darya, the Chu, the Talas, and rivers flowing into Issyk-Kul Lake.

Figure 5. Water resources in Kyrgyzstan.
3.2.4. Land found

According to the Land code of the Kyrgyz Republic, all lands which are within the territory of the republic are the Land Fund of the republic. In accordance with the purpose and legal regime of use, the Land Fund is divided into categories of land. Figure 6 shows distribution of the Land Fund of the Republic by land categories in provinces.

The structure of agricultural lands includes farmlands and land occupied by internal roads, communications, closed ponds, buildings and structures necessary for functioning of agriculture. In January 2013, the area of agricultural land was 5,721.2 thousands ha.

All lands which are within settlements belong to lands of settlements. In January 2017, the area of the lands referred to this category in the whole country, was 245.6 thousands ha.

Forest fund lands. These are lands covered with forest, and also not covered with forest, are provided for needs of forestry. Forested area is actually occupied by wood species forming afforestation, its area was 864.9 thousands ha.

The lands of water fund include lands occupied by water bodies (rivers, lakes, reservoirs, canals), glaciers, wetlands, hydraulic and other water management structures, and also the lands allocated as allotment strips. In January 2013, the total area of the considered category of lands is 767.3 thousands ha.

Lands of stock are all lands which haven't been conceded for using or as property. They are in the public domain. In January 2013, the total area of lands of stock was 9,903.8 thousands ha.
Figure 6. Distribution of lands in Kyrgyzstan by categories of use.
3.2.5. Pastures

Kyrgyzstan is a mountainous Central Asian country with extensive pastoral resources, including more than 9 million ha of land on which agro-pastoralism is practiced (85% of the country’s agricultural land) (SAEPF 2012). Pastoral resources and pastoralism are central to Kyrgyz national culture and play crucial roles in supporting local and national socio-economic development. As much as 33% of pastures in Kyrgyzstan would be substantially degraded (USAID 2007). The Pasture Law, promulgated in Kyrgyzstan in 2009 and amended in 2011, is innovative in Central Asia for devolving governance of pasture resources to local communities. Simultaneously, the basic pasture management unit has been enlarged from individual to community scale. This realignment of governance systems and spatial aggregation of land management units reflect the bio-geophysical scale at which environmental (climatic) variability occurs in mountain areas and the consequent need for livestock mobility if herders wish to respond effectively to variable pasture conditions (Jacquesson 2010; Crewett 2012; Rahimon 2012)\(^8\).

Pastures are unevenly distributed among provinces of the republic (Figure 7).

![Figure 7](image)

*Figure 7. Pasture area by provinces of the republic (thousand ha).*

The vegetation of natural pastures is a growth place for numerous types of medicinal, melliferous and ornamental plants. It is a native habitat and forage source for many wild animals. Pastures are closely connected with pharmacology, beekeeping, tourism and hunting economy of the Republic, and also with the organization of natural parks and nature reserves. According to seasonal use, pastures are subdivided into the following categories: winter, spring-autumn and summer.

Winter pastures are generally close to permanent settlements, in areas of light or negligible snowfall where livestock can be easily housed, at least at night. Usually livestock sheds are located at these sites, as are small houses for shepherds. In many localities, these pastures are grazed all year round and, consequently, are in poor condition.

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Summer pastures are usually situated at middle elevations and in the high mountain valleys and gorges, typically located at significant distances from the settlements. They are characterized by high productivity and are used in summer for one to four months. Excessively used in Soviet times, most summer pastures are now showing the beneficial effects of several years of light and sometimes negligible grazing by livestock – but many also show signs of degradation through the uncontrolled spread of unpalatable plant species.

Spring and Autumn pastures are usually located in the foothills below 2,500 m altitude. Grazing starts here in the early spring when forage growth begins and again in fall after hay harvest has been taken from the fields. These pastures are extremely important because they serve as the first natural feeding source after winter, and they are used for sheep shearing and mating periods\(^9\).

Regarding vegetation types, natural pastures and hayfields are divided into desert (1.8 million hectares), semi-desert (0.15 million hectares), steppe (3.1 million hectares), meadow-steppe (2.4 million hectares) and meadow (1.3 million ha) (tall grass, subalpine and alpine).

Average productivity of pastures in the republic for the period from the 1970\(^{th}\) till the 1990\(^{th}\) decreased by 14%. Considerable area of pastures is moderately and strongly degraded (Figure 8) (Table 2).

Productivity of natural pastures is generally low: in 1970-1980 it was on average 0.51 t of dry matter (DM)/ha, in 1980-1990 (when there was the highest load of cattle on pastures) it was 0.43-0.45 t DM/ha, in 1991-1999, when the load of cattle on pastures plummeted, the average productivity increased to 0.68 t DM/ha. Today, 18% of pastures are subject to strong degradation, 5% are subject to different degrees of erosion, 4% are located on steep slopes (40° and more), 17% are affected by woody encroachment, 13% are invaded by non forage species, 16% are stony, 30% are in good condition.

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Figure 8. Ratio of degraded pastures by seasons of use (Semenova 2014).

| Table 2. State of pastures in Kyrgyzstan (according to data of the “Kyrgyzgiprozem”, 2014). |
|---------------------------------|-----------------|-----------------|-----------------|
| **Type of pastures** | **Total pasture area, thousand ha** | **Stage of degradation, thousand ha** | **Not degraded lands** |
|                      |                             | Desertification | Beginning of desertification | |
| **Winter**           | 2,454                       | 515             | 739                          | 1,200                        |
| **Spring-autumn**    | 2,756                       | 413             | 593                          | 1,750                        |
| **Summer**           | 3,978                       | 430             | 615                          | 2,933                        |
| **Total**            | 9,188                       | 1,358           | 1,947                        | 5,883                        |

Pasture use is concentrated mainly on pastures near villages and on remote pastures close to roads and water sources. Such pastures suffer from overgrazing, while a huge amount of distant pastureland is not used at all and is overgrown with weeds and poisonous vegetation. People depend on the infrastructure for transporting and selling their products.

The main problem of pasture management is pasture degradation. Excessive loading on pastures, unsystematic grazing, lack of on-going measures to improve natural forage lands from year to year lead to a deterioration of pasture grass stand. Overloading of pastures with livestock adversely affects their ecological condition. Significant overgrazing leads to the destruction of the grass sod of pasture plants and the mechanical structure of soil, lower yields and erosion. Spring-autumn and winter pastures are especially susceptible to degradation. Deterioration of pastures is a danger not only in terms of reducing stocks of pasture forage, but also leads to the disappearance of individual plant species that are most sensitive to grazing, loss of unique mountain landscapes and depletion of biodiversity. In addition, grazing on mountain slopes contributes to the development of water erosion, which is an irreversible
process in the mountains. Climatic conditions of the region have a significant impact on the increase in pasture degradation. The increasing frequency of extreme weather conditions creates serious risks for pasture livestock farming in the Kyrgyz Republic\textsuperscript{10}.

3.2.6. Agro-climatic zones

Currently, there is no classification of agroecological regions in Kyrgyzstan, so far only the classification of agro-climatic zones for crops cultivation is used.

The Kyrgyz Republic is dominated by the Tien Shan Mountains. Most of the country is above 1,000 meters, with an average altitude of 2,750 meters. The mountains run from west to east in a series of parallel ranges, dividing the country into three main zones (Figure 9).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{map.png}
\caption{Map-scheme of growing agricultural crops taking into account agro-climatic zoning at the territory of the Kyrgyz Republic: agro-climatic regions: C3 - north-west, CB - north-east; IO3 - south-west; BT - internal Tien Shan\textsuperscript{11}.}
\end{figure}

\textsuperscript{10} Draft. Adaptation strategy to climate change of pasture farming and animal husbandry of the Kyrgyz Republic for 2019-2024.

The northern zone includes the Talas and Chu river valleys, which mark the southern edge of the Kazakh steppe. This zone includes a huge upland basin that cradles Lake Issyk-kul. Much of this zone is irrigated, allowing high-value crop production in the lower areas. Cereal and livestock production predominate in the foothills. The central zone, which is the main body of the country, is a vast alpine area of rugged mountains, high river valleys, upland steppes, and alpine and subalpine pastures. Most summer grazing areas (above 2,500 meters) are located in this zone.

Crops are grown in the more sheltered, upland valleys, but conditions are hard and production is low. This zone is best suited to extensive livestock production, especially in areas such as Naryn, where there is good winter grazing in valleys with light winter snowfall. Production risks, in both summer and winter, are highest in this region.

The southern zone is a fringe of rich agricultural lowlands around the edge of the Ferghana Valley, near Osh and Jalal-Abad, and in the foothills and lowland areas in Batken. The milder climate, high soil fertility, and higher precipitation in the lowland areas facilitate intensive crop production, although land pressure is very high and farms are small. Livestock production is more prevalent in the foothills above the Ferghana Valley. Production and price variability can have a large impact on rural livelihoods in this zone, as farms are small and rural poverty is high.

### 3.3. Short review of agriculture

Agriculture is one of Kyrgyzstan’s most important economic sectors, contributing to approximately 18% of the gross domestic product and employing 48% of the country’s workforce.

During the Soviet era, the agricultural sector was dominated by large-scale farms that managed thousands of hectares and employed hundreds of workers. Emphasis was placed on large-scale milk, beef and fine-wool production, which led to significant increases in livestock numbers and also dependence on imported concentrate feed. But when the Soviet Union collapsed in 1991, the transition to a free market economy disrupted agriculture and increased poverty in rural areas. GDP dropped by 50 per cent after support from the Soviet Union ceased. The loss of the Soviet market and limited availability of imported feed, combined with declining international demand for wool and privatization of state flocks, led to a dramatic reduction in the number of sheep. Between 1990 and 2007 production of wool and meat declined by 70 and 30% respectively. The numbers of cattle, goats and horses have remained relatively stable during the transition, but intensively managed herds and flocks have been replaced by family owned livestock, mainly for subsistence.

Although only 7% (Figure 10) of the national land area is arable, agriculture is a significant factor in the economy and social resilience. More than 70% of the arable area depends on irrigation for its production. In the Soviet period, only about 4% of agricultural land was owned privately, although private plots contributed to a much higher percentage of overall output, especially in fruit and vegetable productions.

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15 http://factsanddetails.com/central-asia/Kyrgyzstan/sub8_5d/entry-4797.html
The least area suitable for crop growing is located in the Naryn and the south-eastern part of the Issyk-Kul provinces because of complicated mountain relief and severe climatic conditions.

![Map of favourable and unfavourable regions for cultivation of agricultural crops in Kyrgyzstan](image)

*Figure 10. Map of favourable and unfavourable regions for cultivation of agricultural crops in Kyrgyzstan (Source: Atlas of the Kyrgyz Republic).*

The main crops for domestic consumption are potatoes, onions, cabbage, as well as fruits and berries. Other goods such as wheat flour, rice, tea, salt and sugar are bought or exported\(^\text{16}\) (figure 11).

![Total crop areas in 2018, ha](image)

*Figure 11. Total crop areas in 2018, ha (National Statistic Committee, 2018)*\(^\text{17}\).

In the structure of sown areas, along with the increase in the areas of cereals, leguminous crops, cotton, tobacco and potatoes, oil crops (by 12.6%) and sugar beet (by 6.0%) were reduced.

Poor animal health and the lack of an effective veterinary service are the most important factors limiting the development of the livestock sector. Animal diseases not only negatively affect animal productivity, but also pose serious public health risks and limit the country’s export potential. In addition, the lack of internationally recognized testing facilities is an important constraint for the country’s export potential as it prevents Kyrgyz farmers and food processors to establish direct business relationships with

\(^{16}\) [https://borgenproject.org/sustainable-agriculture-in-kyrgyzstan/](https://borgenproject.org/sustainable-agriculture-in-kyrgyzstan/)

\(^{17}\) [http://www.stat.kg/media/publicationarchive/c14d88ad-2ae6-4e25-a4e1-023fea32f73f.pdf](http://www.stat.kg/media/publicationarchive/c14d88ad-2ae6-4e25-a4e1-023fea32f73f.pdf)
potential foreign partners at the end of the supply chain. There are also serious concerns with respect to food quality. Poor quality of raw material (agricultural products) poses sometimes problems for further processing, limiting the export potential and integration in modern supply chains\(^\text{18}\).

**Irrigated and rain-fed farming land**

The Kyrgyz Republic is a large area of irrigated agriculture in the Central Asian region, because it is virtually impossible to farm without irrigation due to the lack of rainfall during the vegetation growth period in spring and summer and also because irrigation water is collected and provided in abundance by mountain areas.

Cereals, cotton, bean, potato, tobacco, sugar beet, maize, temporary grasslands, vegetables, fruits are produced on irrigated lands. About 90% of the total crop production is obtained on the irrigated lands. Irrigated lands are located in the plains and foothill zones of the republic, in its main agricultural areas. They are the Fergana Valley, Chui and Talas depressions, the Issyk-Kul kettle and intermountain valleys of the Central Tian-Shan. In arid conditions and global climate change, the solution of food security problem generally depends on effective use of irrigated lands.

