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Sustainable Consumption and Production Tools and Circular Economy Approach in the Agri-food Sector in Kyrgyzstan

Acknowledgement

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List of Acronyms and Abbreviations

AIC	Agro-Industrial Complex
CE	Circular Economy
EC	European Commission
EE	Energy Efficiency
EEC	European Economic Community
ELGP	End of Life Goods or Products
EMS	Environmental Management System, e.g., ISO14001 certified
ETS	Emissions Trading System
EU	European Union
EUMS	European Union Member State
FAO	Food and Agriculture Organization of the UN
GDP	Gross Domestic Product
GE	Green eEconomy
GEP	Green Economy Programme
GHGs	GreenHouse Gas(es)
GMO	Genetically Modified Organisms
ha	hectare
HSW	household solid waste
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPPM	Integrated Production and Pest Management
ISO	International Standards Organization
KR	Kyrgyz Republic
LLC	Limited Liability Company
MoA	Ministry of Agriculture
MoEC	Ministry of Economy and Commerce
MTS	Machine and Tractor Station
NGO	Non-Governmental Organisation
NLAs	Normative Legal Acts
PGS	Participatory Guarantee Systems
PPM	Process and Production Methods
RE	Renewable Energy
SCP	Sustainable Consumption and Production
SDG	UN Sustainable Development Goals
SMEs	Small and Medium-sized Enterprises
SWM	Solid Waste Management
T	tonne (metric)
TS	Technical Support
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
VAC	Value Added Chain
VC	Value Chain
WHO	World Health Organization

Foreword

Ministry of Agriculture of the Kyrgyz Republic

The Ministry of Agriculture of the Kyrgyz Republic is working to implement the principles of sustainable consumption and production (SCP) and green economy and along with other agencies is working in this direction in accordance with the National Development Strategy of the Kyrgyz Republic for 2018-2040, National Development Program of the Kyrgyz Republic until 2026, Green Economy Development Program in the Kyrgyz Republic for 2019-2023 and other strategic documents.

Integration of SCP approaches and circular economy, in particular in the agro-industrial sector, in the implementation of green economy policy is considered a priority for which EU- SWITCH-Asia provides support. The Ministry expresses its great gratitude to EU-SWITCH-Asia for analyzing the current situation in the agro-industrial sector and identifying challenges and opportunities for further joint work on the implementation of SCP in Kyrgyzstan by improving the SCP approach and the circular economy in the agricultural sector with a focus on the introduction of guidelines for green supply chain of agrifood products, introduction of production and consumption tools for production of quality/organic products.

The Ministry of Agriculture of the Kyrgyz Republic expresses its readiness for effective cooperation on the implementation of the concept of SCP in the national policy of the country, intends to fully support the adoption and implementation of measures for the transition to a “green” economy, climate change mitigation, to bring agriculture to a more sustainable level by applying international standards and best practices on SCP in the agro-industrial sector of Kyrgyzstan.

N.K. Alisherov

First Deputy Minister
Ministry of Agriculture of the Kyrgyz Republic

Introduction

Many developing countries in Asia and Central Asia are undergoing rapid industrial transformation, with a significant impact on the environment. Industrial sector activities, including the burning of fossil fuels, contribute to greenhouse gas emissions and waste, influencing climate change and natural disasters. It is thus an urgent task to change production and consumption patterns and decouple economic growth from environmental degradation, as well as address natural resource depletion. For this reason, the European Commission launched SWITCH-Asia, Promoting Sustainable Consumption and Production (SCP) in 2007 to support the transition to a low-carbon, resource-efficient circular economy.

SWITCH-Asia is the largest sustainable consumption and production (SCP) programme supported by the European Union, involving 24 countries in Southeast Asia, South Asia, Central Asia, and including Mongolia and China. In line with the European Green Deal priorities, the programme aims to promote sustainable and inclusive growth in Asia, decoupling it from environmental degradation, and to support Asian countries in their transition to a low-carbon, resource efficient and more circular economy, contributing to poverty reduction. The programme promotes the integration of sustainable consumption and production into relevant national policies, and supports the transition to a green economy (GE), poverty reduction and climate change mitigation.

The second phase of SWITCH-Asia was launched in 2018, and in July 2019 the programme was extended to five Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The last call for proposals was launched in 2019, and 23 new grant projects were awarded, of which seven focusing on the tourism, agri-food and textile sectors were awarded to the Central Asian region. The SCP Action Plan is structured as follows:

The programme, through a combination of and interaction among grant-funded projects, is expected to:

1. Increase the use of environmentally friendly technologies and practices by businesses,
2. Change consumer behaviour by introducing SCP principles,
3. Improve policy dialogue on SCP at national and regional levels in Asia with a common platform to promote SCP,
4. Initiate an active and continuous dialogue on SCP priorities and needs at national, regional and international levels through information exchange and training, and
5. Develop effective economic instruments that will strengthen SCP.

The SCP Facility of the SWITCH-Asia Programme Office established in Bangkok, Thailand, provides the coordination for the technical assistance activities for countries. The Central Asia regional office is located in Almaty, Kazakhstan, and serves as the liaison between the Central Asia region and the head office in Bangkok. Activities at the regional level aim to support SWITCH-Asia countries through the following:

- Incorporating SCP into national policies to promote GE strategies/concepts
- Raising awareness among all stakeholders through advocacy
- Promoting best practices to ensure future sustainable improvements in SCP models
- Building the capacities of government officials and other key stakeholders
- Increasing dialogue on local and regional SCP priorities
- Ensuring the adoption of cleaner technologies and practices

The intensive use of natural resources in Kyrgyzstan has certainly contributed significantly to economic growth in the short term, but it is important to understand that in the long term such practices will lead to an overall negative impact: widespread poverty and deteriorating public health from polluted air and poor-quality drinking water along with critical food and energy shortages.

Kyrgyzstan has participated in global sustainable development processes and developed its first Voluntary National Review (VNR) for the 2020 High Level Political Forum (HLPF). The government has introduced

various policies to promote the principles of green economy in the Kyrgyz Republic, aiming to achieve the United Nations Sustainable Development Goals (SDGs) by introducing a sustainable consumption and production (SCP) approach for medium- and long-term policies.

A green economy is defined as an economy that results in improved human well-being and social justice, while significantly reducing environmental risks, preserving and enhancing natural capital, using resources efficiently, and encouraging conservation of a country's natural ecosystems. In a green economy, income and employment growth is driven by public and private investments to reduce carbon emissions and pollution, create green jobs, and increase efficiency in the use of energy, resources, and ecosystem services.

The concept 'Kyrgyzstan – a country of green economy' was adopted by the Zhogorku Kenesh on June 28, 2018 (No. 2532-VI), and the next stage was the development of the Green Economy Development Programme for the implementation of the green economy for the period 2019–2023. The programme identified seven priorities: green energy, green agriculture, low-carbon transport, green industry, sustainable tourism, green cities, and waste management. This is a unique opportunity to integrate SCP principles and circular economy approaches into national policies and sectoral plans, as well as to support the implementation of the seven priorities and the achievement of the SDGs in Kyrgyzstan.

Integration of SCP and circular economy approaches, particularly in the agro-industrial sector via the implementation of green economy policies, is considered a priority for which EU-SWITCH-Asia is providing support. The objective is to facilitate the implementation of SCP in Kyrgyzstan by improving the SCP approach and the circular economy in the agro-industrial sector with a focus on the implementation of greening the agri-food supply chain and implementing production and consumption tools for quality/ organic production.

Chapter 1 of this document introduces the topic of SCP, its relationship to environmental and other policy documents and higher-level goals, as well as the many SCP tools and measures that can help identify practical actions to improve resource efficiency, reduce waste, replace potentially harmful resources with safer ones, and reuse and recycle end-of-life products. One of the main aspects of applying SCP is to pay attention to industry-specific 'value chains' that include all stages of production, use (consumption), management and end-of-life disposal of products. These are defined at the national level, based on the economic structure of the country.

Chapters 2-4 provide an overview of existing policies related to SCP and circular economy in the Kyrgyz agribusiness, also mapping organic products using international experience with the provision of several lines of domestic products.

In Chapter 5, guidelines are provided for the greening of the supply chain of agro-food products to increase the production and consumption of organic products in Kyrgyzstan.

In Chapter 6 reports on activities conducted for stakeholders and representatives of the Ministry of Agriculture (MoA) and the Ministry of Economy and Commerce of the Kyrgyz Republic (MoEC), to familiarize them with SCP approaches to greening the agri-food supply chain and to support SMEs (small and medium-sized enterprises) in minimising the use of natural resources, toxic materials and in reducing the generation of waste and pollutants during the life cycle of products.

In Chapter 7 recommendations are given in support of SMEs to improve resource efficiency.

Annex 1 lists the Sustainable Development Goals (SDGs) relevant to the implementation of SCP in the Kyrgyz Republic; Annex 2 gives a visualisation of the circular economy in the form of the butterfly diagram visualising the circular economy.

Finally, Annex 3 provides the agenda and a summary of events of the seminar held on May 26, 2022 in Bishkek for representatives of SMEs and government agencies, as well as the roundtable held on June 15, 2022 at the Kyrgyz Ministry of Agriculture to familiarize representatives of state agencies with the results of the analysis of SCP tools on greening the supply chain of agri-food products in support of SMEs in order to transition to a circular economy.

1. Sustainable Consumption and Production (SCP)

One of the Sustainable Development Goals (SDG 12) proposed by the Open Working Group of the UN General Assembly focuses on responsible consumption and production (SCP) and involves:

- Promoting resource and energy efficiency
- Creating sustainable infrastructure
- Providing access to basic social services
- Ensuring green and decent jobs and a better quality of life for all

Achieving SDG 12 is key to achieving all 17 SDGs, as it sets the direction for many of them and is a prerequisite for sustainable development. Many countries around the world have already begun to transition to more sustainable consumption and production patterns as the world's population grows rapidly, requiring very large resources and supplies (Figure 1).

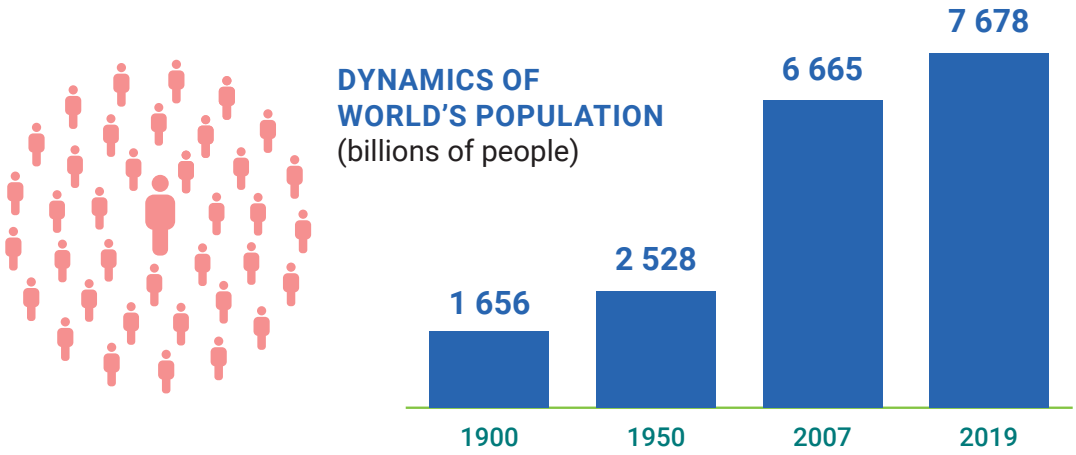


Figure 1. Evolution of the Earth's population *(Source: www.tvoiklass.ru)*

The SDG 12 process needs to be expanded and accelerated immediately through initiatives and strategies at both the national and regional levels.

The solution to overconsumption is to move to a **circular economy** model. This means moving away from the 'take-make-throwaway' model to one in which **waste is not thrown out of the system, but is reused and recycled many times**. This in turn means using fewer resources more efficiently, and designing and producing products that can be repaired, reused, or remanufactured, lengthening their life cycle.

1.1. Definition of Sustainable Consumption and Production (SCP)

The Oslo Symposium in 1994 proposed a working definition of SCP as *'the use of services and related products which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emission of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations.'*[1]

In 2011, the United Nations Environment Program (UNEP) amended the SCP definition as follows: 'a holistic approach to minimising the negative environmental impacts from consumption and production systems while promoting quality of life for all.'[2]

1 Oslo Symposium, 1994: https://enb.iisd.org/consume/oslo004.html

2 UNEP [no date], https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies See also:https://www.unep.org/explore-topics/resource-efficiency/about-resource-efficiency UNEP, 2015, Sustainable Consumption and Production: A Handbook for Policymakers, p. 9-11. The online PDF may be freely downloaded here: https://wedocs.unep.org/handle/20.500.11822/9660

Three fundamental SCP concepts may be extracted from the above definitions:

- **Resource efficiency**
- **Substitution with safer raw materials and supplies**
- **Circularity**

UNEP suggests four SCP principles as a guiding framework for analysis and policy action:

1. Improving the quality of life without increasing environmental degradation and without compromising the resource needs of future generations
2. Decoupling economic growth from environmental degradation by:
    - Reducing material/energy intensity of current economic activities and reducing emissions and waste from extraction, production, consumption and disposal
    - Promoting a shift of consumption patterns towards groups of goods and services with lower energy and material intensity without compromising quality of life
3. Applying life-cycle thinking which considers the impact from all life-cycle stages of the production and consumption process
4. Guarding against the re-bound effect, where efficiency gains are cancelled out by resulting increases in consumption[3]

Drawing on the three fundamental concepts of **resource efficiency, substitution,** and **circularity,** SCP may be seen as a delivery agent for a national Green Economy (GE); see Figure 2.[4]

Figure 2. SCP, together with circularity, contributes to delivering a Green Economy
(Source: Sustainable Consumption and Production Action Plan for the Republic of Kazakhstan, SWITCH-Asia 2022)

Each of the three concepts is described below[5].

Resource Efficiency (less consumption): reduce the consumption of energy, water and materials in production; and design, buy and use fewer resource-intensive products. Some examples:

- Use less energy, water and materials in production
- Use fewer resource-intensive products in design and procurement; for example:
    - Increase the energy efficiency of buildings by improving their insulation

3 UNEP, 2015, Sustainable Consumption and Production: A Handbook for Policymakers, p. 9-11; see also https://www.oneplanetnetwork.org/sites/default/files/briefings_on_scp.pdf
4 UNEP [no date], https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies
5 UNEP, 2011: https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies
Key publications and tools for a general understanding of Sustainable Consumption and Pro-duction are available online, including: ABC of SCP, UNEP, 2010, https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=945&menu=1515; Global Outlook on SCP policies, UNEP, 2012.;-- See also www.switchasia.eu

- Introduce water-saving techniques to reduce the net freshwater consumption in agricultural and industrial production
- Optimise product design and manufacturing operations so that fewer resources are consumed in making and using consumer products

- Consumers purchase resource-efficient products (incentivised by eco-labelling, informational messaging, targeted communications campaigns, etc.)

Substitution (Use Better):[6]

- Use harmless or less harmful resources to produce goods and services; e.g., produce, buy, and use paints that contain fewer, or are free of, organic solvents
- Generate electricity using renewable energy sources instead of fossil fuels, such as solar panels and wind power plants

Circularity ('From Cradle to Cradle'):

- Save resources by recycling or reusing a product or waste stream or product
- Recover and dispose of waste streams (solid, liquid and gaseous) in design, production, end-of-life product management, and consumer behaviour
- Design products for low-resource consumption while in use, and for durability, repairability, and ease of end-of-life disassembly (i.e., 'circularity')
- Apply a value-chain (VC) approach in key sectors, including measures to reduce all forms of waste systematically, and reuse or recycle whatever waste is produced
- Implement the necessary systems and infrastructure to enable the recovery and reuse/recycling of constituent components and materials from products that have reached the end of their lives

Understanding each of these concepts helps to appreciate and recognise the systematic, deep-seated changes in behaviour and practice achieved through SCP. There is a shift away from 'business as usual'.

A feature of SCP is the recognition and emphasis of the role of producers and consumers, which includes government, institutions, members of the public, and businesses.

1.2. Economic models – linear and circular models

1.2.1. Linear economic model

The linear economic model[7] is an economy in which almost no attention is paid to minimising the consumption of resources, and there is no recycling of materials, no measures to prevent waste and emissions into the atmosphere, and no increase in the efficiency of the use of all kinds of resources. The dominant economic model until the 21st century and still current in many countries, including Kyrgyzstan, is the linear economy – 'take-make-use-send to landfill'. In a linear economy, up to 90% of the raw materials used to produce a product are lost, and this is known even before the product comes off the assembly line. Statistics show that 80% of consumer products end up in the trash within 6 months of manufacture (See Figure 3).[8]

6 UNEP, 2011: https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-consumption-and-production-policies
7 https://vk.com/wall-54372460_20696 (in Russian).
8 Mashukova B. S. Basic principles of cyclical economy (circular economy) // European science. 2016. No. 7. https://cyberleninka.ru/article/n/osnovnye-printsipy-tsiklichnoy-ekonomiki-ekonomika-zamknutogo-tsikla (in Russian).

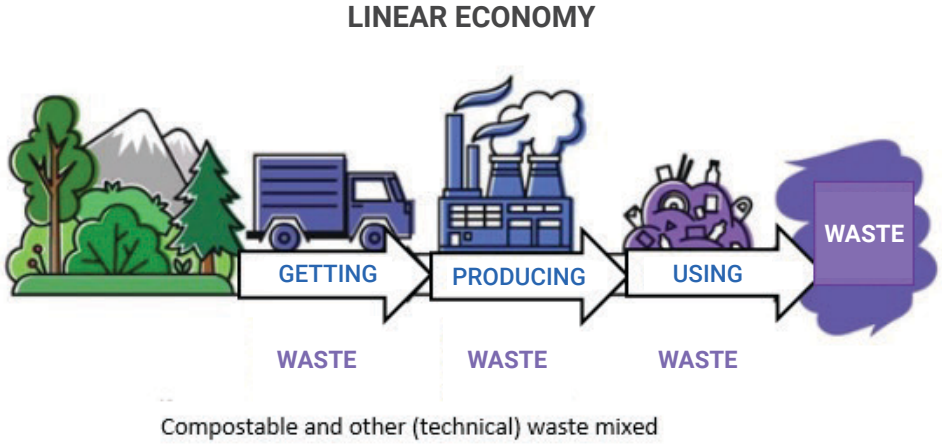


Figure 3. Schematic diagram of a linear economy mode *(Source: www.viafuture.ru)*

1.2.2. The circular economic (CE) model (a closed-loop economy model)

An alternative to the linear economy is the circular economy (CE),[9] which is based on the renewal and reuse of natural resources. But we should distinguish between recycling and CE.

Recycling is the process of converting waste into reusable materials, which begins at the last stage of the product's life. Thus, CE focuses on preventing waste. However, closed-cycle economics is more than waste management: it is an entire philosophy of recycling and profiting from what used to be considered unnecessary and/or disposable.[10] A schematic of the CE model is shown in Figure 4 and Annex 2 as a visualisation of the circular economy – the butterfly diagram.[11]

The CE model affects all sectors of the economy, for example:

- **Primary sector:** agriculture and forestry, fishery, water withdrawal, coal and ore mining, stone quarrying, oil and gas extraction
- **Secondary sector:** processing of primary raw materials and foodstuffs, purification of fresh water for supply purposes, oil and gas refining and petrochemical production, energy conversion processes, including electricity and heat production from fossil fuel combustion and coke production, as well as production and output of all kinds of goods and packaging materials for sale
- **Tertiary sector:** distribution and supply of goods and services, public transportation, sewer and wastewater utilities, municipal solid waste disposal facilities, retail trade, health and educational facilities, and the provision of all types of services, including public administration at the national and local levels
- **Consumers:** Government and institutions, households, hospitality industry, all industry users of goods and services, whether produced domestically or imported, and all external users of goods and services exported from Kyrgyzstan

9 Wikipedia article, Экономика замкнутого цикла [in Russian].
10 Sokolova A. V. Relationship between the Phenomenon of Freeganism and the cyclical economy. https://cyberleninka.ru/article/n/vzaimosvyaz-fenomena-friganstva-i-tsiklicheskoy-ekonomiki (in Russian)
11 From the report of the international expert R. Frost on the preparation of the AMR Action Plan for the Republic of Kazakhstan.