Irrigated lands are divided into regularly irrigated and conditionally irrigated according to defined norms. There are also rain-fed farming lands in the country where agricultural crops are provided only with rainfall water. Reduction of irrigated and rain-fed farming arable lands of the Republic, where the main part of agricultural production is obtained, is of special concern nowadays. Allocation of land for non-agricultural needs, flooding, impoundment, waterlogging, soil erosion, and also allocation of land for construction of houses and personal plots are the main reasons of the reduction of the area of these agricultural lands (Table 3).

| Table 3. Dynamics of changes in the area of irrigated and dry-farming arable land (thousand ha). |
|-----------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Total lands                                  | 19,995              | 19,995              | 19,995              | 19,995              | 19,995              | + 0.6                |
| Total arable land                           | 1,289               | 1,296               | 1,297               | 1,262               | 1,203               | - 86                 |
| Out of them: irrigated                      | 836                 | 843                 | 837                 | 831                 | 793                 | - 42                 |
| Rain-fed farming                             | 454                 | 452                 | 460                 | 431                 | 409                 | - 45                 |
| Lands of settlements                         | 51                  | 59                  | 101                 | 201                 | 266                 | + 215                |

3.4. **Agriculture and food security characteristics**

Agriculture production value is almost equally divided between crops (49.5%) and livestock (48.1%). Wheat crops dominate the structure of total grain production, making up 52% of all grain production in 2016. However, the wheat production area has been decreasing over the last decade; it decreased by 12.4% in 2016 compared to 2014 and by 18% compared to 2011. Grain production is also decreasing against the increase in fodder cultivation. The Kyrgyz Republic has been self-sufficient in potato production since 1994. Both the volume of production and the yield of vegetables have also been significantly increased over the last ten years. Sugar production significantly decreased between 2008 and 2015, with annual production at only 143,000 tons of sugar per year, which is not enough to meet

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\(^\text{18}\) [http://www.fao.org/3/a-i2711e.pdf](http://www.fao.org/3/a-i2711e.pdf) (P.14)
the country’s internal consumption needs. Vegetable oil production is very low in the Kyrgyz Republic; therefore, the country relies on imports. Low internal production is related to the absence of modern enterprises with the necessary volume of raw materials for processing.

Livestock production is a key part of the livelihoods of the rural population due to the abundant pastures and contributes to 48.1% of the gross agricultural output in the country. The country produces 94,400 tons of milk annually (average tons from 2011 to 2015) and has been steadily increasing over the last five years. Milk production far exceeds the required amount needed for the country's consumption. Livestock farming is concentrated in the mountainous districts of Naryn, Issyk-Kul and Osh provinces and utilized mainly for meat and milk production. The number of livestock in the country is closely correlated with the increasing production of meat; in 2011 the total number of livestock in the country was 5.9 Mio, it reached 7.5 Mio in 2016. Meat is produced in all districts of the country with steady growth over the last three years (2014-2016), and annual average production of 207,800 tons of meat.

Gross output of agriculture, forestry and fishery products in January-June 2018 reached the amount of 55655.9 million KGS, and the volume index was 101.6%. In the total volume of agricultural production in January-June, Animal husbandry accounted for 81.5%, plant growing - 13.9%, forestry and fishing - 0.3% and services - 4.3%. The share of peasant (farm) households and personal subsidiary plots of citizens in general in the total volume of products accounted for 94.1%. The growth in gross output of agricultural products in January-June was due to increase in livestock production.

Poverty is a major cause of food insecurity. The poorest people spend 74% of their budget on food. Two thirds of the country’s poor people live in rural areas. Their weak purchasing power is further diminished by problems such as national dependence on imports of basic foods, particularly wheat.

Agricultural productivity is declining, with the share of agriculture in GDP decreasing from 29% in 2006 to 14% in 2015. A third of women are involved in agriculture, and even though livestock raising is considered an occupation for men, women make important contributions by processing livestock products. There are no legal or formal barriers to women's property ownership, but 80% of smallholders’ land is registered to men. This limits women's participation in decisions about the management of land as a productive asset.

To be food secure, households or individuals must have adequate food at all times, but often food access and availability are severely hindered by natural disasters, insecurity and socio-economic setbacks. Climate-related disasters such as drought, floods and mudflows, food price volatility, and reduction of remittances are some of the most common shocks that periodically undermine the food security of households in the Kyrgyz Republic.

Climate-related disasters, especially floods and mudflows caused by heavy rains and increased melt-water from glacial lakes, have become more frequent in recent years. The most vulnerable districts were in the southern and western parts of the country, especially in Osh, Jalal-Abad and Batken provinces.

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20 http://www.stat.kg/media/publicationarchive/c14d88ad-2ae6-4e25-a4e1-0233fa32f73f.pdf
High and volatile food prices are a major food security risk for poor and vulnerable households as they put further economic pressure on low-income groups who already spend a large proportion of their household budgets on food. The domestic prices of basic commodities such as wheat flour, sugar and cooking oil are vulnerable to global food prices because of the country’s high dependence on imports.²³

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Chapter 4 WHAT IS AGROECOLOGY?

4.1. Introduction

Agroecology is the application in the agriculture and food sectors of ecological principles to the interactions between human beings and their environment, as well as to their consequences, with the goal of minimising the negative effects of certain human activities. It aims at protecting the environment, ensuring the sustainable renewal of the natural resources (water, soil, biodiversity, etc.) necessary for production, and making careful use of non-renewable resources. By gradually eliminating the use of chemicals, it strives toward implementing organic farming, thus contributing to improving the health of farmers and consumers alike. Agroecological practices thus combine technical solutions reconciling productivity, reduced pressure on the environment and the sustainable management of natural resources. All this is a question of ensuring a balance between human beings, farming and nature.

Agroecology requires a paradigm shift in our attitude towards nature and agriculture. Agroecological systems cease ‘to make war’ to nature, they collaborate with it by developing alternative solutions that allows biodiversity to provide ecosystem services that are the basis of the functioning of agroecological systems.

The ecological strategy of agroecological systems consists in a search for farm autonomy, farms should rely mainly on local natural resources and should replace as much as possible fossil fuel based inputs by ecosystem services provided by biodiversity.

The economic strategy consist in reducing variable and fixed Production Costs, and increasing Activity Product in order to maximise Value Added. Activity Product and Value Added can be increased by product processing and marketing in short and local marketing chain.

BOX 1. What is Agroecology?

Agroecology is considered jointly as a science, a practice and a social movement. It encompasses the whole food system from the soil to the organization of human societies. It is value-laden and based on core principles.

One of the most complete definitions of agroecology today is the “ecology of the food system” (Francis et al., 2003). It has the explicit goal of transforming food systems towards sustainability, such that there is a balance between ecological soundness, economic viability and social justice (Gliessman, 2015). However, to achieve this transformation, change is needed in all parts of the food system, from the seed and the soil, to the table (Gliessman and Rosemeyer, 2010).

4.2. Definition

According to FAO conception, Agroecology is based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system. By building synergies, agroecology can support food production, food security and nutrition while restoring

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25 http://www.agroecology-europe.org/
26 http://www.fao.org/3/a-i4729e.pdf
ecosystem services and biodiversity that are essential for sustainable agriculture.

Agroecology can play an important role in building resilience and adapting to climate change, can work with solutions that conserve above and below ground biodiversity as well as cultural and knowledge diversity with a focus on women’s and youth’s role in agriculture. Agroecology is the basis for evolving food systems that are equally strong in environmental, economic, social and agronomic dimensions\(^\text{27}\).

**BOX 2. There are 5 basic components of agro-ecosystems\(^\text{28}\):**

1. **Soil, both support and product of life.**
   Soil represents the top layer of the earth resulting from the transformation of the bedrock. It develops under the actions of environmental factors (climate and vegetation) and Man who shapes it over time. Soil performs various functions: food (it contains the elements necessary for crop development); support (foundation on which man develops his activities) and environmental (water storage, landscape support...). So it is essential to manage this resource responsibly in order to maintain it and enhance it.

2. **Without water there are no crops or livestock.**
   The water cycle is also the life cycle. Whether liquid or vapour, in the soil or atmosphere, it gives the soil life, carrying nutritional elements for plants and watering men and animals. Water can also be destructive: it erodes land with runoff; in strong rain, it destroys crops; sometimes, it floods. So integrated practices must be adopted to manage this resource’s excesses and / or insufficiencies.

3. **Plants, wild or domesticated, rich in diversity, are the basis for agro-systems.**
   Plants nourish animals and people. Through photosynthesis, they produce oxygen and sequester carbon. Their roots colonize the soil and favour soil life, their aerial parts protect the soil and maintains an environment suitable for living beings. They can be bad, uncontrolled, thorny, sometimes poisonous, but their presence is never random. Plant diversity must be preserved.

4. **Animals, precious allies for farmers and farm equilibrium.**
   Livestock performs different functions that fulfil people’s needs: food (meat, milk), utilitarian (wool for weaving, animal energy for traction...), economic (cash flow, additional income...). Livestock activity is an element of balance in agricultural systems: there are exchanges between crops and animals (feed, providing organic matter). Synergies must be created and maintained between plant production and livestock activities.

5. **The landscape, a fundamental element of the land and its various production units.** The landscape is fashioned by people who leave their footprint. The footprint left by farming activities may be positive when these activities maintain a balance with their environment or negative when they contribute to destroying the landscape that houses them, sometimes endangering themselves. From people’s actions and nature’s effects an agroecological sustainable system will be born, or not. Therefore, it is essential for production activities to be a part of a global landscape development vision.


4.3. Strategy, principles and practices of agroecology

Agroecology integrates ecological and social concepts in the design and management of agricultural production and food systems, while optimizing interactions between plants, animals, humans and the environment. The approach also aims to address the social aspects of a sustainable and fair food system. To promote the wider use of this approach, FAO convened the first International Symposium on Agroecology in 2014, followed by international and regional dialogues. The process culminated in the second International Symposium on Agroecology, held from 3-5 April, in Rome, Italy. The event aimed to synthesize the outcomes of the dialogues, launch the Scaling up Agroecology Initiative, and discuss key steps in implementing the initiative\(^29\).

From tackling hunger, poverty and inequality to responding to climate change to safeguarding biodiversity and expanding nutritional choice, agroecology echoes the goals of the 2030 Agenda. The agroecology approach is holistic, balancing focus on people and the planet, the three dimensions of sustainable development – social, economic and environmental, while strengthening, the livelihoods of smallholder food producers, indigenous peoples, women and youth. Agroecology contributes directly to multiple Sustainable Development Goals (SDGs) through integrated practices that cut across many areas. Along with the SDGs, agroecology can also contribute to realising the aims of the Paris Climate Agreement, the Convention on Biological Diversity and the United Nations Convention to Combat Desertification\(^30\).

**Box 3. Agroecology principles (Altieri and Toledo, 2005)\(^31\):**

Miguel Altieri (2005) defined five principles of agroecology. They mainly apply to farming systems and agro-ecosystems.

1. Enhanced recycling of biomass, optimising nutrient availability and balancing nutrient flows;
2. Securing favourable soil conditions for plant growth particularly by managing organic matter and enhancing soil biotic activity;
3. Minimizing losses due to flows of solar radiation, air and water by way of microclimate management, water harvesting and soil management through increased soil cover;
4. Species and genetic diversification of the agro-ecosystem in time and space;
5. Enhance beneficial biological interactions and synergisms among agro-biodiversity components thus resulting in the promotion of key ecological processes and services.


The 10 Elements of Agroecology

In guiding countries to transform their food and agricultural systems, to mainstream sustainable agriculture on a large scale, and to achieve Zero Hunger and multiple other SDGs, the following 10 Elements emanated from the FAO regional seminars on agroecology:

1. **Diversity**: diversification is key to agroecological transitions to ensure food security and nutrition while conserving, protecting and enhancing natural resources.
2. **Co-creation and sharing of knowledge**: agricultural innovations respond better to local challenges when they are co-created through participatory processes.
3. **Synergies**: building synergies enhances key functions across food systems, supporting production and multiple ecosystem services.
4. **Efficiency**: innovative agroecological practices produce more using less external resources.
5. **Recycling**: more recycling means agricultural production with lower economic and environmental costs.
6. **Resilience**: enhanced resilience of people, communities and ecosystems is key to sustainable food and agricultural systems.
7. **Human and social values**: protecting and improving rural livelihoods, equity and social well-being is essential for sustainable food and agricultural systems.
8. **Culture and food traditions**: by supporting healthy, diversified and culturally appropriate diets, agroecology contributes to food security and nutrition while maintaining the health of ecosystem.
9. **Responsible governance**: sustainable food and agriculture requires responsible and effective governance mechanisms at different scales – from local to national to global
10. **Circular and solidarity economy**: it reconnects producers and consumers and provides innovative solutions for living within our planetary boundaries while ensuring the social foundation for inclusive and sustainable development.