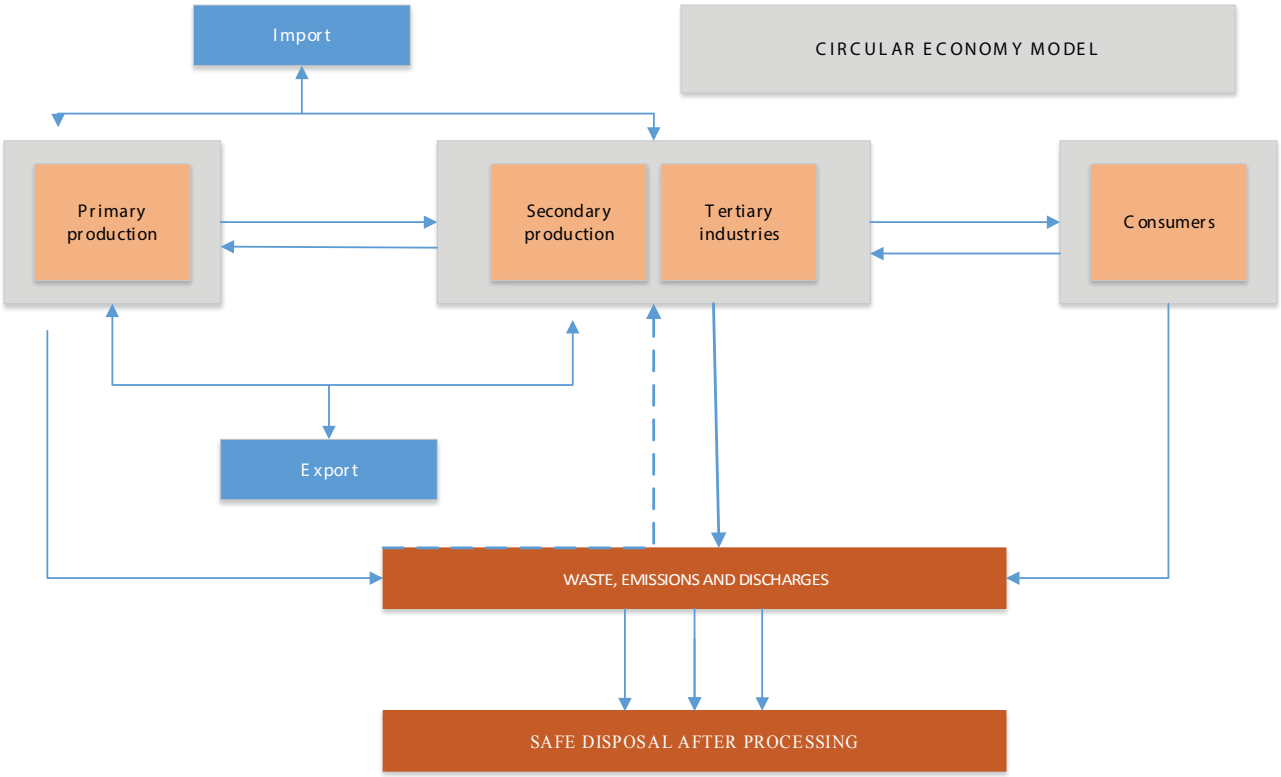


Figure 4. Circular economy model diagram *(Source: Russian Economic Bulletin 2020)*

A CE[12] or (closed-loop economy model) is an economy that successfully ***decouples economic growth from resource consumption and greenhouse gas (GHG) emissions***, reaching or approaching a state of sustainability – and it is the opposite of the linear 'take-make-use-send to landfill' model.

1.3. The experience of EU countries

Many countries are already in the process of transitioning to CE. Some experiences of transition to CE are seen in examples within the European Union.

The Netherlands. The Government has set goals to halve the consumption of primary raw materials by 2030 and to transition to CE by 2050,[13] which will require a change in the way raw materials are used. In order to transform the economy into a CE at an accelerated pace, the State Program for CE of the Netherlands by 2050 set out three strategic objectives:

- To make the transition from non-renewable sources to sustainably produced renewable (inexhaustible) sources
- To use available raw materials more efficiently
- To develop new production methods that reuse existing resources

In 2019, the Netherlands was recycling 53% of household waste, and the percentage of recycled packaging was 73%.[14] Currently, many raw materials are imported from abroad. Because of the international dependence on supplies of important raw materials for industry as well as food, the Netherlands is vulnerable to supply chain problems. In a CE, the Netherlands will be much less dependent on other countries. In the future, materials that previously used to be destroyed or sent to landfill or incinerators will be reused.

12 https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/573899/EPRS_BRI%282016%29573899_EN.pdf
13 A Circular Economy in the Netherlands by 2050. Summary. 2016. https://www.oecd.org/environment/ministerial/whatsnew/2016-ENV-Ministerial-Netherlands-Circular-economy-in-the-Netherlands-by-2050.pdf
14 ECOPRENEUR.EU (European sustainable business federation), 2019, Final Report – Circular Economy Update. https://circulareconomy.europa.eu/platform/sites/default/files/ecopreneur-circular-economy-update-report-2019.pdf

Finland. The Finnish roadmap to a circular economy 2016-2025, which was published in 2016, was one of the world's first national documents on CE.[15] In 2019, 65% of packaging and 42% of municipal waste were recycled in Finland. And in April 2021, Finland passed a resolution to implement a circular economy. By 2035, the Finnish government plans to reduce the consumption of natural resources, thereby strengthening the country's role as a leader in CE. Increasing the reuse of resources can provide the Finnish national economy with a growth potential of EUR 2–3 billion by 2030.

One example of a partnership in the circular economy is the Digipolis project, which brings together the University of Lapland, the city of Kemi, the Finnish Innovation Fund Sitra, and industrial parks. Such cooperation allows a more efficient use of available resources, as well as exploring the obstacles that stand in the way of CE in the industrial sector.

Sweden. In 2018, the Royal Swedish Academy of Engineering presented its Resource Efficiency and Circular Economy project to create a platform for identifying and connecting initiatives related to CE. In 2019, Sweden recycled 49% of household waste and 68% of packaging. The Swedish government adopted a national strategy for the circular economy in 2020, which sets out directions and goals for the long-term and sustainable transition of Swedish society. This is an important step toward Sweden becoming the world's first fossil-free welfare state.

The Swedish Minister of Environment and Climate noted that 50% of global emissions and more than 90% of global water shortages and loss of biodiversity are the result of ineffective resource management. According to the minister, CE will not only preserve Sweden's nature, but also allow the state to create opportunities for new jobs and sustainable business.

Estonia. Estonia has adopted a development strategy for the period 2021–2027, under which the focus for the energy sector will be on increasing the share of renewable energy sources in the industrial sector, as well as on increasing energy efficiency and resource productivity. The objectives have necessitated a transition to CE. According to the Director General of the Estonian Association of Circular Economy Industries, after the pandemic caused by COVID-19, it is necessary to not restore the outdated linear economy, but to introduce a new model of CE, since the reuse of resources will make it possible to balance the budget and protect the environment.[16] Estonia plans to move to a climate-neutral, resource-efficient circular economy by 2050, and has already had success in this area at this stage: in 2019, 56% of packaging and 28% of household waste were recycled in Estonia.

Data on recycling and reuse of materials in the above countries are shown in Fig. 5.

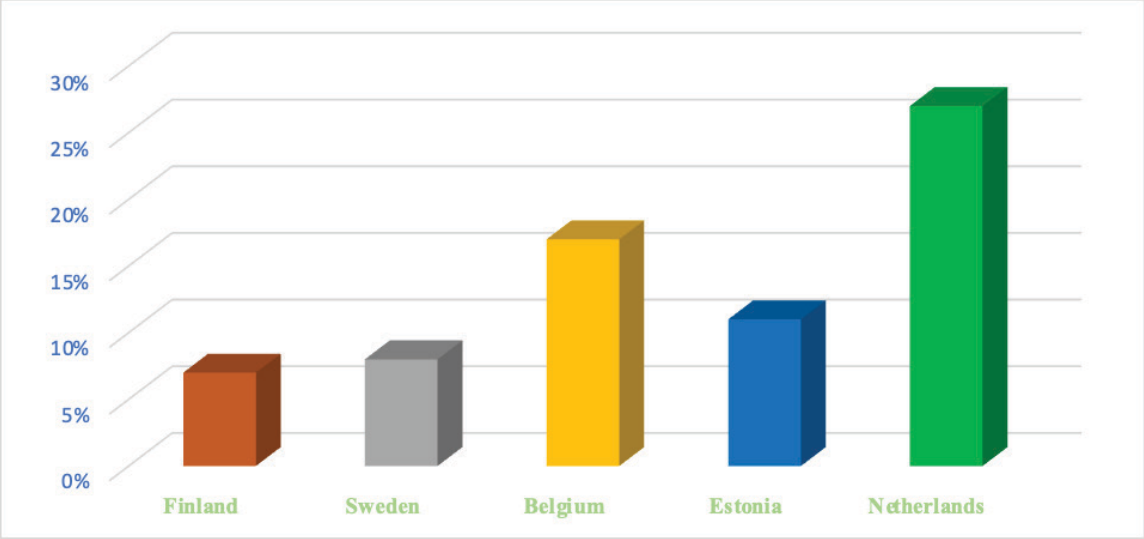


Figure 5. Recycling and reuse of materials in 2020
(Developed by the author according to *the circular economy ranking*[17])

15 https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025/
16 Estonia is turning to the circular economy. 2021. https://www.interregeurope.eu/resindustry/news/news-article/12297/estonia-is-turning-to-the-circular-economy/
17 The circular economy ranking: https://www.politico.eu/article/ranking-how-eu-countries-do-with-the-circular-economy/

We should also note the role of environmental certification and labelling in the transition to CE models and sustainable production and consumption models, which are also actively developing in the EU countries.[18]

Thus, in the past few years, the transition to the CE model is becoming more and more relevant and is being implemented both as part of national programmes and as joint projects between business and government. The EU is one of the leaders in the implementation of the CE model, and is achieving results in reducing the technogenic load on the environment.

18 Aliev R.A., Grazion K.P. The role of environmental certification in the transition to models of rational production and consumption // Waste and Resources, 2018 № 3, https://resources.today/PDF/03ECOR318.pdf (in Russian).