**Best practices of environmental agricultural approaches:**

Agricultural practices aiming to produce significant amounts of food, which valorise in the best way ecological processes and ecosystem services in integrating them as fundamental elements in the development of the practices, and not simply relying on ordinary techniques such as chemical fertilizer and synthetic pesticide application, or technological solutions such as genetically modified organisms.

- **Family farming** are the custodians of a finely adapted understanding of local ecologies and land capabilities. Through local knowledge, they sustain productivity even on marginal lands, through complex and innovative land management techniques. As a result of the intimate knowledge they have of their land and their ability to sustainably manage diverse landscapes, family farmers are able to improve many ecosystem services. Family farmers have strong economic links to the rural sector; they contribute strongly to employment, especially in developing countries where agriculture still employs the majority of the labour force. In addition, the incremental income generated by family farming is spent on housing, education, clothing etc. in the local non-farm economy.

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• **Biological pest control** is a method of controlling pests (including insects, mites, weeds and plant diseases) using other living organisms. It relies on predation, parasitism, herbivory, or other natural mechanisms, but typically also involves an active human management role. It can be an important component of integrated pest management (IPM) programs. There are three basic types of biological pest control strategies: importation (sometimes called classical biological control), augmentation and conservation of natural enemies of crop pests35.

• **Integrated pest management** associates all control methods available to protect crops from their enemies. It is aimed at maintaining the populations of pests at a sufficiently low level for not causing economic prejudice. It favours preventive methods to avoid the appearance of crop enemies and uses curative methods when a pest could cause unbearable damage19.

• **Organic agriculture** appeared in the beginning of the 20th century as a movement for restoring a ‘more natural farming’ in opposition to the emergent industrialized agriculture. Since the 1990s, organic farming and food are defined by labels and rigorous regulations that prohibit the use of synthetic pesticides and fertilisers, processing additives, and genetically modified organisms or products (FAO/WHO Codex Alimentarius Commission, 1999)36. The market of organic products is now growing fast which is encouraging small and medium farms to provide quality products but also large farms that invest in the sector while adopting minimum standards of organic production in the framework of industrial systems.

• **Integration of semi-natural landscape elements at field, farm or landscape scale.** The main principles of this approach are biological control, pollination, erosion, drinking water protection, biodiversity conservation.

• **Agroforestry** is a system that integrates trees and shrubs with crops and/or livestock to create environmental, economic, and social benefits. Agroforestry systems have long been developed in South-East Asia, especially by ethnic minorities, before the emergence of export-led monocultures (e.g. fruit trees in home gardens). ‘Modern agro-forestry’ has been promoted in reaction to deforestation and resource depletion to protect natural resources while increasing agricultural productivity and diversifying sources of income. More recently, attention has been given to the potential of complex agroforestry systems to reduce atmospheric concentration of CO2 and mitigate climate change. ICRAF (World Agroforestry Centre) plays a leading role in the promotion of modern agroforestry in the Mekong region.

• **Pastoralism.** About 10-12% of the world’s animal producers are pastoralists. They have depended on the commons: migrating for grazing resources over thousands of kilometres. Historically, the migration systems of pastoralists represent a sustainable way of utilizing resources and supporting pastoralist populations. Pastoralists provide valuable ecosystem services. They maintain high levels of biodiversity, increase soil cover, reduce erosion and ensure nutrient cycling in grazing lands. Their proper management of livestock can improve soil health. Thus, the agroecological knowledge of pastoralists should be respected and promoted. Linking pastoralists with markets in order to sell products such as milk and furs can be a means of helping them to sustain their production systems.

• **Conservation Agriculture (CA)** principles are minimal soil disturbance, crop associations and rotations, and adequate organic soil cover. These farming systems aim at increasing agricultural production and productivity while conserving the natural resources and enhancing biological interactions in agroecosystems. CA implementation results in increased soil moisture, soil biodiversity, decreased soil erosion, reduced losses of nutrients and increased yields. Farmers face a number of constraints in the adoption of DMC systems (Direct seedling Mulch based Cropping system) such as a high level of initial investment and technical problems. Other difficulties are the limited access to the market for legume cover crops, lack of supply chains for direct sowing mechanization and limited access to credit. Given the rapid soil degradation caused by increased chemical inputs, ecological intensification and other means of finding alternatives to herbicides for existing agricultural practices are needed, through: building healthy soils, promoting biodiversity, adopting cover/relay crops; and integrating biological and mechanical facilities for Conservation Agriculture.

• **Landscape Approaches** combine natural resources management with environmental and livelihood considerations. Optimization of production and resource use is treated at a larger scale – the landscape. People’s activities and needs are treated as integral part of the system rather than as external factors.  

• **Agroecology in dry land areas.** The pressure from farmers in arid regions can lead to soil degradation. In some dry land areas, land has been taken for industrial purposes. Local farmers have techniques to manage dry lands in a sustainable manner, by imitating natural systems when operating their farms, by minimizing external inputs into agroecosystems with the production of chicken, vegetables, mushroom, honey bees, etc.

• **Crop fertilization management.** A major goal is to reduce residual soil nitrate, because if the crops don’t use it, the field can lose it. Annual soil testing and realistic yield goals should help producers calculate fertilizer N rates to avoid over-fertilization. When calculating fertilizer rates, credit all sources of N available to the crop, including legume input, organic matter and soil nitrate-N. Spring soil tests are a better measure of available N than fall soil tests because they account for overwinter changes to soil nitrate levels.

• **Crop irrigation systems and water management.** Irrigation systems can ensure that water is available to the crop during dry spells. Effective irrigation influences the entire growth process from seedbed preparation, germination, root growth, nutrient utilization, plant growth and regrowth, yield and quality. Irrigation systems should encourage plant growth while minimising salt imbalances, leaf burns, soil erosion, and water loss. Losses of water will occur due to evaporation, wind drift, run-off and water (and nutrients) sinking deep below the root zone.

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38 [http://www.fao.org/3/a-i5672e.pdf](http://www.fao.org/3/a-i5672e.pdf)

39 [http://landresources.montana.edu/soilfertility/documents/PDF/pub/MgtMinLeachingMT201103AG.pdf](http://landresources.montana.edu/soilfertility/documents/PDF/pub/MgtMinLeachingMT201103AG.pdf)

40 [http://www.access-irrigation.co.uk/design-services/irrigation-agriculture/field-irrigation](http://www.access-irrigation.co.uk/design-services/irrigation-agriculture/field-irrigation)

• **Mobilizing water resources and irrigation systems.** Irrigation systems provide for capturing underground or surface (lakes, rivers, springs) water for use in farming. The development must be efficient to fulfill production needs at acceptable cost and without imperilling the resource on the long-term.\(^{42}\).

• **Water management on cultivated plots.** Water resource management, guarantying farming activities and their long-term development, requires: choosing a suitable scheme for water distribution; adopting farming practices that ensure water retention in the soil in favour of cultivated plants and limiting losses by evapotranspiration; dosing and supplying as needed by the plant and according to physical environmental conditions; adopting practices aimed at reducing the negative effects of water during heavy rains.\(^{43}\).

• **Manure recycling** is an operation that consists of preparing the raw manure before burying it in the soil for fertilization. It has the advantage of improving the quality of the buried organic matter.\(^{43}\).

• **Composting** is an acceleration of the natural decomposition process for organic waste. Intense bacterial activity is primarily responsible for decomposition; it requires oxygen and releases heat. The resulting compost acts as a supplement and fertilizer. There are different composting techniques includes swath composting.\(^{44}\).

• **Hedging vegetable crops sites** is an agroforestry technique consisting of planting shrubs and trees around and in cultivated plots. Depending on their density, layout, and type, they limit insolation and wind, thereby favouring soil water retention and creating a micro-climate favourable to crops.\(^{43}\).

• **A ground-level nursery** consists of producing healthy, vigorous plants in a developed site, with sufficient mastery of the water, soil and farming techniques.\(^{43}\).

• **Adding basic organic manure** (recycled manure or compost) is one of the first stages in planting a vegetable crop is. Manure is called “basic” when it is added before planting the crop and acts over time. Intended to enrich the soil and ensure the availability of the elements required for good crop development, the basic manure supplement is primordial and will provide for significantly (even totally) limiting the use of artificial chemical fertilizers.\(^{43}\).

• **Bowls farming.** In contexts where organic matter and water resources are limited, bowls cultivation is particularly recommended to provide for meeting the plant’s needs while limiting resource waste. Crops are planted so as to localize organic matter and water supplements. This allows to preserve these rare resources for the benefit of crop.\(^{43}\).

• **Crop association** is mixing different plants on the same plot. The practice of crops association consists of planting or sowing several crops in the same plot: crop cycles are parallel or overlapping. These associations harmonize in different ways depending on their configuration in space and / or time. There are different types of crops association depending on plant characteristics and their complementarities in mobilizing nutrients in the soil and water, their development in space (above and belowground) and their ability to interact.\(^{43}\).

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39
• **Mulching** is the act of covering the soil with plant waste material in order to protect it from climatic aggression. It is particularly effective to create an environment favourable to crop development. The practice of mulching consists of cover the soil in vegetable beds so that it is never left bare. Beyond its protective effect against erosion and weeds, it directly influences added water and soil fertility and, in doing so, sharply favours biological life.

• **Fruit tree farming** is an economic opportunity for producers. It may be conducted alone or in association with irrigated or rain-fed crops. In either case, the planting stage is primordial for successful crops. It is a question of guarantying the young plants to develop well and ensuring quick, quality production.

• **Integrated fish farming systems and agricultural.** The overall objective of integrating fisheries and agriculture is to maximize the synergistic and minimize the antagonistic interactions between the two sectors. The former are mainly derived from the recycling of nutrients arising in the course of agriculture-livestock-fish production processes, from integrated pest management and from the optimal use of water resources.

• **Contour cultivation** (contour farming, contour ploughing) is a sustainable way of farming where farmers plant crops across or perpendicular to slopes to follow the contours of a slope of a field. This arrangement of plants breaks up the flow of water and makes it harder for soil erosion to occur.

• **Terrace cultivation**, method of growing crops on sides of hills or mountains by planting on graduated terraces built into the slope. The method has been employed effectively to maximize arable land area in variable terrains and to reduce soil erosion and water loss.

• **Farmer Field School (FFS)** is an approach based on people-centred learning. Participatory methods to create an environment conducive to learning: the participants can exchange knowledge and experience in a risk free setting. Practical field exercises using direct observation, discussion and decision making making encourage learning-by-doing.

• **Climate Smart Agriculture (CSA)** aims to enhance the capacity of the agricultural systems to support food security, incorporating the need for adaptation and the potential for mitigation into sustainable agriculture development strategies. CSA proposes more integrated approaches to the closely linked challenges of food security, development and climate change adaptation/mitigation, to enable countries to identify options with maximum benefits and those where trade-offs need management.

• **Ecosystem-Based Adaptation (EBA)** is an overall strategy that integrates the use of biodiversity and ecosystem services to help people adapt to the adverse impacts of climate change. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to both current climate variability, and climate change.
Chapter 5 MAPPING OF AGROECOLOGICAL FARMING: RESULTS OF THE FARM SURVEY AND INDICATOR VALUES (OASIS)

5.1. Introduction

The farm survey provided different types of results:

- a nineteen-page questionnaire fulfilled for each farm of the thirty farms (total: 570 pages) (annex 2);
- an Excel sheet with all the indicator data of the thirty farms (79 lines x 31 columns) (annex 3);
- a synthesis of these data for all thirty farms (section 5.2);
- six charts corresponding to six indicator groups per farm for all thirty farms (total: 180 charts) (annex 4);
- five charts for the same indicators per farm size for five farm size groups (total: 30 charts) (annex 5);
- each of the six indicator group charts are also presented together for the thirty farms in order to easily compare all these farms for each indicator (180 charts) (annexes 6 to 11);
- two-page portraits for each of the thirty farms (total: 60 pages of farm descriptions) (annex 12).

5.2. Synthesis of the indicators values

A synthesis of the data collected in the thirty farms for all indicators is presented in this section.

Regarding indicators describing farms in categories, results are presented as farm number and frequency per category. This is the case for farm type, farm size, farming system, dependency on commercial inputs, adoption of agroecological techniques, variable costs, fixed costs, revenue, income, farm prospects, food security, environmental impact, biodiversity.

Results of semi-quantitative indicators (all other indicators) are presented as averages for the thirty farms.

1. FARM TYPE

![FARM TYPE Graph]

<table>
<thead>
<tr>
<th>Farm Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arable</td>
<td>5</td>
</tr>
<tr>
<td>HORTICULTURE -</td>
<td>10</td>
</tr>
<tr>
<td>PERMANENT CROPS</td>
<td>15</td>
</tr>
<tr>
<td>MIXED CROPPING</td>
<td>20</td>
</tr>
<tr>
<td>GRAZING LIVESTOCK</td>
<td>25</td>
</tr>
<tr>
<td>MONOGASTRICS</td>
<td>30</td>
</tr>
<tr>
<td>AQUACULTURE</td>
<td>35</td>
</tr>
<tr>
<td>MIXED LIVESTOCK</td>
<td>40</td>
</tr>
<tr>
<td>MIXED FARMING</td>
<td>45</td>
</tr>
<tr>
<td>OTHER</td>
<td>50</td>
</tr>
</tbody>
</table>
Most farms (70%) are mixed farms where crop and livestock productions are integrated. Other farmers are specialized in Grazing livestock (7%) and others combine different types of livestock (7%). Farmers often consider livestock as investment and capital. They sell animals when they need money. Almost each farming family owns livestock (84%). Another category manages permanent crops. Orchards are indeed regularly cropped especially for apple, apricot and peach productions.

2. FARM SIZE

The majority of observed farmers are medium (50%) and small size (30%).

Since the Land reform of 1997, almost all farmers obtained agricultural land from the State. Currently the average land area per farm is about 1.5 to 2.5 ha. In the south part of the country, farms are smaller because population density is higher and land availability lower.

3. FARMING SYSTEM

The vast majority of farms (83%) are conventional and irrigated. Some conventional farms are rain-fed.
Five farms (17%) are organic, most of them have irrigated land. They are mainly working for export since customers for organic products are rare on local market. At this stage, local people are not ready to pay extra money for organic products. However, in rural areas, most people produce their own potatoes, vegetables and fruits in family garden according to organic practices.

One farm (3%) adopted conservation agriculture after having been selected as pilot farmer for a FAO project.

In Kyrgyzstan, there are about 1.5 million ha of land available for agriculture among which 70% are irrigated land and 30% are rain-fed. Irrigation water is abundant and provided by the many glaciers in the mountains. The main problem is the lack of efficient modern irrigation infrastructures and a poor irrigation water management.

### 4. PRODUCTION AND ECONOMIC ASPECTS

#### 4.1. DEPENDENCY ON COMMERCIAL INPUTS

**SYNTHESIS 4.1. DEPENDENCY ON COMMERCIAL INPUTS**

![Dependence on Commercial Inputs Chart]

The dependency on agricultural inputs is mainly medium to high. Only two farmers (7%) are fully independent from purchasing inputs. They are working in forests.

#### 4.2. ADOPTION OF AGROECOLOGICAL TECHNIQUES

**SOIL TILLAGE**

Average result – 1.10

No-till techniques are not widespread among farmers. Only one farmer is using them. Many farmers are not aware of such techniques. Farmers who know about them, do not want to implement these techniques because they consider that their soils are too compact and stony. Another factor that reduces the spread of these techniques is the lack of adapted equipment.
USE OF SEEDS, SEEDLINGS, PLANTS, CUTTINGS
Average result – 3.38
Farmers mainly use local traditional types of seeds and seedlings brought in the country during Soviet times. There are two main reasons for this. Traditional cultivars are more resistant to pests and diseases although their productivity is lower compared to commercial types. Traditional cultivars are also better adapted to local climate and soil conditions and are less demanding.

It can be noted that ancient cultivars do not really exist in Kyrgyzstan since people were nomads till the first half of the 20th century. They never cropped plants before that period.

USE OF DIRECT SEEDING
Average result – 1.15
Direct seeding, as no-tillage, is rarely practiced by farmers. The reasons are mainly the same.

FERTILISATION AND SOIL FERTILITY MANAGEMENT
Average result – 3.10
Legume-based temporary grasslands are often integrated in crop rotations. They fix a lot of nitrogen that is partly available for the following crops and partly recycled through farmyard manure. Organic manure is also much used because most farmers have their own livestock. Farmers usually recycle crop wastes from crop production. Small farmers use food waste mainly on their kitchen gardens. Synthetic fertilizers are used mainly in complement to the previous means.

Soil life seems to be still active and is supported by temporary grassland, long crop rotation and organic manure. It is the basis of soil fertility and contributes to control crop disease and sustain crop health and quality.

CROP PEST CONTROL
Average result – 2.59
Farmers usually control pests with insecticides. Other methods for pest control happen mainly by accident. For example, farms and landscapes are criss-crossed by a network of herbaceous strips that appear spontaneously along earth irrigation channels and that may increase populations of natural enemies of crop pests.

Farmers usually use also long crop rotations and traditional resistant cultivars but these techniques are not deliberately used and combined for pest control. For farmers, they have other purposes, mainly increasing yield by the combination of legume-based temporary grasslands and annual crops, and increasing resilience with traditional cultivars.

CROP DISEASE CONTROL
Average result – 2.71
The situation is very similar for disease control. Farmers control disease mainly with fungicides but again long crop rotation, resistant cultivars and living soils help. However, no specific strategy is designed for reducing disease incidence.

WEED CONTROL
Average result – 2.96
Farmers very often control weeds by herbicides but mechanical, including hand weeding, is widespread. Long crop rotations and particularly temporary grasslands have however a very strong and positive influence on weed control. Traditional cultivars better compete with weeds than commercial cultivars.
SOIL COVER
Average result – 1.30
Soil cover is almost never used. In cereal production, soils are however partly covered after harvest by crop wastes.

WATER MANAGEMENT
Average result – 1.23
Water management level is very simple. Farmers, even big farmers, mainly use earth channels. Drip irrigation systems are considered as too expensive. However, recently, some wealthier farmers started to buy such equipment.

GRASSLAND MANAGEMENT
Average result – 2.58
Almost all farmers use winter and summer pastures. Additionally, farmers conserve forage for winter period since winter pastures do not produce enough for feeding livestock in winter. These practices are very favourable.
However, since livestock density is high and pasture area decreasing, pasture degradation is frequent. Farmers are not developing enough pasture conservation and restoration techniques such as rotational grazing and stocking rate control.

LIVESTOCK MANAGEMENT
Average result – 2.33
Small and medium farmers mainly use low-demanding and local traditional animal breeds. However, big wealthier farmers prefer imported breeds since they generate more benefit when they are well fed and can be sold as genitors.

AGROFORESTRY
Average result – 1.01
Agroforestry was introduced in Soviet times. During that period, large number of trees were planted around fields and pastures, mainly to protect them from strong winds. Nowadays, farmers do not plant new trees and do not use agroforestry techniques anymore.

SYNTHESIS 4.2 ADOPTION OF AGROECOLOGICAL TECHNIQUES

The level of adoption of agroecological techniques is not high, but at the same time not very low. However, most agroecological practices are implemented without a clear holistic strategy of farm management. Most farmers adopt crop rotations for reducing risk and increasing crop yield. Some
farmers adopt organic standards. Small farmers especially do not use synthetic chemicals since they do not have money for buying them. They use traditional seeds or seedling since they are cheaper. They use animal manure since they have livestock and so can reduce the use of commercial fertilizers. They use summer pastures since they are free. Large farms are more intensive and agroecological practices are more seldom implemented. If agroecological practices would be better and more implemented, production costs could be reduced and income could be higher.

During the survey, it appeared that farmers lack information on the nature and use of pesticides. The term ‘pesticide’ is often not known and no distinction is made between herbicides, fungicides and insecticides for instance. Farmers rely on the information provided by input sellers who advice them for their crops. These sellers often present chemicals as ‘vitamin’ for crops. Farmers spread products on the basis of these advices without really understanding what they are doing. On the other hand, several farmers complained about the decline of life in their fields. They cited mainly the reduction in insect populations and they observed also that soil life is decreasing. However, they do not understand the reasons for this decline. They seem also to ignore the health risk of pesticides for themselves and their family.

4.3. PRODUCTION COSTS

4.3.1. IMPORTANCE OF VARIABLE COSTS

SEEDS, SEEDLINGS, PLANTS, CUTTINGS
Average result – 3.61
Small and medium farmers usually use local traditional seeds especially for cereals and grassland since their price is low. Only large farms can buy imported seeds. In market gardening, farmers use more regularly imported seeds, but for self-consumption in kitchen gardens they use traditional seeds. In fruit production, local cultivars prevail too since they are better adapted to local climate and soil conditions.

CHICKS, PIGLETS, FISH LARVAE
Average result – 4.69
In general, farmers do not buy and do not sell young animals. Producing their own animals is the cheapest way to raise livestock. However, the aquaculture farm buys fish larvae in Europe.

FERTILISATION
Average result – 2.56
Farmers usually use both organic or commercial synthetic fertilizers. Almost all farmers use farmyard manure on their fields or gardens.

HERBICIDE OR BIOLOGICAL WEEDING
Average result – 2.36
Conventional farmers use generally herbicides. However, almost all farmers integrate temporary grasslands in their crop rotation which reduce very much weed occurrence. Small farmers do not use herbicides since herbicides are too expensive. Some farmers do not have weeding problems so they do not use chemicals.

HERBICIDE OR MECHANICAL WEEDING
Average result – 2.64
In bean and medicinal herb production particularly, many farmers pay workers for weeding their crops
by hand since high revenues from these crops allow paying them. This is often combined with mechanical weeding by using a tractor equipped with a harrow. Otherwise, mechanical weeding is not very popular in arable crops since it requires specific tools that are not available. Only large and rich farmers can buy such equipment. Herbicide use is easier. In small plots and kitchen gardens, farmers use hand weeding.

**CROP DISEASE CONTROL**
Average result – 2.55
Farmers have crop disease problems mainly in fruit and vegetable productions. Diseases are controlled by relatively long crop rotations and traditional cultivars are quite disease resistant. The dry continental climate of Kyrgyzstan most probably contributes to reduce the occurrence of fungal diseases. Living soils have certainly also a positive effect on the control of crop pathogens. Commercial fungicides are used when necessary.

**CROP PEST CONTROL**
Average result – 2.53
Farmers usually use commercial insecticides for controlling pests, especially in fruit and vegetable productions. Imported cultivars are more vulnerable to pests. That is the reason why farmers sometimes prefer using traditional cultivars for these productions. In cereal and grass productions, pest problems are limited.

**ANIMAL FEEDING**
Average result – 3.80
Forage self-sufficiency is high. Farmers produce their own feed for their animals. Wheat, barley and corn are mainly produced for animal feeding. Wheat is not suitable for flour production or unprofitable to process into flour. This is why it is used for animal feeding. Almost all farmers use legume-grass mixtures in their crop rotation. This forage dried as hay is of course also used for animal feeding.

**WORKLOAD**
Average result – 2.16
Workload is generally high because modern agricultural machinery is rare. Small and medium farmers cannot buy new equipment since it is too expensive. Farmers do not cooperate for buying new machinery. Hand harvesting of some crops such as cotton, beans, and medicinal herbs requires a lot of labour resources. Producing cereals also requires a lot of time and efforts. Support from the Government or international development cooperation agencies for purchasing new machines could make farmer’s work easier.
Production costs are medium to high. Progress can thus be made for reducing the use of commercial inputs by a holistic approach of soil fertility management, mechanical and biological weeding, pest control by natural enemies and disease reduction by a more living soil and a larger and better managed ecological network.

4.3.2. IMPORTANCE OF FIXED COSTS (INVESTMENTS)

MACHINERY
Average result – 4.07
Small and medium farmers cannot buy new modern equipment. Loans from commercial banks have very high interest rate. Governmental support does not exist. Farmers thus mainly use old, Soviet times machines. Only large and rich farmers can buy brand new machinery. New machines could facilitate agricultural work but investments should be done in machinery cooperative or work with large machines should be done by contractors (e.g. or cereal harvesting).

BUILDING AND OTHER INFRASTRUCTURES
Average result – 4.20
Investment in building is similar to machinery. Small and medium farmers have mainly low cost building and infrastructure. This advantage should be maintained but cheap buildings could be better designed in the future for a better work organization.

HIGH TECHNOLOGY
Average result – 4.83
Almost all farmers use low tech, low cost options or technological options that could pay back in a limited number of years. The main reason for this is that farmers want to control risk. Farmers prefer traditional methods of agriculture or methods that do not require big investments. They do not implement new technologies because they believe more in traditional agriculture methods. Many of them are familiar and use internet, social media and smart phones.
Fixed costs are limited by the financial possibilities of most farmers. Buying large machines and tools are out of reach for most of them. Buildings are often simple, and high tech are still rare.

4.4. REVENUE IMPORTANCE

4.4.1. PRODUCT QUALITY
Average result – 3.13
In general, small and medium scale farmers produce average quality products. Just a small proportion of them produce products with higher quality, mainly organic. Large farmers can more easily produce higher quality since they have more opportunities, for example, they can implement different standards such as food safety criteria, etc. Since livestock is mainly fed on the basis of grasslands, grass-fed beef and dairy products are common. They are of course higher quality. Traditional fruit and some vegetable cultivars are very tasty.