2. Overview of existing policies related to SCP and the circular economy (CE) in the agribusiness sector

2.1. The current situation of the agro-industrial sector worldwide

Globally, the agri-food sector is an approximately USD 6 trillion industry that feeds the planet and employs over 40% of world population.[19] The agri-food sector includes the entire production cycle from the field to the consumer's table. In recent decades, however, as a result of industry policies and industrialisation to increase production and profits, large advanced economies have created serious environmental impact and degradation due to emissions resulting from growing, processing, loss of materials, inefficient energy use and waste generation.[20]

According to scientists, modern agriculture (in particular industrial crop production and industrial livestock production) is the single most climate-altering human activity, accounting for about 25% of all GHGs (Willet et al., 2019). When GHGs from agriculture are combined with emissions from land use change and food transformation, the share attains 30–35% of all GHGs (Eaglesham, 2011; Bajzelji et al., 2014; Foley, 2016). By 2050, in a business-as-usual scenario, this share is expected to reach 50% as demand for food increases and the population grows (Willet et al., 2019).

The agri-food sector is also a major contributor to the depletion of key non-renewable resources through air pollution, degradation of land, soil and water, and the reduction of biodiversity around the world.[21]

In turn, the supply of increasingly cheap and abundant food of animal origin and highly processed foods has contributed to a widespread shift toward unhealthy diets in both developed countries and major emerging economies. This has contributed to the escalation of obesity and nutrition-related non-communicable diseases, with an increasing impact on private and public finances worldwide (WHO, 2018; Etemadi et al., 2017). In several other countries, the global food supply system has created or reinforced rather than eliminated distortions, resulting in chronic malnutrition for several hundred million people. As a result, many large developed and emerging economies are simultaneously over- and undernourished (WHO, 2014). By 2050, the world's population is expected to grow to nearly 10 billion people, increasing the demand for agricultural products – under a moderate economic growth scenario – by about 50% compared to 2013 (UN, 2017). Also, rising incomes in low- and middle-income countries will accelerate the nutritional transition to higher animal protein consumption compared to plant-based protein, which will require commensurate changes in production and increased pressure on natural resources (Bajzelji et al., 2014; Willett et al., 2019). Reducing biodiversity at an exponential rate is posing serious risks for the future of global food and agriculture: the overall diversity of crops and livestock has declined over the past 50 years due to the expansion of industrial monoculture and global seed patenting, and consequently the composition of the global diet has become more homogenous as shown in a 150-country study (Khouri et al., 2016).

While 6000 plant species are cultivated for food, only nine of them account for two-thirds of all crop production. As for livestock, about a quarter of breeds are endangered: only a few breeds provide the vast majority of meat, milk, and eggs, and more than half of fish stocks are threatened with extinction (IPBES, 2019).

19 McKinsey, 2015; Food and Agriculture Organization, 2018; Euler Hermes, 2019.

20 Willet et al., 2019 Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems - PubMed (nih.gov).

21 Bajzelji et al., 2014; De Longe et al., 2015; Hyner, 2016; USDA, 2015; Food and Agriculture Organization, 2018 & 2019; IPBES, 2019.

Lack of dietary diversity is an additional threat to food security and human health. Wild food species are also rapidly disappearing: just under a quarter of known wild food species survive today. In addition, species that contribute to the food ecosystem, such as pollinators, soil organisms and natural enemies of pests, are under serious threat.

Examples include bees, butterflies, bats, and birds (Food and Agriculture Organization, 2019; IPBES, 2019). Finally, while the share of agriculture in total world output and employment continues to decline at varying rates, the acceleration of productivity growth that is needed to match supply with demand is hampered by the degradation of natural resources, loss of biodiversity, and the spread of transboundary plant and animal pests and diseases, some of which are leading to the spread of zoonotic outbreaks such as avian and swine influenza, and others are becoming resistant to antibiotics with potentially pandemic consequences (O'Neill et al., 2016).

Research shows that to achieve global sustainability of agri-food systems, two endpoints of the global food system must be addressed simultaneously: final consumption (healthy eating) and production (sustainable food production).[22]

First, it is essential that a large-scale transition from conventional agriculture to agricultural practices that support biodiversity, such as organic farming, sustainable soil management and ecosystem restoration take place. Innovative systems that protect and strengthen the natural resource base while increasing productivity are needed, which implies a process of transformation toward 'holistic' approaches such as agroecology, agroforestry, climate-smart agriculture and conservation agriculture, which also draw on indigenous and traditional knowledge.

Technological improvements along with dramatic reductions in the use of fossil fuels in the economy and agriculture will help address climate change and the increasing natural hazards that affect all ecosystems and all aspects of human life. Such a shift would restrain and potentially reverse some of the dangerous dynamics that have emerged over the past few decades from the spread of conventional farming practices, namely the anthropogenic non-linear acceleration of the biogeochemical nitrogen (N) and phosphorus (P) cycles, unsustainable use of global freshwater, the way land systems are changing as forests are cleared to become monocrop fields or pasture for livestock, and the accelerating rate of biodiversity loss associated with the relentless expansion of agricultural land and use of synthetic pesticides and herbicides. In addition, around 14% of food produced worldwide is lost at all stages, from harvest to market. Another 17% of food is spoiled or ends up in the trash in consumers' homes, factories, stores or catering facilities. The problem of food waste, according to the FAO representative, is a global one and not just for rich countries.[23] Food loss and food waste are often caused by inadequate packaging or improper storage, and they exacerbate the wasteful use of water, land, energy, and other natural resources spent to produce food. Moreover, the use of these resources in conventional agriculture causes about 4.4 gigatons of greenhouse gases to be released into the atmosphere each year.[24]

Second, it is necessary to reconcile a significant reduction in the production of food of animal origin with a rapid increase in the production of food of plant origin. In fact, this will imply a significant reduction in the world's livestock population (currently over 77 billion head for a global human population of 7.6 billion). Livestock enteric fermentation is a major cause of agri-food GHGs, along with land-use change associated with the expansion of agricultural land at the expense of forested areas, which has been shown to contribute decisively to the reduction of carbon sinks on the planet and the disastrous trend of global and regional biodiversity loss.[25]

UNEP characterises the green economy as a low-carbon economy that uses resources efficiently and is in the interest of all society. In a green economy, public and private investments must also be 'green,' that is, they must reduce carbon emissions and pollution, increase energy and resource efficiency, and prevent the reduction of biodiversity and ecosystem services.

22 Willet et al., 2019. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems - PubMed (nih.gov).
23 https://news.un.org/ru/story/2021/09/1410882 (in Russian)
24 https://www.tetrapak.com/campaigns/go-nature-go-carton/challenges/product
25 Food and Agriculture Organization, 2019; World Bank, 2019.

2.2. Central Asia

The 'linear economy' prevails in the countries of Central Asia – 'take-make-use-send to landfill', although Since 2015, some Central Asian countries have begun to sign international commitments, such as the 'Paris Agreement', 'Cooperation with the European Union' and within the framework of these agreements' programmes, strategies, plans for their implementation are developed.

For example, in Kyrgyzstan at the state level there are virtually no programmes or NLAs (normative legal acts) to implement SCP approaches, and only the development programme 'Green Economy' in the section 'Agriculture' focuses on the conservation and improvement of soil fertility and implementation of organic standards at all stages of the supply chain. However, 'Organic Agriculture' that is more familiar to the country can, but not always, contribute to SCP. For example, the standards of organic agriculture can mandate use of only organic production materials or ban of pesticides and mineral fertilisers. Yet, such practices are not necessarily paying attention to use of water, energy, packaging or practices along the supply chain.

Due to the lack of understanding, experience and lack of awareness of the concept of SCP, many countries in Central Asia in agriculture are implementing the standards of organic agriculture. This chapter presents the experience of development and implementation of organic agriculture in the countries of Central Asia.

2.2.1. Organic agriculture/introduction of SCP practices in Kazakhstan

The Foundation for the Integration of Ecological Culture (FIEC) together with Realinvestgroup.kz in June 2013 decided and officially registered the federation 'KazFOAM' (Kazakhstan Federation of Organic Agriculture Movements; kazfoam.org). The total area of organic land in Kazakhstan is about 300,000 ha and produces more than 25 organic crops. About 16% is exported, more than 19 companies are engaged in the production of organic crops. In 2013 the market volume of Kazakh organic products was estimated at 95 billion tenge, or about USD 51 million (HWA/Austria 2018 data).

2.2.2. Organic agriculture, promotion of SCP practices and circular economy models in Tajikistan

Organic agriculture in Tajikistan was initiated in 2009 in the framework of the Organic Produce Development Project (OPDP) with the support of the donor organisation ICCO/Holland and Helvetas Tajikistan. In January 2012 the consumer cooperative 'Biokishowars' was established, located in Khuzhand. The main partners of the project are 'Sugdagroserv Organic', 'Barakot-Isfara' and 'Oro-Isfara'. Production of PC 'Biokishovarz' has obtained an organic EU certificate and Fairtrade certification. The certifying body is KIVA Germany and FLO-CERT. Organic apricots are exported to Europe and Japan (HWA/Austria data 2018).

2.2.3. Introducing circular economy models for sustainable agriculture in Uzbekistan

Silk Road Organic Foods, a subsidiary of the Austrian firm MARAP, was founded in 2003 and is located in Samarkand. It has EU organic certificates, also Fairtrade certificates for the production of dried cherries. MARAP occupies the first place in production with 95% of the world market. In season the company processes about 1000 t of cherries and 20 t of apricots, which are exported to 45 countries in Europe, America and Asia (data from HWA/Austria 2018).

2.2.4. History of the development of organic production in Kyrgyzstan

Organic production in Kyrgyzstan was started in 2003 under the project 'Development of production and promotion of organic cotton trade' (Bio Cotton) with the financial support of donor organisations SECO, Hivos, ICCO and Helvetas/Kyrgyzstan. In 2007, a public foundation 'Bio Service' was established to provide advisory services on organic production and internal control. In 2008 the first cooperative 'Bio Farmer' was created for the production and export of organic cotton to the EU. In general, throughout the country several cooperatives and private farms have been created for the production of organic apricots, plums, garlic and for the collection of wild walnuts. In 2012, the Federation of Organic Movement of Kyrgyzstan (FOM 'BIO-KG') was created, which is an umbrella and consolidating organisation of producers on the initiative of organic participants. In 2018, there were 1107 farmers engaged in organic production.[26]

26 Ministry of Agriculture, Kyrgyz Republic data for 2020.

Laws and standards

In 2019 the Law 'On Organic Agricultural Production in the Kyrgyz Republic' was adopted. **The second version of the law 'On Organic Production' has been developed** and is under consideration by the Cabinet of Ministers of the Kyrgyz Republic.