4.4.2. PRODUCT PROCESSING
Average result – 1.71
Processing level is very low. Small and medium scale farmers sell their products mainly as raw material. Only a limited number of these farmers have processing facilities. Usually, when they exist, they are very simple. Unfortunately, collaborations between farmers are not frequent. Separately, they cannot buy processing equipment since it is too expensive. Only large farmers can buy this equipment and can get extra added value to their products.

4.4.3. SHORT MARKETING CHAIN
Average result – 3.26
In general, farmers who live far from large cities sell their products directly to intermediaries on their fields since they do not have transportation or time opportunities to sell in cities. Farmers who live close to cities, try to sell their products on city markets since they can earn more. But lately, farmers started to use IT-technologies like internet-based markets or Facebook to sell their products directly to customers. Large farmers mainly sell their products directly to shops, supermarkets, etc. one farmer has his own shop, a small supermarket.
4.4.4. LOCAL MARKETING CHAIN
Average result – 3.03
According to official statistics, food exports are an important part of all country exports. Main exported products are fruits, walnuts, beans, honey, beef and dairy products. Main importing countries are Russia and Kazakhstan. Other products are mainly sold on local markets.

SYNTHESIS 4.4. REVENUE IMPORTANCE

Although favourable natural conditions are existing, farmers do not target quality, sell mainly raw, unprocessed products. Some are able to sell on foreign markets through export. These long marketing chains are mainly managed by foreigners, not by Kyrgyz farmers. A lot of progress can thus be done.

4.5. INCOME IMPORTANCE

BENEFIT COMPARED TO OTHER SIMILAR FARMERS
Average result – 3.66
A small proportion of farmers can earn more through selling high quality products, mainly organic, but the majority of them has standard income. Big farmers have higher benefit since they have more opportunities to earn extra money.

ECONOMIC BENEFIT FROM FARMING ACTIVITIES
Average result – 4.03
Since there are 400,000 farmers in Kyrgyzstan on a total rural population of about 3.8 million, agriculture is usually one of the main income generation activities in rural areas. For farmers, it is very difficult to evaluate the importance of their benefit because there are no other activities to compare with. Since it is almost impossible to find another job in rural areas, most farmers declared that they are happy with their benefit from agriculture.

Some agricultural activities such as fruit or vegetable productions could be highly profitable. Additionally, climate conditions and large water availability are suitable for producing these products with high added value. Existence of markets and stable prices are limiting factors.
Taking into account the above comment on economic opportunities in rural areas, income is considered by farmers as medium to very high. This is also because interviewed farmers have usually higher income than ‘average farmers’.

5. SOCIAL ASPECTS (Farm viability, Quality of life, Food security)

5.1 FARMER’S AGE
Average result – 49 years
Agricultural activities are not very popular among young generations in rural areas. This is the main reason for a high level of internal and external migrations from these areas. Most farmers are 40 to 60 year old. The second reason is that all available agricultural land is already divided and used by farmers in place. Young people who want to take over a farm have to invest money for buying land. Instead, young people prefer to invest or to work in other activities such as tourism.

5.2 FARM VIABILITY

LONG-TERM FUTURE OF FARM
Average result – 3.89
In general, almost all farmers have an optimistic vision on the future of their farms. Agriculture can provide job opportunities and food sources for farmers while job alternatives are limited.

CHANCE TO HAVE A SUCCESSOR
Average result – 3.41
Every farmer has children and they help their parents. Farmers who have favourable financial possibilities, send their children to agricultural colleges or universities. Usually, among all children of a family, only one or two continue to work in the farm. Not all family children are ready to continue their parent’s work. Young generation prefer to live and work in cities like Bishkek or Osh since in cities average salaries are higher than in rural areas.
5.3. QUALITY OF LIFE

WORKLOAD OF FARMER AND HIS FAMILY
Average result – 2.34
In general, agriculture is a very difficult job that requires a lot of time. In some farms, for example in cotton or medicinal herb production, workload is very high since all harvesting is done by hand. Fruit collection is also a very difficult work. Small and medium farmers cannot always employ extra-workers in their farms since salaries should be paid immediately after the end of work, and frequently farmers obtain money only after selling their products. Workload of large farmers who can employ people in their farms is also high.

NUMBER OF EXTERNAL AGRICULTURAL WORK UNIT (AWU)
Average result – 4.95
Only big and rich farmers can hire several workers in their farms. They are mainly tractor drivers, operators for cleaning machines, accountants, etc. Big farmers can employ for a short period of some weeks up to one hundred people, mainly for harvesting beans or cotton for instance. Small or medium farmers do all work themselves or with family members. They can occasionally pay services, for example paying a contractor for harvesting wheat or barley with a combine harvester.

NUMBER OF AWU IN THE FAMILY
Average result – 1.3
In almost all farms, family members are involved into farm work. In small farms, spouses or elder children help farmers, especially during the growing season. In large farms, parents send their children to universities for agricultural education, so later their children can continue to manage the farm.

STRESS LEVEL
Average result – 3.03
Since all farmers have an independent spirit, they are usually not member of cooperatives or other unions. They have thus to cope with stress alone. The main problem of local farmers is marketing and selling their products. Especially small-scale farmers cannot sell their products with a good price since they cannot provide required quality and quantity to clients. Another problem at this stage is a low adaptation skill of local farmers to climate change. Since agriculture is very depending from weather, rapid climate changes can cause significant damages to farmers (e.g. late spring frosts).
All these factors are generating stress.

TIME FOR HIS FAMILY AND SOCIAL RELATIONSHIPS
Average result – 3.10
During the vegetation season, there is no time for anything else but agriculture, especially during the harvesting period. All farmers are involved in agricultural work during this season. Small and medium farmers do their job on the field. Big farmers manage all work in their farm which also requires a lot of time. During off-season, all farmers have more free time and they can spend this time with their families and members of their community.

TIME FOR ACQUIRING NEW KNOWLEDGE AND IMPROVING SKILLS
Average result – 4.11
All farmers started to understand that increasing their knowledge in agriculture and other related activities can improve their live. Big farmers started to send their children to agricultural universities. Internet is a very useful and common source of information for many farmers. Extension services provide also information especially to small and poor farmers. Many international donor organizations support
agricultural development in the country. They organize different free training courses on all aspects of agriculture for farmers.

SYNTHESIS 5.2 AND 5.3 FARM PROSPECTS

The opinion of farmers on farm’s prospects is medium in average.

5.4. SELF-CONSUMPTION OF FOOD PRODUCTS
Average result – 3.86
Since almost all farmers have their own kitchen gardens, the proportion of farm productions in family diet is very high. In some cases, especially among poor farmers, kitchen garden is the main source of food. Even big and rich farmers prefer to have their own products on the table instead of buying products in shops or markets. In rural areas, farmers buy only five types of products – sugar, vegetable oil, tea and wheat flour. Other products are cultivated by farmers themselves.

5.5. FOOD SECURITY
Average result – 4.86
Survey was conducted among farmers which have land and small household plots where they can produce food for self-consumption. They can also buy products. In this category of the population, food security is satisfactory or very good. However, according to FAO and national statistics there are still many problems especially among rural and poorest populations. Nearly 400,000 people (6.5% of total population) suffer from undernourishment. Currently, people in rural areas have access to an adequate quantity of food, but quality of this food may still be a problem.
SYNTHESIS 5.4 AND 5.5 FOOD SECURITY

6. ENVIRONMENT AND BIODIVERSITY ASPECTS (Farm impacts)

6.1. POLLUTION
Average result – 3.43
Pollutions are mainly related with nitrate and pesticide in ground or surface water but they do not seem to be important except maybe for pesticides because farmers are not aware of the risk associated with these products and they thus do not know how to prevent pollutions.

6.2. SOIL CARBON MANAGEMENT
Average result – 2.88
Farmers do not use Conservation agriculture techniques such as no-till and cover crops. Almost all farmers are ploughing and adopt intensive harrowing. This induces soil organic matter mineralization and carbon de-stocking. At the opposite, long crop rotation include a high proportion of legume-based temporary grasslands that fix a lot of carbon in soils. Additionally, farmers use regularly farmyard manure from their livestock.
Many farmers were trained by different international organizations or agricultural extension services on the importance of soil carbon management.

6.3. WIND OR WATER EROSION
During the survey, most farmers declared that they do not have problems with water or wind erosion. Their fields are often located on relatively flat land.
However, soil erosion is a serious problem in the country. According to the land cadastre, the area of land subjected to water and wind erosion is about 5 million hectares, or 45.7% of the total area of agricultural land. Of these, 720,600 hectares are arable land prone to water erosion. One of the negative factors contributing to water erosion is the presence of steep terrain slopes.

6.4. SALINIZATION
Farmers do not easily evaluate salt levels in soils. This should be done by soil laboratories. Since existing laboratories are not in good condition and very old, or even inexistent in some oblasts, farmers do not check salt level in their soils. Even some farmers are not aware of the importance of soil salinization.
According to news from the Ministry of Agriculture, there are about 245,000 hectares of saline lands in the country. However, in surveyed farms, the problem seemed to be low.

**SYNTHESIS 6.1 AND 6.4 ENVIRONMENTAL IMPACT**

The impact of agriculture on the environment is assessed as medium or good. This is due for instance to low intensification levels and crop – livestock integration.

**6.5. BIODIVERSITY**

**DEVELOPMENT OF ECOLOGICAL INFRASTRUCTURE**

Average result – 1.1

No ecological infrastructure is intentionally developed in farms or at landscape level. The majority of farmers is not aware about the importance and the role of ecological infrastructures. In some farms, an ecological infrastructure (for example, tree lines or forest plantations) persisted after Soviet times. On a total of thirty farmers only one farmer has intentionally developed such infrastructure.

**HIGH-NATURE VALUE HABITATS**

Average result is – 2.93

Most farms conserve and manage high-nature value summer pastures. Some farmers have small ponds.

**SYNTHESIS 6.5 BIODIVERSITY**
Although biodiversity associated to agricultural land is still in a better state in Kyrgyzstan than in many other countries because of the existence of large mountain areas covered by species-rich grasslands, a low level of pesticide and fertilizer use which allow insect and weed species and thus also bird species to thrive, an irrigated agricultural area in plains that is divided by narrow earth channels every 30 to 60 m and where a spontaneous vegetation can develop and that is a good habitat for insects and birds, actions undertaken intentionally by farmers for managing this biodiversity are reduced. This explains that the biodiversity indicator is assessed as mainly bad or very bad.

5.3. Radar charts of indicators

Radar charts are presented per farm in annex 4, per farm size in annex 5, and per group of indicators in annexes 6 to 11. These annexes are examples of lay-out. Indicators can also be clustered per farm type or per farming system for instance. Multivariate analysis can be performed by cluster analysis for creating farm groups or by factorial analysis for analysing the relationships between factors.

An example is presented for one farm, farm 7, in figure 12. This kind of chart is useful for identifying the strengths and weaknesses of a farm. It can be used for discussing with a farmer and advising him on the kind of progress he could reach if he adopts agroecological techniques in a coherent management system. For instance, in terms of adoption of agroecological techniques, farm 7 could improve irrigation water management, adopt a package of no-till, direct seeding and soil cover techniques and better develop agroforestry. It should look for solutions for reducing workload and develop holistic techniques for crop pest and disease control. Processing product could be envisaged for increasing income.
The indicators of two or several farms can be compared for showing to the least agroecological farmers the potential of progress they can achieve if they adopt the techniques of the most agroecological farms (figure 13). These could be done in farmer’s groups that meet regularly and are facilitated by a farmer’s advisor. Progress objectives can be defined for each farm and target objectives can be scheduled over time. Least agroecological farmers can be encouraged to move by observing that progress are possible and that agroecological techniques are working since they are successfully adopted by the most agroecological farmers.
Farm 4 (one of the least agroecological)

ADOPTION OF AGROECOLOGICAL TECHNIQUES

- Agroforestry
- Livestock management
- Grassland management
- Water management
- Soil cover
- Crop pest control
- Crop disease control
- Use of seeds, seedlings
- Use of direct seeding
- Fertilisation and soil fertility

VARIABLE COSTS

- Workload
- Animal feeding
- Crop pest control
- Crop disease control
- Herbicide or Biological weed control
- Chick, piglets, fish larvae
- Fertilisation

FIXED COSTS - INVESTMENTS

- Machinery
- Building and infrastructure
- High tech

REVENUE

- Local marketing chain
- Product processing
- Short marketing

Farm 7 (one of the most agroecological)

ADOPTION OF AGROECOLOGICAL TECHNIQUES

- Agroforestry
- Livestock management
- Grassland management
- Water management
- Soil cover
- Crop pest control
- Crop disease control
- Use of seeds, seedlings
- Use of direct seeding
- Fertilisation and soil fertility

VARIABLE COSTS

- Workload
- Animal feeding
- Crop pest control
- Crop disease control
- Herbicide or Biological weed control
- Chick, piglets, fish larvae
- Fertilisation

FIXED COSTS - INVESTMENTS

- Machinery
- Building and infrastructure
- High tech

REVENUE

- Local marketing chain
- Product processing
- Short marketing
Note: On the ‘Adoption of agroecological techniques’ chart of both farms, the top vertical axis represents the indicator ‘Use of soil tillage technique’.

**Figure 13. Example of indicator results for Farms 4 (one of the least agroecological) and 7 (one of the most agroecological).**

These comparisons between farms can be presented by clustering on a single charts the results of several farms, for instance farms from the same farm type or size class. Figure 14 presents this kind of results for four farms. For instance, compared to the three other farms, farm 9 has better workload, reduced investments costs, processes its production and has a successor.
Figure 14. Comparison of indicator values of four farms of the same farm size class.
5.4. Farm portraits

Two-page farm portraits bring information that is complementary to indicator data. Writing a text is an opportunity to make farm functioning and farmer’s working condition livelier and more concrete. It is also an occasion to add nuance in the information.

A name is given to each farm. This name summarizes the main characteristics of farm in a few words.

It appears from these portraits and from the indicator values that several components are widespread among the thirty farms. Many farms:

- are mixed farms where crop and livestock are integrated in variable proportions;
- use farmyard manure in a smart way for fertilizing their fields. Synthetic fertilizers are only used in complement to organic fertilizers;
- use low or no amounts of pesticides;
- prefer local traditional cultivars of annual crops and forages;
- raise local animal breeds or cross them with European breeds in a smart way;
- adopted a long and relatively diversified crop rotation;
- integrate legume-based temporary grasslands (lucerne and sainfoin mainly) in the crop rotation on a significant part of the arable land area (often between 30 to 50%). These grasslands fix a lot of nitrogen in the system and control weeds which has a positive influence on annual crop yields. They improve soil structure, soil life and soil fertility;
- send their livestock in summer in species-rich mountain pastures;
- regularly create jobs for local population especially for weeding and harvesting activities;
- are actively developing marketing opportunities on the export or the local markets including by new communication technologies such as social media;
- are looking for information on internet and to farmer’s advisers.

Several farmers understood that soil is their capital and take care of it by organic manure application, reduction of synthetic fertilizer and pesticide use, and cropping of legume-based temporary grasslands. Some of them heard about conservation agriculture and tried to use it with variable success. There is a clear need of better advices and equipment for the development of this farming system.

Many farmers are not aware of pesticide action modes and risks for the environment and for their health. Input sellers present pesticides as ‘vitamins’ for crops. An information campaign would be extremely useful for pesticide use optimization, for reducing their use and improving their impact on the environment.

A few farms only are really industrial and rely on massive commercial input use.

The state of the machinery park is really bad. Machine and tools are old. They often date back to Soviet times. They are thus more than 30 years old. New machines are too expensive and not available on the national market. This is especially the case for harrows, weeding tool and harvesting machines. Some of these tools could be built locally if a training programme would be developed for metalworkers.

A national programme could support marketing, processing and packaging of high quality products such as organic, wild or tasty cultivars of fresh and dry fruits and vegetables. Finding markets is almost impossible for the majority of isolated farmers. Organising farmers in cooperatives is essential but even so these organizations are often too small for finding export markets in the European Union (EU) for
instance. Export to Russia and other former Soviet Republics is easier but products are sold there at a lower price compared to the EU. Cooperatives should also be developed for buying machinery and some commercial inputs.

Advisory services could also adopt modern, participatory approaches instead of top-down technological transfer. Kyrgyz farmers are often creative and dynamic. They need more to be guided and organized instead of receiving instructions.
Chapter 6 MAPPING OF PRIVATE AND PUBLIC STRUCTURES, POLICIES AND LEGISLATION RELEVANT TO AGROECOLOGY ACTIVITIES

This chapter is the result of deskwork, long lasting experience of the national consultant Tatjana Semenova, and contacts with different stakeholders.

6.1. Key actors, activities, and responsibilities

The complete list of public institutions, private sector organizations, international organizations and civil initiatives that can be involved in the process of agroecology, is presented in annex 13.

A selection of among the most concerned organizations by agroecology is presented below. This list is not restrictive. Explanations on the activities of these organizations are available in annex 13.

Governmental organizations

• Ministry of Agricultural, Food industry and Melioration of the Kyrgyz Republic
• Department of Water Resources and Melioration
• State Centre of the Kyrgyz Republic for Testing Varieties and Genetic Resources of Plants
• Department of Crops Expertize
• Department of Livestock and Fisheries
• Department of Mechanization and Power Supply
• Centre for Management, Implementation and Control over the Production and Use of Biological Means for Plant and Animal Protection "Kyrgyzagrobiotsentr" ‘AGRO BIO Center’
• State Agency for Environmental Protection and Forestry under the Government of the Kyrgyz Republic
• Centre for State Regulation in the field of environmental protection and environmental safety
• Department of Rational Use of Natural Resources
• Department of Forest Ecosystem Development

Academic organizations

• Kyrgyz National Agrarian University named after K.I.Skryabin
• Kyrgyz Research Institute
• Veterinary medicine named after Arstanbek Duisheyev
• Kyrgyz research institute of livestock and pasture
• Kyrgyz Scientific Research Institute of Irrigation
• Kyrgyz-Turkish Manas University

Non-governmental organizations

• Federation of organic movement "BIO-KG"
• Public Foundation “Bio Service”
• Public Foundation “CAMP Alatoo”
• Rural Advisory Service (RAS)
• Rural Development Fund (RDF)
• Public Foundation "Institute for Sustainable Development Strategy"
• TES-Centre of training and advice
• Public Foundation "Agency for Development Initiatives" (ADI)

Private sector (private companies)

• Association of farms "Farmer"
**International Organizations**
- Food and Agricultural organisation of the United Nations (FAO)
- German Society for International Cooperation (GIZ)
- Japan International Cooperation Agency (JICA)
- Korea International Cooperation Agency (KOICA) Kyrgyz Republic Office

**Local authorities and profile specialists**
- Heads of Local Government (Aïyl Okmoty), village activists, heads of regional agrarian departments

**farmers’ and producers’ groups**
- Cooperatives, association

**farmers**
- Small-scale producers
6.2. Overview of the environmental, agricultural and food security policies (goals, priorities, on-going projects)

Analysis of strategic documents on the development of the Kyrgyz Republic has shown that environmental protection, organic farming and sustainable agriculture, as well as climate change related issues, are reflected in the following most important national strategy, policy and program documents:

The most important policies with regard to agroecology are:

- **The Strategy for Agricultural Development of the Kyrgyz Republic until 2040.** In May 2018, the Ministry of Agriculture submitted a draft of the Strategy for the Development of Agriculture of the Kyrgyz Republic for the period up to 2040 for public discussion. The goal of the Strategy is to ensure the country’s food security by meeting the needs of the population with sufficient, high-quality, affordable and full-value food of domestic production.

- **The Strategy for Agricultural Development of the Kyrgyz Republic until 2020** was developed in 2012, but after consideration was sent for revision. There is still no official approval. The objectives of the Strategy are: to increase the volume and efficiency of crop production and livestock; improvement of water resources management in agriculture; development of the land market; development of the processing sector; development of cooperation; the introduction of innovations and the development of trade, as well as the development of the rural financial system. The main expected results of the Strategy implementation are qualitative improvement of food security, production growth, competitiveness and export of agriculture, as well as an increase in the incomes of rural commodity producers.

- **The concept of development of the agricultural cooperative system in the Kyrgyz Republic for 2017-2021.** For the purpose of implementation of state policy in forming and development of agricultural cooperative system.

- **Draft of the National Action Plan for the Development of Organic Agricultural Production in the Kyrgyz Republic.** The development of organic agriculture in the Kyrgyz Republic, which contributes to the sustainable development of agriculture and the improvement of the health of the nation and the well-being of people.

- **The Concept of development of organic agricultural production in the Kyrgyz Republic for 2017-2022.** Creation of favourable conditions for the development of organic agriculture through the improvement of regulatory legal acts and the adoption of other measures that contribute to the sustainable development of the agricultural sector of the economy and the competitiveness of organic products.

- **Development of livestock breeding in the Kyrgyz Republic for the period 2017-2021.** The main goal of this Program is to preserve, improve and develop the domestic genetic potential of breeding animals and poultry in the country to ensure food security of the country and export products.

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51 www.agroprod.kg/documents/proekt0404164.doc
53 http://www.gov.kg/?p=105752
54 http://www.gov.kg/?p=105752
• The Food security and nutrition programs in the Kyrgyz Republic for 2015-2017\(^{55}\). At the present time, the program for public discussion has been made until 2023. The strategic goal of food security and nutrition of the Kyrgyz Republic is the qualitative improvement of the population's food supply, stable provision of consumption norms and food safety requirements, sustainable domestic food production\(^{56}\).

• The Action plan for the implementation of the Program for Adaptation of Agriculture and Water Resources to Climate Change for 2016-2020\(^{57}\) includes a component Introduction of innovative technologies for the production of agricultural products: drip irrigation of agricultural crops; construction of greenhouses for growing vegetables; development of organic farming.

• The Concept of development of the forestry sector of the Kyrgyz Republic for 2018-2040\(^{58}\). Under consideration and discussion. Represents directions for openly conducted reforms, taking into account the need for broad involvement of local people in forest management in order to support the socio-economic development of regions and the conservation of forests through sustainable multifunctional use.

The following other policies should be mentioned too:

• The Development Program of the Kyrgyz Republic for the period 2018-2022 «Unity. Trust. Creations»\(^{59}\) (Approved by the Decree Jogorku Kenesh of the Kyrgyz Republic of April 20, 2018 No. 2377-VI). This is a strategic document for supporting all sectors for sustainable development, including the agricultural sector:

  4.1.12. Priority areas of crop production should be industries that ensure more efficient use of water and land resources: the cultivation of high-yield cereals, legumes, technical, fruit and berry and stone fruits.

  4.1.13. Livestock sectors will also focus on products with high added value - honey, organic meat, wool and dairy products. Special attention will be paid to the development of fish farming and the production of concentrated fodder. Intensification of livestock production will be directed to the development of stall fattening of livestock, the electrification of agricultural production, the organization of closed farm cycles.

  4.1.14. The main result of the success of measures will be the increase in yield and land use efficiency in accordance with environmental quality standards of products.

  4.1.15. The government will provide assistance to enterprises of the agro-industrial complex to form such brands of ecological and organic products as "Kyrgyz meat", "Kyrgyz milk", "Kyrgyz apple", etc. Ecological cleanliness and quality of grown fruits and vegetables should become a brand of domestic 24 agricultural products, as well as national drinks, fruit juices, mineral water and medicinal herbs. Therefore, it is necessary to expand the range of services of laboratories for the certification of domestic ecologically clean products intended for export, as well as the introduction of international standards in business processes of such farms.


• The Concept of the development of the cotton industry in the Kyrgyz Republic for 2017-2021. For the purpose of recovery and development of cotton industry, the creating favourable conditions promoting increase in production of export-oriented products.\(^{60}\)

• The Program of development of food and processing industry of the Kyrgyz Republic for 2017-2021. The main objective of the Program is to ensure the guaranteed and sustainable supply of safe and quality food products to the population of the country, through the development of the food and processing industry, the achievement of stability in the development of domestic sources of food and raw materials. The Program is designed to create the necessary conditions for the modernization of industry, to solve financial and economic and social problems, to promote the implementation of goals of socio-economic development of the republic until 2021.\(^{61}\)

• The State Program for the Development of Irrigation of the Kyrgyz Republic for 2017-2026. The state program provides for the construction of irrigation infrastructure to provide rural residents with new irrigated land. The new irrigated lands introduced for the cultivation of agricultural products will improve the socio-economic situation and ensure the development of the regions, and will also contribute to addressing food security and poverty alleviation. The state program will allow to introduce 66.5 thousand hectares of new irrigated lands, to increase 51,08 thousand hectares of land, and to improve land reclamation on 50,000 hectares.\(^{62}\)

• Program of fisheries and aquaculture development in the Kyrgyz Republic for period before 2027. The program for 2008-2012 has been revised and revised. The program is proposed for consideration until 2027.\(^{63}\)

• Decree of the Government of the Kyrgyz Republic "On measures to support the development of seed production and the distribution of highly effective varieties of fruit and berry crops in the Kyrgyz Republic" was signed.\(^{65}\)

• The Program on adaptation of agriculture and water resources to climate change for 2016-2020. The goal of the Program is to identify the vulnerability of rural and the development of measures for the adaptation of rural and water management to climate change.

• The Concept of Ecological Safety of the Kyrgyz Republic (2007) coordinates the issues of creating a system of environmental legislation, state control and expertise, environmental management of the economy, environmental monitoring.