In July 2021, by Presidential Decree № 25 of February 8, 2021, **national organic and ecological standards** were adopted in the field of agricultural production and food safety.

The Department of Organic Agriculture was established under the Ministry of Agriculture of the Kyrgyz Republic with seven regional branches, which implement this policy throughout the country. The Department created and keeps a register of producers of organic products, but does not have either the resources or the legislative framework for the implementation of such measures.

Domestic market

There is no willingness to pay for organic products, but there is a need for clean products. For example, KH 'Eco-farm' has created 3 offline and 1 online store with the brand name 'Ecomade', where they accept agricultural products by checking with portable mini-equipment to detect nitrates, such as dried fruits from farmers who passed the organic certification (https://loya24.ru/ecomade) such products sell as 'clean products', and are more expensive by 10–15% than traditional products; however, they are still cheaper than organic products by 50%. A as a rule people are not aware of organic products, and they are not willing to pay for a higher-priced category of foods in recognition of different production systems.

Import

Currently, there are no organic products or raw materials that are specifically imported for sale in the organic market.

Export market

Kyrgyzstan is among the world's suppliers of organic cotton, producing 6.8% of the world's supply, with an annual production of 8019 t in 2017. More than two-thirds (66.8%) of national cotton production is certified as organic. The total area devoted to organic cotton cultivation in 2017 was 7920 ha, of which:

- 6929 ha are planted in organic cotton;

- 991 ha are in transition to organic production.

A total of 1009 farmers are involved in the production of organic cotton. In 2020, 340 t of cotton was exported to the EU, with the expectation that another 100 t would follow by the end of the year.[27] There is some speculation that a significant amount of traditionally produced cotton from the country enters the EU markets, after the fraudulent purchase of organic product accreditation. Many farmers adhere to the organic principles of production following the general rule because they do not have the funds for mineral fertilizers and pesticide, in some areas, there is still a legacy of the Soviet systems, under which cotton is grown using large quantities of pesticides, which can have a serious detrimental effect on biodiversity, leaving toxic residues in the soil. Except organic cotton their other agricultural organic crops for exporting:

- beans
- rice
- walnuts
- pistachios
- capers
- honey
- dried apples
- prunes
- apricot
- medicinal valerian

27 Source: BioCotton Cooperative, Kyrgyz Republic.

Organic crops and the area of their cultivation in the Kyrgyz Republic, including aimaks (areas) working under the PGS system (guarantee participation – the principle of voluntary control of using pesticides.)

Table 1. Organic crops and growing area in the Kyrgyz Republic

Culture	Area (ha)	Standards
Cotton	11,155	Organic
Beans	624	PGS system
Wheat	236	PGS system
Shelled walnuts	175	Organic/wild culture
Rice	57	PGS system
Fruits and vegetables	41	PGS system

Certification of organic production

Despite the government's stated commitment to organic agriculture, the country does not have certification protocols or organisations that can provide the necessary robust accreditation that is acceptable in international markets.

Organic certification relies heavily on donors, as funding for certification comes from international organisations rather than from farmers, processors or other actors in the value chain. As a result, accreditation is carried out by foreign certification bodies/agencies authorised under the laws of the importing country. The list of control bodies authorised by the EU to accredit organic production in Kyrgyzstan is shown in Table 2.

Table 2. Foreign certification agencies operating in Kyrgyzstan (Source: trademap, 2019)

Name (Country of origin)	Code number	A: Non-processed plant products	B: Live animals or unprocessed animal products	C: Processed agricultural products for use as food	D: Processed fodder products	E: Vegetative planting material and seeds for cultivation
AGRECO R.F. GÖDERZ GmbH (Germany)	KG-BIO-151	X	X	X	-	-
bio.inspecta AG (Switzerland)	KG-BIO-161	X	-	X	-	-
CCPB SRL (Italy)	KG-BIO-102	X	X	X	X	-
CERES (Germany)	KG-BIO-140	X	-	X	-	-
Control Union (Netherlands)	KG-BIO-149	X	X	X	X	X
Ecocert SA (France)	KG-BIO-154	X	X	X	X	-
ECOGLOBE (Armenia)	KG-BIO-112	X	X	X	-	-
Kiwa BCS (Germany)	KG-BIO-141	X	X	X	X	-
Letis SA (Argentina)	KG-BIO-135	X	-	X	_	_
ORSER (Turkey)	KG-BIO-166	X	_	X	_	_
Organic Standard (Ukraine)	KG-BIO-108	X	X	X	_	_

Lack of certification

The biggest obstacle for organic farmers in the Kyrgyz Republic is the lack of a reliable, accessible and internationally recognised organic certification system in the country. As mentioned above, initiatives have been taken by various projects that started the process, but certification is still a huge gap in the value chain for producers. Due to the lack of certification, farmers and producers of organic products cannot enter international markets, despite the natural products grown without the use of chemicals. With the support of various projects, farmers have participated in international agri-food fairs, where there was a great demand from food retailers. The cost of certification is likely to be prohibitive for small farmers, preventing them from gaining access to these markets. Donor organisations have played and continue to play an important role in supporting the development of organic agriculture, which supports the technical part, that is, funding producers in obtaining organic certification.

2.3. Policy and legislative framework for the introduction of SCP in Kyrgyzstan

2.3.1. The concept of green economy in the Kyrgyz Republic (KR): 'Kyrgyzstan is a country of green economy'

KR accepts that the GE in the context of sustainable development and poverty eradication will increase the ability to use natural resources rationally with less impact on the environment, and to increase the efficiency of resource use and reduce waste.[28] GE is defined as an effective tool for fighting and reducing poverty through new opportunities for cooperation and access to cheaper technologies for energy, food, shelter, and other vital needs of developing countries without further environmental degradation.

In the framework of the Concept of Green Economy in KR ('Kyrgyzstan – the country of green economy'), the country recognises that most of the agricultural land and pastures in the Republic are subject to degradation and anthropogenic erosion due to intensive and improper use. A significant area of pastures in Kyrgyzstan (25% of the total area) is moderately to severely degraded due to excessive pressure from increased livestock, and the yields of summer and winter pastures over the past 50 years have decreased by 3. There has been a 20% reduction in the area of the national forests.[29] Despite the fact that the rural population in Kyrgyzstan is 66% of the country's total population, agriculture contributes only 15% of the value added to GDP.

Due to the use of uneconomical surface irrigation methods in agriculture, irrigation water is used extremely inefficiently for irrigation, and due to the poor condition of irrigation systems, 25% of water is lost during its transportation from abstraction sources, where 98% of the total volume of water consumed is used for the needs of the country's agricultural sector. In turn, KR recognises the need to change the economic policy on the principles of green economy, which involves active subsidisation of green areas in sectors of the economy and, conversely, requires the reduction of public spending, loans and investment in sectors that pollute the environment.

2.3.2. Policy instruments, organic standards and certification, and best practices in SCP

In KR, a 'green' economy is defined as an economy that leads to improved human well-being and social justice while significantly reducing environmental risks, preserving and increasing natural capital, using resources efficiently, and encouraging conservation of the country's natural ecosystems. In a green economy, income and employment growth is stimulated by public and private investments aimed at reducing carbon emissions and pollution, creating green jobs, increasing the efficiency of energy, resources and ecosystem services. One of the main documents in Kyrgyzstan regarding the development of a green economy is the 'National Development Strategy of the Kyrgyz Republic for 2018–2040' from October 31, 2013 № 221 signed by the Decree of the President of the Republic, which includes environmental issues, adaptation to climate change, and disaster risk reduction. In addition, climate change issues are embedded in the Concept of Environmental Security of the Kyrgyz Republic, approved on November 23, 2007 № 506.

28 Green Economy Development Program of the Kyrgyz Republic 2019–2022 - КОНЦЕПЦИЯ зеленой экономики в Кыргызской Республике "Кыргызстан - страна зеленой экономики" (Утверждена постановлением Жогорку Кенеша Кыргызской Республики от 28 июня 2018 года № 2532-VI) (minjust.gov.kg)..

29 Ibid.

Climate change issues are integrated in the Concept of green economy in the Kyrgyz Republic 'Kyrgyzstan – the country of green economy', approved by the Resolution of the Zhogorku Kenesh of KR from June 28, 2018 № 2532-VI and the Resolution of the Government of KR from August 30, 2018 № 413. Climate change issues in KR are reflected in the Land, Water and Forest Codes of KR, laws of KR and regulatory (by-law) acts of KR adopted in accordance with them.

To date, KR does not have a relevant strategic policy document to promote SCP approaches, and the priorities of KR on adaptation to climate change by 2017, approved by the Government of KR on October 2, 2013 № 549 'On approval of priority areas of adaptation to climate change in the Kyrgyz Republic until 2017' and providing for adaptation measures in the main sectors: water resources, agriculture, public health, climate change mitigation, etc.

The Government of KR approved the Paris Agreement and signed it during the 71st session of the UN General Assembly in September 2016 and submitted a draft law of KR: *'On Ratification of the Paris Agreement on the United Nations Framework Convention on Climate Change, signed on December 12, 2015 in Paris' to the Kyrgyz Republic Zhogorku Kenesh by Resolution No. 329 of June 28, 2019*.

In the law of KR 'General technical regulations to ensure environmental safety in KR, dated May 8, 2009 № 151 (as amended by Laws of KR dated March 1, 2012 N 11, July 8, 2019 N 83), the main requirement is the production processes, storage, transportation and disposal of products and mandatory for all legal and physical persons engaged in processes of production, storage, transportation and disposal of products. The objects of regulation are the production processes that are used or will be used at the objects of economic or other activities for which a category of hazard has been established or for the planned activities of which an environmental impact assessment is required, as well as the processes of storage, transportation and disposal of products.

In order to achieve the goals of the SDGs and implement the principles of 'green economy' in the agro-industrial complex of KR, the following main activities were laid down:

- Improve biological productivity of land through the introduction of new methods and approaches in the use, and improve pastures to preserve the ecological integrity of pasture ecosystems in the environment
- Improve irrigation systems and methods of irrigation through reducing state funding of irrigation measures that harm the environment, having the form of subsidising tariffs for irrigation water supply, to introduce new water-saving irrigation methods, in particular drip, discrete and spray irrigation
- Carry out measures to reduce losses during inter-farm and on-farm water transportation (restore irrigation systems, canals, flumes, etc.)
- Development of production of environmentally friendly organic fertilisers and plant protection products, as well as production of natural bio stimulants and antibiotics for livestock
- Create conditions for the use of modern environmentally friendly organic fertilisers and plant protection products by agricultural producers
- Stimulate the development of bio-fertilisers production using biomass, organic and food waste
- Stimulate the development of the 'green' agricultural sector
- Create specialised agricultural zones in KR, providing production of ecologically clean agricultural products with further dissemination of successful experience to agricultural zones throughout the republic, as well as introduction of a national system of certification of ecologically clean food and other products, and introduce of a national label for ecologically clean products ('organic', 'eco')
- Stimulate the development of processing industries in order to increase the added value chain through the industrial processing of agricultural products
- Implement the principles and mechanisms of sustainable financing in the financial and private/real sector
- Disseminate and improve awareness of all participants in economic processes on sustainable financing, development of sustainable financing principles and tools

- Attract ‘green’ investments in environmentally friendly technologies and irrigation system

As part of the activities to attract ‘green’ investments for energy efficiency in buildings (2009–2020), the ‘green building and financing of green technologies for sustainable agriculture’ activity, with the support of the EBRD, has financed 22 projects in the agricultural sector, including vegetable storage, greenhouses, orchards, renovation of production lines, and biogas plants.

3. Mapping agricultural products using international best practices (A study of several domestic product lines)

The agricultural sector represents a significant development potential in Kyrgyzstan. To date, agricultural production is predominantly small-scale (95.3% in 2019), where the degree of processing is extremely low, and investment in the agricultural sector is among the lowest in the country. In the villages, most agricultural producers are small farmers who are forced to use a strategy of minimising costs, which leads to insufficient investment in agricultural production and a constant build-up of pressure on available natural resources, i.e., agricultural land and water.

Since the mid-1990s, agriculture has not been one of the country's development priorities. This can be seen in the share of spending on agriculture, which over the past two decades has ranged from 1.5% to 3% of the state budget. One of the first documents in the history of independence signed in the country was the Presidential Decree № UP 25, dated February 8, 2021 'On measures to develop agro-industrial complex of the Kyrgyz Republic', where one of the main tasks is the development of agricultural clusters in Kyrgyzstan. In accordance with this Decree, in December 2021, the Ministry of Agriculture of the Kyrgyz Republic developed the 'Concept of cluster policy development of the agro-industrial complex (AIC) of the Kyrgyz Republic'.

The goal of this cluster policy is to achieve by 2027 the growth of food security in Kyrgyzstan by stimulating the development of clusters and increasing the number of products in the agricultural sector with high added value and deeper level of processing[30] according to the selected priorities. The goal will be achieved through integrated resource management, innovation and growth of production of priority products, development of processing, and inclusive development of the agro-industrial complex through the cooperation of small family farmers. Obligatory conditions for achieving the goals of cluster policy of agrarian development are the identification of key priorities, saturation of clusters with resources (financial, human, land), as well as the support of institutional development.

The authorised body in the field of public administration in agriculture is the Ministry of Agriculture (MoA). In order to synchronise indicators with the national system of strategic documents, monitoring and evaluation indicators will be respectively harmonised with the national strategic documents – system of indicators – of the National Development Program of KR until 2026 and indicators of the Sustainable Development Goals. Every year, the progress of implementation of the Cluster Development will be discussed at the level of the Cluster Development Council and will be presented by the authorised body to the Cabinet of Ministers of KR.

The cluster has a clearly defined territorial focus, which allows highlighting the main advantages that play a positive role for the development of agricultural production in Kyrgyzstan. The positive factors of regional development (climate, land, water and labour force) should be included along with the established institutional structure of the private agricultural sector.

An agribusiness cluster (cluster association) is a technical concentration of farmers, agro-industrial enterprises, agribusinesses and institutions operating in the agribusiness value added chain (VAC).

At the current stage of agricultural production, nine food security products – grain, meat, milk, sugar, eggs, vegetable oil, potatoes, fruits and vegetables – have been selected as priorities for cluster development in Kyrgyzstan. As necessary, the KR MoA has the right to supplement the list of priorities with new products and expand the focus of development. As the situation evolves, the cluster development priorities may gradually change. At this stage, nine products were selected due to the need to focus on food security tasks, which are based on cyclical global crises regarding access to food, the country's dependence on food imports, food price fluctuations and vulnerability to macroeconomic shocks, which Kyrgyzstan faces every few years.

30 This refers to processing beyond operations such as freezing or drying and leads to diversification of products. For example, high quality fruits can be sold fresh and battered or low quality ones can be processes into jam, juice, marshmallows, or fertilisers.

The central core of a cluster is the formation of a vertical level production chain in a particular geographical area. An example of an agro-industrial production chain is 'supplier of inputs –> agricultural producer –> processor –> distribution network –> consumer'. The chain can have more links (e.g., exporter/TLC – trade and logistics centre) or fewer (if there is no processing), which will contribute to the consolidation of product flows and increase added value. This is extremely important given the small-scale agricultural production in the country.

One of the important criteria for the selection of the target subject/aggregator of the cluster association is their degree of compliance with ESG (environmental, social, and governance) indicators, an approach to screening potential corporate investors based on how their company policies – environmental objectives, social and labour commitments, leadership and corporate governance – line up with sustainable objects, such as SCP and the SDGs.

3.1. Experience applying SCP tools: Agriculture farming enterprise (AFE) 'EcoFarm'

AFE 'EcoFarm' – the first private initiative in the country in the field of organic agriculture.

The activities of AFE 'EcoFarm' are aimed at developing sustainability in local communities and at protecting consumers' rights to the highest quality, most diverse food. AFE operates under the brand name ECOMADE and started its activities in 2016. Since then, the enterprise has confidently followed a dynamic path of development that began with delivering boxes of local agricultural products to consumers, to a well-organised level of business, and is an example not only of sustainable organic production (with its own VAC), but also of creating the format of a socially responsible business.

In four years of work in the local market, the Ecomade team has been able to:

- Create the first organic farm a 20-minute drive from Bishkek with a 3-ha garden, vegetable beds and 2 ha of berries
- Launch a production laboratory for producing and processing healthy food
- Launch a production laboratory for growing microgreens
- Create three offline stores FERMA market (145 Akhunbaeva str., 154 Moskovskaya str., 23/3 Tokombaeva str.), 1 online store with own application Ecomade[31]
- Create, develop and own the production of healthy food FERMA Food (healthy desserts, soups, salads, main meals, lunches for corporate clients)

  Launch EcoFestivals and camps for schoolchildren
- Develop strong links with the network of responsible farmers (cooperatives and small farms) and suppliers of products by checking products for nitrates
- Establish imports of quality products (imports of a range of products) that cannot be found on the local market
- Earn the trust of its customers, both private and from the corporate world, whose number is growing every day.

31 Скачивайте мобильное приложение «Ecomade»: https://loya24.ru/ecomade

Experience of *Agriculture Farming Enterprise* (AFE) in implementing SCP approaches

Concept of SCP		
Resource efficiency *(less consumption)*	**Substitution** *(higher quality consumption)*	**Circularity** *('from cradle to cradle')*
a. application of drip irrigation system to reduce net consumption of irrigated water b. production of healthy food and semi-finished products, for which fewer resources are used c. informing consumers about organic farming and healthy eating through Ecomade's own app d. taking care of the health of the nation by promoting products without nitrates	a. the use of biological preparations in the control of pests and diseases of plants and the use of manual labour to remove weeds b. the use of eco or organic packaging in the production of goods c. generating electricity using renewable energy sources (solar panels)	a. production of biogas from food waste and weeds b. collection of glass and paper containers and product packaging for recycling

3.2. Experience applying SCP tools: Eco-farm Jannat Garden

The organic farm *Jannat Garden* is the first lavender farm in the country to cultivate and produce essential oils. The eco-farm aims at developing agro-tourism, adding value to and preserving the biosphere zone of the Issyk-Kul region through sustainable use of resources, organic farming, development of rural economy and increasing capacity of local communities.

In two years of activity, the team of Jannat Garden Eco-farm has been able to:

- Create a lavender farm to produce essential oils (2 ha) and promote agritourism
- Create a demo plot for growing organic products (berries and vegetables) (1 ha)
- Conduct training on organic farming and water-saving irrigation systems for more than 200 farmers in rural areas
- Launch products with high added value (essential oils, handmade soaps, teas with berries, etc.)
- Create jobs for rural women
- Establish exports of quality domestic products (Japan)
- Establish the sale of products through e-commerce

Experience of eco-farm *Jannat Garden* in implementing SCP approaches

Concept of SCP		
Resource efficiency *(less consumption)*	**Substitution** *(higher quality consumption)*	**Circularity** *('from cradle to cradle')*
a. application of drip irrigation system to reduce net consumption of irrigated water b. production of products, whose manufacture and use consume fewer resources c. informing consumers about organic farming and conservation of resources through social networks d. taking care of the health of the nation by promoting products without synthetic chemicals	a. the use of biological preparations in the control of pests and diseases of plants and the use of manual labour to remove weeds b. the use of eco or organic packaging in the production of goods c. generating electricity using renewable energy sources (solar panels)	a. production of biohumus and compost from food waste and weeds b. collection of plastic and paper product containers for recycling

3.3. Experience applying SCP tools: LLC Agroproduct Asia

The company 'Agroproduct Asia' is the first enterprise for cold storage and processing of fruits and vegetables in the Kyrgyz Republic, built on the basis of the most modern technologies and international best practices.

The goal of the company is to become a producer and reliable supplier of fresh quality products for trading partners in the domestic market and in the countries of the Eurasian Economic Union (EAEU): Russian Federation and the Republic of Kazakhstan.

The company cooperates with the best farmers and implements the best practices of fruit and vegetable growing both on its own land and with farmers. The company provides the following services:

- Washing, calibration, and packaging of vegetables
- Vegetable and fruit storage
- Vegetable storage and cooling
- Container production

In 2018, the company planted a 100-ha intensive apple orchard next to the storage facility, reducing the cost of transporting the harvest. The main advantage of the close proximity of the orchard and the storage facility is to maximise the shelf life and quality of the produce.