• The Concept of green economy in the Kyrgyz Republic "Kyrgyzstan is a country of green economy," was approved by the resolution of the Jogorku Kenesh of the Kyrgyz Republic (June 28, 2018 No. 2532-VI). For the transition to a green economy, it is proposed to develop green areas in the following sectors: Green transport in a green city, Green energy and energy conservation, Green

\(^{60}\) [http://www.cawater-info.net/library/rus/kg_384-2016.pdf](http://www.cawater-info.net/library/rus/kg_384-2016.pdf)


\(^{64}\) [http://www.gov.kg/?p=103196](http://www.gov.kg/?p=103196)


agriculture, Green industry, Green waste recycling, Government policy, green procurement and payments for ecosystem services, Protecting biodiversity, green thinking, green education, green education, green investment and sustainable financing to promote a green economy.

Most of the above documents and laws do not directly address the development of agroecological approaches in Kyrgyzstan's agriculture, but include potential opportunities and issues that can be taken into account when planning further cooperation and project development.
6.3. Environmental, agricultural and food security legislations

Theoretically, the legal base of the country covers all major elements of agriculture, but it could be improved.

This report identified and examined 14 laws related to land management, logistics centres development and international trade regulation, 9 laws concerning inputs (seeds, fertilizer, artificial insemination), 6 laws about cooperatives, 3 laws regarding food safety, 7 laws addressing food security, and 7 laws about animal health.

This report concludes that the legal base in the country is satisfactory, the emphasis should be given to the actual implementation of laws.

A commented list of the most important legal texts is presented below. Many of them can support the development of agroecology.

The most important legislations with regard to agroecology are:

- **The Law on Pastures (2009), (2011)** has been developed to ensure economically viable and sustainable use of pastures. Pasture use employs an approach based on the involvement of local communities and entailing their participation. The Law on Pastures provides a legal framework for the sustainable management of pastures, elimination of the three-tier management and transfer of all functions and powers to ayil okmotu.
  
  The main specifics of new legal framework include:
  - the KR Law on Pastures decentralizes management of all pastures till the local level of government with the further opportunity to decentralize it to the level of pasture-users who shall establish the Pasture Users Union (PUU);
  - PUUs develop Community Pasture Management Plans that should be used as the basis for the management, maintenance, improvement and use of pastures;
  - pastures are considered within the framework of ecosystems, and the new law substitutes the rent with the right of use to facilitate the mobility and pasture rotation and ensure fair access to them for all users;
  - fees for pasture use get collected in PUUs and, it is expected, that they will be used for pasture improvement;
  - other users, in addition to livestock farmers, will take part in the process of decision-making and are represented in the Pasture Committee.

- **The Land Code of the Kyrgyz Republic (1999)** regulates land relations in the Kyrgyz Republic, origin, procedure of execution and termination of the rights for land and their registration; it also targets the establishment of land-market use in the conditions of state, municipal and private ownership of land, and rational use of land and its protection. The Land Code constitutes the main document that regulates the land-use, but it contains few provisions related to pastures. Nevertheless, it stipulates state ownership of pasture resources. Finally, the Land Code identifies forms of economic activities

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69 [http://www.cawater-info.net/library/agri-kg.htm](http://www.cawater-info.net/library/agri-kg.htm)


on agricultural lands\textsuperscript{72}.

- **Law on Cooperatives \textsuperscript{(2004)}** determines the legal and economic foundations of education and activities of cooperatives of the Kyrgyz Republic and their unions. Currently, the draft amendment is under consideration\textsuperscript{73, 74}.

- **The law ‘On Mountainous Areas of the Kyrgyz Republic’ \textsuperscript{(2002)}** was developed to establish the social, economic and legal framework for the sustainable development of mountainous areas of the Kyrgyz Republic, protection and rational use of natural resources, the historical, cultural and architectural heritage. The law should become a basis for the regulation of people’s activities in mountainous areas.

- **Water Code of the Kyrgyz Republic \textsuperscript{(2004)}** regulates water relations in the sphere of use, protection and development of water resources for guaranteed, sufficient and safe water supply to the population of the Kyrgyz Republic, environmental protection and ensuring rational development of the republic's water fund\textsuperscript{75}.

- **The Law ‘Development of Agriculture of the Kyrgyz Republic’ \textsuperscript{(2009)}**. Establishes legal relations between citizens, legal entities, state executive bodies and local self-government bodies to achieve positive results in the development of the agro-food sector of the economy of the Kyrgyz Republic\textsuperscript{76}.

- **The Law ‘Water users associations’ \textsuperscript{(2002), (2013)}** defines the legal status, organizational foundations of the creation and activities of associations (associations) of water users as non-profit organizations to ensure the exploitation and maintenance of irrigation systems in rural areas in the public interest\textsuperscript{77}.

- **The Law ‘Protection of Soil Fertility of Agricultural Land appointments’ \textsuperscript{(2012)}** regulates relations in the field of protection of soils, fertility, preservation of quality and protection from degradation and other negative phenomena associated with the possession, use, disposal of agricultural land\textsuperscript{78}.

- **The Law ‘Food Security of the Kyrgyz Republic’ \textsuperscript{(2008), (2013), (2017)}** establishes the main directions in ensuring food security of the Kyrgyz Republic, which is an integral and important component of the national security of the state\textsuperscript{79}.

The following other policies should be mentioned too:

- **The Law on Environmental Expertize \textsuperscript{(1999)}** constitutes the main legislation related to environmental assessment. Its objectives include prevention of adverse impacts on human health and environment that take place as a result of economic and other activities, and ensured compliance of this activity with the environmental requirements of the country. This law is used

\begin{itemize}
\item \url{www.k-a.kg/sites/.../ppplegalframeworkadbforumeng.ppt}
\item \url{http://cbd.minjust.gov.kg/act/view/ru-ru/1456}
\item \url{http://www.gov.kg/?p=106191}
\item \url{http://www.cawater-info.net/library/rus/water/water_kyrgyzstan.pdf}
\item \url{http://www.cawater-info.net/library/rus/kyrp_farm_kyrgyzstan.pdf}
\item \url{http://www.cawater-info.net/library/rus/land/29.txt}
\item \url{http://www.cawater-info.net/bk/land_law/files/182-2012.pdf}
\item \url{http://www.cawater-info.net/library/rus/165-2008.pdf}
\item \url{http://www.cawater-info.net/library/rus/kyrgyzstan.pdf}
\end{itemize}
extensively in the ‘development projects’ that could make certain environmental impacts, including: Feasibility study and designs for construction, reconstruction, development, retrofitting and other projects irrespective of their estimated cost, origin or type of ownership, which implementation can make environmental impacts. According to this law, the project initiator is responsible for the submission of necessary documentation on the project and its environmental impact to the state environmental expert evaluation (SEE). The review of the submitted documentation is made by the Expert Committee of SAEPF. Favourable decision of the SEE constitutes the prerequisite of the started financing or implementation of a project. A negative conclusion prohibits the project implementation.

- **The Law on ‘General Technical Regulations on Environmental Safety in the Kyrgyz Republic’** (hereinafter, the Technical Regulations), in accordance with the KR Law ‘On the Bases of Technical Regulation in the Kyrgyz Republic’, is used with a view to protect the environment and identifies main provisions on technical regulation in the area of environmental safety; also, establishes general requirements to ensuring environmental safety while designing and implementing activities at the facilities of economic and other agents for the processes of production, storage, transportation and disposal of produce. The requirements of this Technical Regulations are active in the Kyrgyz Republic in relation to the processes of production, storage, transportation and disposal of produce and binding for all legal entities and natural persons implementing these processes.

- **The Law on Veterinary** identifies the general, legal, organizational and financial framework of veterinary. The law regulates operations in veterinary in accordance with the international requirements, identifies the legal status and structure of the veterinary service, establishes necessary veterinary and sanitation requirements and bases of veterinary control. It targets protection of animal health, protection of people from diseases common for humans and animals, ensured production and sale of animal products of high veterinary-and-sanitary quality.

- **The Law on Chemicalization and Protection of Plants (1999)** identifies the legal, economic, environmental, social and organizational framework of chemicalization and plants protection in the interest of protected health of people, animals, environment, prevention or elimination of consequences of soil, vegetation and animal products contamination. In order to implement the Law, there has been adopted the KR Government Resolution ‘On the Measures of Environmental Protection and Protection of People’s Health from Adverse Effects of Certain Hazardous Chemical Substances and Pesticides’ dated 27 July 2001 No 376 that includes the List of Chemical Substances and Pesticides which use is prohibited or strictly limited. In accordance with Article 3 of the law ‘On Chemicalization and Protection of Plants’, there is a ban on the supply and use of pesticides that have not passed registration tests and are not included into the List of Pesticides and Agrochemicals allowable for the use in the Kyrgyz Republic. Also, there was adopted the KR Government Resolution ‘On Approved State Catalogue of Pesticides and Agrochemicals Allowable for the Use in the Kyrgyz Republic for 2011-2019’. As regards special technical regulations on the safe use of pesticides, it does not exist yet as an official document. There is a draft though, and the MAM has been instructed to submit draft Technical Regulations to the Government for consideration by 1 February 2014.

- **Law on Fisheries (1997, amended in 1998, 2017)** regulates the legal, economic and organizational foundations of the fish industry of the Kyrgyz Republic with a view to its full development, preservation and enhancement of fish stocks, improving the fish productivity of water bodies and ponds, and the most complete satisfaction of the population’s requirements for fish products. 

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• The law ‘On Agricultural Land Management’ (2001) regulates legal relations on agricultural land management and targets the ensured efficient and safe use of lands in the interest of people of the Kyrgyz Republic. The Forest Code of the Kyrgyz Republic establishes legal framework of rational use, protection, conservation and reproduction of forests, improvement of their environmental and resource capacity, their rational use; it also regulates land-use within the State Forest Fund.

• The law ‘On the Animal World’ (1999) establishes legal relations in the area of nature protection, use and reproduction of wild animal. Wildlife constitutes an asset of the Kyrgyz Republic and an integral element of natural resources, an important regulating and stabilizing component of the biosphere, the utmost protected and rationally used for the satisfaction of material and spiritual needs of the citizens of the Kyrgyz Republic.

• The law ‘On Protection and Use of the Vegetable World’ (2001) establishes legal framework for the ensured efficient protection, rational use and reproduction of plant resources.

• The Law ‘Water’ (1994), (1995). Regulation of relations in the sphere of use and protection of water resources, prevention of environmentally harmful impacts of economic and other activities on water bodies and water facilities and improving their condition, strengthening legality in the field of water relations82.

• The Law ‘Peculiarities of insurance in crop production’ (2009), (2016) establishes the features of insurance in crop production and regulates the legal, financial and organizational basis for its conduct83.

• Draft Law on Chemicalization and Protection of Plants84. The purpose of this law is to strengthen the legal and institutional framework, the creation of appropriate economic and legal conditions for the organization and implementation of measures for the chemicalization and protection of agricultural land that provide:
  - prevention of mass spread of pests, prevention of crop losses and obtaining of high-quality agricultural products;
  - carrying out of state actions on struggle against dangerous and especially dangerous harmful organisms;
  - safe handling of pesticides and agrochemicals.

• Draft Law on Compulsory insurance of farm animals from especially dangerous diseases. The main objectives of this Law are: protection of human and animal health; protection of material and monetary interests of animal owners against the consequences of extremely dangerous for human and animal diseases85.

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81 http://www.gov.kg/?p=103522
84 http://www.agroprod.kg/index.php?aux_page=aux3
85 http://www.agroprod.kg/index.php?pageID=1
CHAPTER 7 CONCLUSION AND DISCUSSION:
MAIN FAVOURABLE AND UNFAVOURABLE FACTORS FOR
THE DEVELOPMENT OF AGROECOLOGY

7.1. Introduction

There is a good potential to develop agroecological systems in Kyrgyzstan.

As criteria for identifying favourable and unfavourable factors for the development of agroecology in Kyrgyzstan, the following topics were singled out: farming structures and practices, administration structures including advisory services, NGO potential, international development cooperation programs and actors, legislative bodies, private companies in the agricultural and food sectors, national and international market, food security.

7.2. Main favourable factors

Since the collapse of the Soviet Union, the usage of mineral fertilizers has been limited to about 10 to 15% of the required amount (about 25 kg per ha of arable land). Kyrgyzstan does not produce mineral fertilizers, and imported fertilizers are expensive for farmers. State support in this regard is minimal. Basically nitrogen fertilizers are regularly used, and phosphate and potash fertilizers are used less frequently.

Unlike mineral and organic fertilizers, pesticide usage in Kyrgyzstan is still quite limited. In 2006, 996 tons were consumed in agriculture in the country, including 140 tons of herbicides, 562 tons of fungicides and 294 tons of insecticides.

In general, soils are still fertile and ‘living’. In view of the lack of knowledge and high price of chemicals and fertilizers, farmers use them only in small quantities, which made it possible to preserve the “living potential” of soils from pollution and toxic compounds accumulation. The soil organic matter content looks still medium or high.

Farmers usually adopt long crop rotations (from 4 to 9 years in the survey). They understood the importance of this practice for a sustainable management of agricultural systems, in particular for the control of weeds, pests and diseases.

There are good prospects for the development of pulses. Beans are already extensively cultivated in the Talas province. These pulses also fix nitrogen and improve soil fertility.

Most farms are ‘mixed farms’ combining livestock and arable productions. This allows for good nutrient and organic matter cycles in farms. It justifies the use of nitrogen-fixing legume-based temporary grasslands that are producing winter forage for livestock and are the pillar of crop rotation by fixing nitrogen, controlling weeds, conserving soil fertility and soil life. Lucerne and sainfoin are the main legumes species. They are cultivated in pure stands or in mixture with grasses.

There is a high rate of forage self-sufficiency in livestock feeding. Some mixed farmers are even selling hay and cereal grain to other livestock farmers.

Farmers regularly use organic manure on arable land because they produce this manure with their
livestock and they are also aware of the importance of it for soil fertility and crop yields. They can consequently reduce the use of synthetic fertilizers which reduces also production costs.

Farmers have a good experience in crop mechanical weeding although they lack good equipment.

A low disease incidence has been noted during field surveys in many crops, including potato. This is partly due to the dry summers of the continental Kyrgyz climate that reduce the development of pathogenic fungi, but certainly also to a well-developed soil life that protects crops against pathogens.

Irrigation water is abundant and a network of earth irrigation channels is well developed in most arable fields.

Along these irrigation channels, native plant species develop spontaneously in herbaceous strips on both sides of the channel. This makes an interesting ecological infrastructure for the development of populations of natural enemies of crop pests. These earth channels and thus herbaceous strips are distant from each other of about 20 – 40 meters in average. The ecological infrastructure network is thus dense.

Species-rich habitats are frequently integrated in agricultural systems by a regular use of mountain pastures for feeding livestock in summer. This has a positive effect of animal health and mineral nutrition. This practice also conserves natural genetic resources.

Local traditional cultivars of most crops are widely used and preferred, including for fruit, forage, bean and even cereals. In fruit production, local cultivars of fruit trees (e.g. apple and apricot) are particularly appreciated because they produce very tasty fruits.

Traditional and local breeds of cows, sheep and goats are also very much used. They are able to efficiently graze and transform the grass resource into milk and meat. They are less disease resistant and less demanding.

No-till techniques begin to be known and are sometimes used. Some farmers are aware of the negative effects of ploughing on soil quality and they would like to adopt these soil friendly techniques. By the way, many farmers are aware of the importance of natural soil fertility and soil life.

In recent years, there has been a growing interest of farmers for organic and environmentally friendly products, protecting the environment, improving nutrition and food safety.

Innovative farmers are not rare. They are dynamic and creative in several ways. They could become pilot farmers for demonstration of agroecological practices and systems.

In the surveyed farms, farmer’s families have a high rate of food self-sufficiency. They produce most of their own food in their kitchen garden and their field. They only buy some products such as wheat flour, rice, tea, salt and sugar. Consequently, the status of farmer’s family food security (food quantity and quality) was very good. This is certainly not true for all Kyrgyz farmers.

Kyrgyz farmers benefit from a low taxation system.

They have a cheap access to land since a land reform gave then land or when land belongs to the State land leasing is cheap and guaranteed over long periods.

Several NGOs are developing activities that are at least partly related to agroecological strategies,
principles and practices. They are very active and competent in their field of action.

For instance, Camp Alatoo Public Foundation is particularly skilled in Sustainable Pasture Management, in Climate Change Adaptation, in several rural development matters such as Management of Water Resources on Watershed Level, Energy Efficiency, Soil and Water Conservation, and Conflict Management Over Natural Resources. This NGO is highly professional and dynamic.

Another very good NGO is the Rural Development Fund. It is active in the promotion and revival of traditional knowledge, implementation and support to pastoral schools and pastoral knowledge, natural resource management, biodiversity, conflict prevention and mitigation, agriculture, land reforms, community foundation and organisation of study tours for instance.

The Rural Advisory Service (RAS) is another non-governmental organization. It has advisers everywhere in the country. The activities of RAS services are very wide, virtually they are involved in the development of all locally relevant crops and livestock types, soil and water management, pasture management, small-scale processing facility, establishment and management of small businesses and income generating activities, business planning and credit access, improved marketing of farm products, establishment of local service providers.

The Federation of Organic Development Bio-KG (FOD Bio-KG) is a NGO whose mission consists in promoting and supporting the development organic farming nationwide. Its main activities are related with the implementation of a legal framework, the creation of an internal certification system, the development of the internal and international organic markets, strengthening farmers’ capacities and raising public awareness on the development of the organic movement.

These four NGOs are an asset for further development of agroecology in the country.

Agro Bio Center is a public administration attached to the Ministry of Agriculture of the Kyrgyz Republic. It has a large expertise in biological control of crop pests and played and is still playing a crucial role in the development of organic farming in the country.

The Kyrgyz National Agrarian University initiated activities in agroecology and several professors are open to new ideas with regard to organic farming and agroecology. In the 2013-2014 period, in the framework of the international project "TEMPUS EPASAT", specialists from the Kyrgyz National Agrarian University n.a. K.I. Scryabin developed a program on "Agroecology" for a future Master degree. The program has been tested and obtained a license from the Ministry of Education and Science of the Kyrgyz Republic:

- Specialty: 520800 "Ecology and environmental management"
- Profile: Agroecology
- Degree: Master
- Period of study: 2 years
- Full-time form of education
- Labour input (ESTC): 120 cred.

The Ministry of Agricultural, Food industry and Melioration, the Ministry of Labour and Social Development and the Ministry of Education and Science, the Kyrgyz National Agrarian University, the Agency of primary vocational education and UN World Food Programme in Kyrgyzstan have developed and piloted since 2016 a National system of short-term courses on skill, knowledge and practice improvement for farmers (SKaP).
7.3. Main unfavourable factors

Extension services for farmers (training and information) are insufficiently informed about agroecology in the country. Agroecology is a new topic that is not yet known and understood by most advisors. There is also a chronic insufficient investment in farmers’ advisory services, and an insufficient training of trainers. Insufficient training programmes induce insufficient farmers’ knowledge on the agricultural system and its management. For instance, there is a widespread ignorance of:

- the existence of synthetic pesticides, their action, their use and their effects on the environment, biodiversity, soil live, crop quality and human health. This induces bad and dangerous use of these products;
- the practice of green manure and soil cover;
- natural methods of livestock parasite and disease control.

Training on no-till techniques is still not enough developed despite important efforts of FAO. Training on agroecology is of course inexistent yet.

Collaboration and exchanges between the Ministry of agriculture, research, extension services and farmers should be strengthened.

A new pesticide import control system has been recently created. The former system was run by Selkhozkhimia (the State Agency for Agricultural Chemicals) that owned specialized analysis equipment and trained staff. It collapsed under the weight of heavy debts and insufficient investment. The new system will take time to replace it.

More than 100 private suppliers of pesticides and mineral fertilizers work in the country, often with poorly equipped material and unprofessional staff. Good pesticide usage practices are rare, especially after the cancellation of licensing of this environmentally hazardous type of products in 2002, a decision that seems particularly unfounded.

The content of pesticides or heavy metals in agricultural soils is not monitored, and therefore there is no information on this issue. At the same time in the country, there are many problems related to agriculture development that could be affected on development of agroecological systems.

No funds are available for the development of organic and environmentally friendly products, for protecting the environment, improving nutrition and food safety and for the production of information and training materials for specialists of the agricultural sector, farmers, consulting services and students on these topics. The organisation of workshop, seminars and conferences would also be required.

After shifting of land from government to private ownership, many people who received plots became farmers. However, most of them did not grow in traditional farmer’s families. Before the collapse of USSR, they had other jobs for instance some were teachers, doctors, cultural workers, and others. All of them would need training in agriculture and agroecology.

Agricultural research and teaching is underfunded in Kyrgyzstan. Its budget is limited to 7-8% of total research funds while agriculture provides 25-30% of the country's GDP. These funds cover only salaries. A higher budget would be necessary for developing research on agroecology.

The Government agricultural policy should include agroecology, develop a medium and long-term program for its development and foresee economic mechanisms for supporting the transition and the development of agroecological systems.
The legislative and regulatory framework for agriculture in Kyrgyzstan does not include yet measures related to agroecology.

Some farmers have noticed a marked decline in soil live and biodiversity in their field in general. This is certainly related to an (inadequate) use of pesticides.

Soil remains generally uncovered between harvest of a crop and the sowing of the following crop. This practice negatively affects soil life, favours soil organic matter mineralization and prevent carbon storage in soils.

Farmers are not aware on the possibilities to make soil analyses and the importance of it.

Nitrogen fixation by legumes is underestimated by farmers. This leads to an excessive use of nitrogen fertilization on crops following lucerne for instance in the crop rotation and useless costs.

In some regions there is a trend to decrease the duration of crop rotations when there are opportunities to crop highly profitable crops such as beans or sugar beet. The proportion of these crops in the arable area is then increased at the expense of less profitable crops. This could lead to the development of weeds, pest and diseases. In Talas province for instance, an increasing proportion of bean monoculture in crop rotation will very likely lead to important disease problems in the medium term.

Efficient grazing management techniques are insufficiently known and used by farmers.

Management of irrigation water is not optimized. A lot of water is wasted through percolation in earth irrigation channels. New techniques should be introduced for sparing water.

Plantations of wind-break tree rows on adequate places (e.a. roads, paths) has been abandoned. Plantation should not be done at plot level but at landscape level which necessitates a coordination and collaboration among farmers.

There is an insufficient holistic design of the agricultural system by farmers. Good practices happen by accident. Bad practices can thus not be reduced.

Cooperatives for buying expensive machines and tools are rare. The consequence is a lack of good machines and tools. The lack of efficient irrigation tools is particularly flagrant.

Marketing strategies and initiatives should be enhanced for promoting and marketing quality product. Training should be intensified on this topic. Not enough products are processed in farms and sold in short marketing chains.
CHAPTER 8 RECOMMENDATIONS

Two types of actions could be undertaken:

- further developing and testing the methodology of the survey method and the indicator system in Central Asia;
- initiating a development project for scaling-up agroecology in Kyrgyzstan.

The survey method and the indicator systems demonstrated their potential for assessing the degree to which a farm is agroecological and for studying the development of agroecology in a region or a country. It is an efficient tool for following up the transition of farms and the farming sector towards agroecology. It provides also a measure of the performances of agroecological systems.

The methodology has however to be fine-tuned in other bio-physical, social and economic environments. Other Central Asia countries could be selected in priority for this task. This could be done with intellectual input from FAO teams in collaboration with Agroecology Europe.

On the other hand, since there are many favourable factors for developing agroecology in Kyrgyzstan, initiatives could be taken in this direction. The following activities are recommended for boosting the development of agroecology in this country.

There would be two priorities in the short term.

Given the potential of agroecology to significantly contribute to food security and the development of agriculture in Kyrgyzstan, given the many favourable factors for the implementation of agroecological systems and the interest of farmers, NGO and administration representatives, it would be desirable and realistic to develop an international project on “Agroecology for sustainable food systems in the Kyrgyz Republic”.

The first step in the preparation of this project would be to gather all interested stakeholders in a national conference and workshop on agroecology. This event could be co-organised by FAO ad the Ministry of Agriculture of the Kyrgyz Republic (MoA). It would aim at identifying possible partners of this international project and at starting to design its ambition, scope, methods and activities. This event could be organised in spring 2019 in Bishkek.

Other priorities would be the following in a longer term. Some of them could be integrated in the international project.

At national level

- Supporting the development of clear agricultural policy objectives in an agroecological context;
- Comparing and analysing legislations and drafting recommendations for improving them according to the agroecology principles;
- Supporting research and development initiatives at the Agrarian University and other research institutes, with the involvement of international experts and scientists;
- Creating a science-education department on agroecology (e.g. in the Kyrgyz National Agrarian University – KNAU);
- Providing support to international and local organizations active in agroecology for encouraging collaboration between national and international knowledge institutions, NGOs and research
institutes;
• Building capacity of specialists from MoA, other public departments, KNAU and NGOs;
• Creating an online web platform for exchanging knowledge, initiatives, experiment results, etc.;
• Developing guidelines on agroecological approaches and promoting them at local level;
• Organising an international conference on agroecology at Central Asia country level.

At regional level

• Creating regional information and training centres on agroecology;
• Supporting the introduction of innovative approaches in the field of agroecology (e.g. compost, compost tea, bio-preparations, complex mixtures of cover crops, direct drill, etc.);
• Developing guidelines on best agroecological practices and publishing leaflets, posters and other training materials.

At local level

• Providing training for farmers: farmers field days for dissemination of best local practices, demonstration plots, thematic workshops, implementation of farmer’s groups;
• Financially supporting and implementing local projects with farmers and farmer’s unions;
• Stimulating interactions between farmers, extension services, public administrations, private companies, and research institutions;
• Developing videos, mobile applications, TV programs, information materials on relevant topics;
• Supporting product processing and marketing.
REFERENCE LIST