Experience of the company *Agroprodcut Asia* in implementing SCP approaches

Concept of SCP		
Resource efficiency *(less consumption)*	**Substitution** *(higher quality consumption)*	**Circularity** *('from cradle to cradle')*
a. application of drip irrigation system to reduce net consumption of irrigated water b. production of products, whose production and use consume fewer resources c. caring for the health of the nation by promoting products without nitrates d. caring for the environment by reducing transportation	a. the use of biological preparations in the fight against plant pests and diseases b. the use of eco or organic packaging in the production of goods c. generating electricity using renewable energy sources (solar panels) and green buildings	a. the use of biological preparations to control plant pests and diseases b. the use of ecological or organic packaging in the production of goods c. generating electricity using renewable energy sources (solar panels) and 'green' buildings

3.4. Experience applying SCP tools: Eco-farm Reina Kench

Agrocomplex 'Reina Kench' was founded in 1996 and is the leading farm in breeding livestock in the Issyk-Kul region. The farm has 2230 ha of pastureland and 410 ha of arable land. As of today, the complex has 270 head of highly productive cattle, 1800 head of sheep, and 250 horses.

Reina Kench has built a modern slaughterhouse in Karakol, Issyk-Kul region in 2021. The enterprise supplies ecologically clean and safe meat to domestic and foreign markets. The production capacity of the enterprise is 500 head of small ruminants and 100 head of cattle for slaughter (up to 40 t) per day.

The project involves farmers from the nearby villages of Zheti-Oguz, Ak-Suu and Tyup districts within a radius of 30–40 km, which will ensure a stable livestock sale to cattle farmers of the region. On the basis of the Regional Training Centre, 56 foremen and 1500 farmers have been trained and have improved their practical skills.

There is an in-house laboratory, which guarantees high environmental friendliness and safety of the products produced. Reina Kench is responsible not only for compliance with sanitary standards, but also for meeting the requirements of the halal industry. It also provides cattle and small ruminant slaughtering and butcher services.

Reina Kench Agrocomplex has a guest house, where horseback riding, brisket rides with national archery, fishing on the Jyrgylan river, boorsok (national food) show, national sports games with clients, and shows with thoroughbred horses 'Novo-Kyrgyzskaya' and 'Russian Trotter' are organised for guests.

Experience of eco-farm *Reina Kench* in implementing SCP approaches

Concept of SCP		
Resource efficiency *(less consumption)*	**Substitution** *(higher quality consumption)*	**Circularity** *('from cradle to cradle')*
a. application of drip irrigation system to reduce net consumption of irrigated water b. production of products whose manufacture and use consume fewer resources c. informing consumers about organic farming and conservation of resources through social networks d. caring for the health of the nation by promoting products without antibiotics e. preserving pastures by stabling animals	a. the use of biological preparations in the control of pests and diseases of plants and the use of manual labour to remove weeds b. the use of eco or organic packaging in the production of goods c. generating electricity using renewable energy sources (solar panels)	a. production of biohumus and compost from food waste and weeds b. collection of plastic and paper product containers for recycling

4. Eco-Labelling: Basics of eco-labelling of agricultural products and food products worldwide

The Kyrgyz government has declared a commitment to organic agriculture, but the country does not yet have certification protocols or organisations that can provide the necessary reliable accreditation that is acceptable in international markets. Accreditation is currently heavily dependent on donors, as funding for certification comes from international organisations rather than from farmers, processors or other actors in the value chain. As a result, accreditation is performed by foreign certification bodies/agencies authorised under the laws of the importing country.

The ideas of environmental protection, healthy living and nutrition in the developed countries of Europe and North America rapidly began to gain popularity from the middle of the last century. Now in order to successfully commercialise their products, manufacturers must give their consumers the assurance that the goods they buy are safe for both humans and the planet. And consumers agree to pay for this. In Russia and in the Central Asian country these processes are just beginning to gain momentum. The source of information about the quality of goods in general and their environmental friendliness in particular for the consumer takes the form of a special marking on the packaging of goods.

An ecolabel is a set of information of an environmental nature about products, processes or services in the form of text, individual graphics, colour symbols (logos) and combinations of these elements. They are applied directly on the product, packaging (container), plate, label (tag), label or in accompanying documentation, after having met specific condition for acquiring the label.[32]

The purpose of introducing the eco-label is to reliably inform consumers about the environmental friendliness of the purchased product and to encourage manufacturers to comply with norms and requirements for environmental protection. At the same time, manufacturers receive the right to label their products with eco-labels only if they have been certified by specially created organisations (state, public, private; commercial and non-commercial), which include representatives of government agencies, ministries of environmental protection, state departments for standardisation, the business community, and public environmental organisations and consumer protection groups. Initially, the international standards ISO-14000 (in Kyrgyzstan, GOST KR ISO 14000) are used as the basis for environmental expertise and certification, and the 'progenitor' and model for the construction of international and national environmental certification systems was the certification for the 'Blue Angel' sign (Germany).

At present, there are a significant number of ecological labels worldwide, and with varying degrees of recognition by consumers and at the level of international and national market recognition, characterised by different aspects of environmental safety or indicating its complexity. Depending on what information the ecolabel is providing for the consumer of product, these eco-labels/signs/symbols/logos can be divided into five groups, as follows:

1. Information about the environmental safety of a product or its packaging for humans and the environment as a whole
2. Information about the safety of a product in terms of any component or biological complex in its origin
3. Indications about the recyclability of product, or whether it was derived from recycling
4. Instructions on how to collect and dispose of waste responsibly and how to protect the environment
5. Warnings about the dangers of some items[33]

32 https://ozpp.ru/consumer/useful/article9.html (in Russian)
33 Eco-labeling (international experience) | Ecois (ekois.net)

Images indicating the safety of the product as a whole

The oldest image in this group is the German[34] *der Blaue Engel* – 'Blue Angel' – that appeared in 1978. Other very well-known images are:

- Euro Flower, eco-label of the European Union
- White Swan, eco-label of the Scandinavian countries
- Eco-logic Choice, eco-Canada

One of the well-known eco-labels of the European Union is 'Euro Flower', which identifies goods and services whose entire life cycle takes into account safety criteria for the environment, including office equipment, household appliances, textile and paper products, footwear and clothing. The requirements for a company to obtain the license are high, and they must pay 0.15% of the sale of their goods for the right to use it.

The 'Blue Angel' ecolabel. The condition for its granting is that the production process of the product is friendly and environmentally friendly. For example, it can be recycled or uses fewer natural resources. The ecological criteria for the awarding of this label are determined by a jury consisting of representatives of authorities and public associations.

Table 3: Some supranational and national eco-labels for product safety[35]

EU (Euro-flower)	USA ('Green seal)	BDR - West German Federal Republic ('Blue Angel')
Japan	Scandinavia ('Scandinavian Swan')	Canada ('Eco-Logic Choice')

'Nordic Swan Label' is one of the most successful ecolabel systems in the world. Assigning this label to products in Finland, Sweden, Norway and Iceland requires compliance with very strict environmental regulations and product quality requirements. The common feature of this group of labels is essentially that they certify that the products or organisations are certified according to ISO 14000, and while the labels do not guarantee the bio-quality of the product, they do ensure that in the normal course of business the company does not pose a threat to the environment (i.e., they are 'environmentally friendly'). It is to be noted that anything can be produced, from synthetic paints and linoleum to environmentally harmful pesticides and food additives that are harmful to the human body. ISO 14000 was originally developed as an evolution of EMAS (Environmental Management System) to reduce the risk of negative environmental impact of industry. In many countries, this series of standards is not called environmental, but more precisely, 'Environmental Management', which initially eliminates confusion in the field of application.[36]

34 The westdeutsche Bundesrepublik, the West German Federal Republic.

35 Eco-labeling (international experience) | Ekois (ekois.net)

36 Shalanda A.V. The concept of continuous environmental education and enlightenment in the field of ecological farming in Russia (in Russian). Download PDF here: www.green-pik.ru/doc/concepciya.doc

In 1994, the Global Ecolabelling Network was created, which included many national ecolabels. This confirmed the recognition of these marks by the international community. Now the network unites 26 countries and country unions. The only post-Soviet country that is represented in it is Ukraine, whose national emblem 'Green Crane' was officially included in the network in 2004.[37] In Russia, this type of mark indicates the safety of the goods. Kyrgyzstan does not yet have this type of ecolabel. In particular, the sign of Conformity to the System of mandatory certification for environmental requirements in Russia, the ecolabel of the International Ecological Foundation (*Ecoptichka*), the Ecological Certificate – Food Safety and Food Quality Control.

Ecological safety signs

Notices on products such as 'does not contain pesticides', 'does not contain preservatives', 'does not contain GMOs', etc., mean that agricultural raw materials are grown in accordance with environmental standards that do not allow the use of mineral/synthetic fertilisers or pesticides. The most well-known ecolabels of this type are presented in Table 4. In the EU, standards for organic (also biological) production are enshrined in the EU Directive 'European Agreement on Organic Production of Agricultural Products No. 2092/91 of June 24, 1991'. Since June 1, 2009 there has been a new directive number 834/2007, defining[38] the norms of organic farming:

- A ban on the use of genetically modified seeds, cloning and irradiation, synthetic and chemical means of soil treatment and plant protection in farms producing organic products
- Using only seed grown on organic farms
- Setting norms for ecological animal husbandry
- Using only ecological fodder, and rejecting synthetic additives, growth stimulants and gene technology
- Free-run conditions (walking and grazing) for animals in summer time
- A ban on tethered housing for animals

Table 4: Common biosignatures for agricultural raw materials and foodstuffs[39]

	The new EU logo for organic products (Eurolist), which came into force on 01.07.2010
	Sign 'Organic Farming – EC Control System', approved in March 2000 by the European Commission, which officially operated from 1.07.2010 in parallel with the euro list, and from 30.06.2012 ceased to be used
	United States Department of Agriculture (USDA) National Organic Agriculture Program Organic Seal Mark

37 Eco-labeling (international experience) | Ekois (ekois.net)
38 Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91 //Official Journal of the European Union 20.7.2007
39 Ibid.

	Swedish label for agricultural products 'KRAV'
	Bio-Siegel mark used since September 2001 in Germany
	Organic label used in Greece
	Organic product certification mark used in New Zealand
	One of the signs used in Israel. Agrior Inspection and Certification is an independent Israeli inspection organisation operating in accordance with IBOAA (Israel Association of Bio-Organic Agriculture) standards
	A sign indicating that the products are certified by Agrosofia CtO (Russia)
	The mark of products grown in farms that adhere to the principles of biodynamic production, applied in Germany

The labelling of organic agricultural products. Until July 2010, a single logo for all producers of EU member states was used on a voluntary basis, at the same time there were private and national logos. Now there is a new mandatory logo, the so-called Biolist. To obtain permission to use it, 95% of the ingredients must be of organic origin, and the products themselves must be packaged in such a way that the contents can be changed only by opening the package. The use of private and national logos is still not prohibited, but they must not be central to the EU labelling. These restrictions are summarised in Table 5.

Table 5: Main restrictions in the production of organic products

Allowed	Forbidden
How plants are grown	
Unmodified seeds	Genetically modified seeds
Weeds are removed by hand	Herbicides
Compost and animal manure from organic farms	Chemical fertilisers
Pests are controlled with birds and beneficial insects	Pesticides Homeopathic medicines Fungicides
How raw materials are processed	
Natural preservatives: sugar, salt, vegetable oils, acids, essential oils	Chemical preservatives
Natural dyes	Synthesised colorants
Natural flavours	Synthesised flavourings and flavour enhancers
Apple and citrus pectin, carob seed flour, guar gum, xanthan, red algae carrageenan, agaragar	Synthesised stabilisers, synthesised thickeners (e.g., starch)
Non-modified ingredients	Genetically modified ingredients (e.g., starch as a filler)
Pasteurisation, pickling, souring, drying, curing, vacuum processing	Harmful technologies: atomic splitting of the product, ultrasonic treatment, chemical preservation, gassing of products in vacuum packaging and without, treatment of products with phenol and surfactants
Packaging: paper, glass, metal, biologically inactive packaging (does not interact with the contents)	Plastic packaging (requires preservatives)

Thus, in order to determine the environmental safety of a product, it is not sufficient to test only the finished product itself. The basic approach is Good Manufacturing Practice (GMP standard), that is, the so-called normal production practice. No matter how the safety and quality of the product itself is controlled, first of all it is necessary to control the production, the technology used, and the raw materials.

Russia has the only state-level environmental sign – Free of Chlorine – which indicates that chlorine and its compounds were not used in the production, processing or treatment of the product. There is no such sign in Kyrgyzstan.

Signs indicating that the product is recyclable

Sometimes the percentage content of recyclable materials in the product is also indicated. This has a very indirect relationship to the market of agricultural raw materials and food. The best known of the eco-signs in this category is the 'Green Dot' (Der Grüne Punkt), which is put on the packaging of goods (glass, plastic, etc.) and indicates that the manufacturing and trading companies have concluded a contract with the company 'Duales System' (Dual System) and pay the corresponding license fees, which are used exclusively to organise the collecting and sorting of packaging to be recycled. Consumers who have purchased the product sort the packaging after use according to the material from which it is made. Dual System collects and recycles packaging marked with the Green Dot. This system was first introduced in Germany and later in France, Belgium, Ireland, Luxembourg, Austria, Portugal, Spain and other European countries. The reusability of a product or its packaging is indicated by signs with various variations on the theme of the Mobius loop or closed arrows:

Signs with a stylised Mobius loop with a number inside are also used to indicate types of plastic. An arrow-closed triangle shows consumers that this product is recyclable.

Signs urging responsible treatment of the environment and collecting and disposing of waste responsibly

They in fact help to form and maintain social relations in society that are loyal to nature:

Signs indicating that goods are dangerous for the environment

Marine pollution threat sign to indicate substances that are transported by waterways

Radiation threat sign

Sign indicating the need for separate collection of used power supplies

Chemical hazard sign

The use of eco-labels is regulated by law worldwide, and the applicant receives the right to use a particular label only after certification of their products by specialised organisations that are accredited for such procedures. A product that does not have an 'organic' certificate issued by an authorised accredited certification body cannot be considered as BIO (or organic). At the same time, the verification criteria and the level of indicators necessary and sufficient to obtain a certain mark are determined by the standards of the right holder for the eco-label. The main types of eco-label standards can be summarised as follows:

International private or intergovernmental framework standards, such as the International Baseline Standards:

1. IFOAM or Food Codex
2. The main Standards or Directives in force (e.g., EU (EEC) Directive No. 834/200 or the American National Organic Program (USDA))
3. Private Organic Production Standards such as Demeter, Naturland, Bioland, Geae, Ekowin, StO Agrosophy, etc.

There are different markets for environmental products with their own individual certification requirements, i.e., with their own Directives and Standards. The most important of these are:

1. EU: Regulation (EEC) No. 834/2007 on organic farming and appropriate labelling of agricultural products and foodstuffs
2. U.S. Organic Market: National Organic Program, which came into force in November 2002 (USDA)
3. Japanese Organic Market: Japanese Agricultural Standards JAS
4. Switzerland, Israel, Argentina, Czech Republic, Bulgaria, Australia: environmental regulations equivalent to EEC Regulation No. 834/2007

The goal of the organic producer is to obtain the right to label organic products with an ecolabel in order to communicate the highest quality of the product to the future. This process is carried out through the activities of the established guarantee certification systems for organic products, which include specialised inspection and certification bodies.

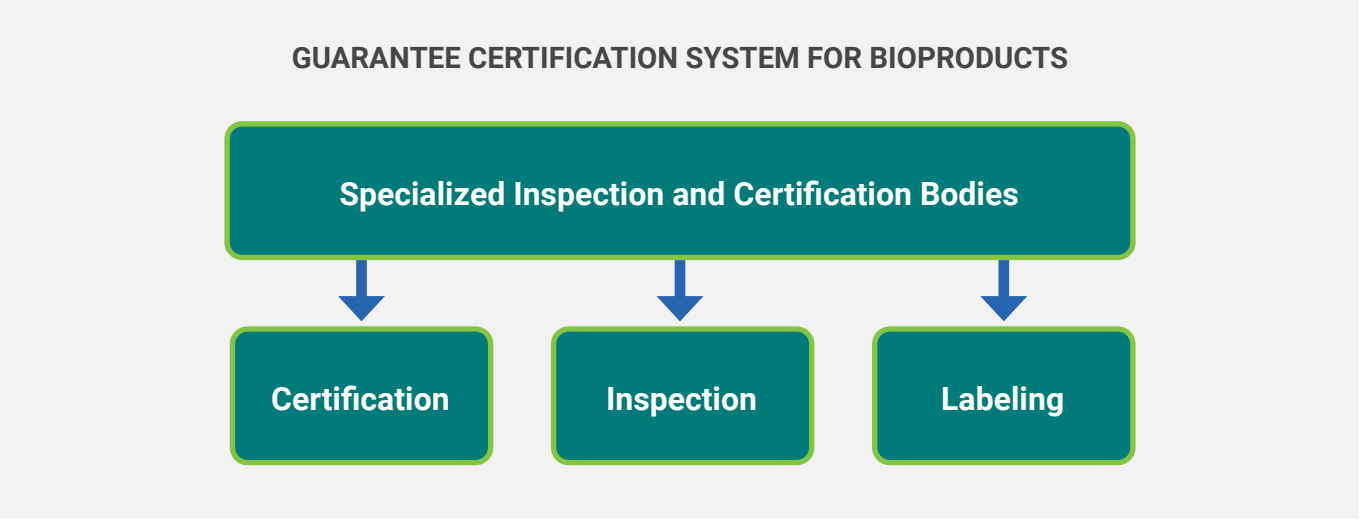


Figure 6. Guaranteed certification system for bioproducts *(Source: international ecolabels — IEL (eko-kaz.kz))*

The activities of this system use both legal norms, establishing mandatory requirements within the framework of state regulation, and individual standards, which are voluntary agreements, i.e. the result of reaching a certain consensus of consumers and producers of goods and services. Thus, this guarantee system (certification, inspection and labelling) validates the entire process of agricultural production of bioproducts and their processing to the level of the final product, including its packaging, labelling and delivery to consumers.

Figure 7. Symbols of some EU certification organisations in the field of organic agriculture

Each certifying authority has its own code number, which must:

- begin with the abbreviation of an EU Member State or a third country according to international norms; the abbreviation consists of two letters of the country code name according to ISO 3166 'Country and Part Name Codes' (e.g., 'DE', 'RU', 'BL', etc.)
- be related to organic/biological production in accordance with art. 23, paragraph 1 of Regulation (EC) No. 834/2007 and Regulation (EC) No. 889/2008 (e.g., 'BIO', 'ECO', etc.)
- reflect the accreditation number (e.g., 'RU-BIO001')
- be placed directly below the EU Bio-Sign if used for marking:[40]

RU-BIO-001

The legitimacy of the EU Biolabel is determined by the following fundamental principles:

1. the voluntary participation of the certification applicant for the right to use the mark
2. at least 95% of products must contain bio-ingredients
3. The name of a product is BIO or ECO

In general, eco-labelling is a set of standards for obtaining the desired certificate of conformity of goods. Strict eco-certification standards motivate manufacturers to make their production more environmentally friendly, and consumers are given a simple and clear tool for choosing goods.

40 Hodus A. Biolabeling. http://sarud.org/file/Ekologicheskaya_markirovka_i_marketing.pdf

5. Guidelines for greening the agri-food supply chain using the example of potatoes with the application of SC practices: a comparison between Kyrgyzstan and Belarus

5.1. Scope of the Potato Value Chain in Kyrgyzstan

The potato agricultural value-added chain (VAC) is complex and linked to several important cross-cutting sectors: water resources, waste management, energy and air quality. **Figure 6** shows the value chain for potatoes as an example.

Each step in the value chain belongs to one of the following economic steps:

- **Primary production sector** – Growing and harvesting
- **Secondary production sector** – Storage and processing
- **Tertiary sector or service sector** – Storage, distribution and sale of raw and finished goods through supermarkets, stores, small markets, etc.
- **Consumption** – food in households, hotels, canteens, cafes, restaurants, etc.

At each stage resources are used, and wastes, liquid and gaseous emissions are generated. The green economy adopts basic SCPconcepts at each stage, such as:

- Efficient use of resources/minimisation of waste and emissions
- Replacing harmful substances with more hazard-free substances
- Reusing and recycling solid and liquid waste and then recycling it back into the cycle where possible

In order to identify opportunities to apply available SCP tools in the potato value chain, each step was analysed, considering the number of resources and technologies used, the waste and emissions generated, and relevant activities that would help make the economy more resource efficient. The following are the main SCP concepts and an abbreviated coding:

RE: Resrouce Efficiency; S: Substitution; C: Circularity

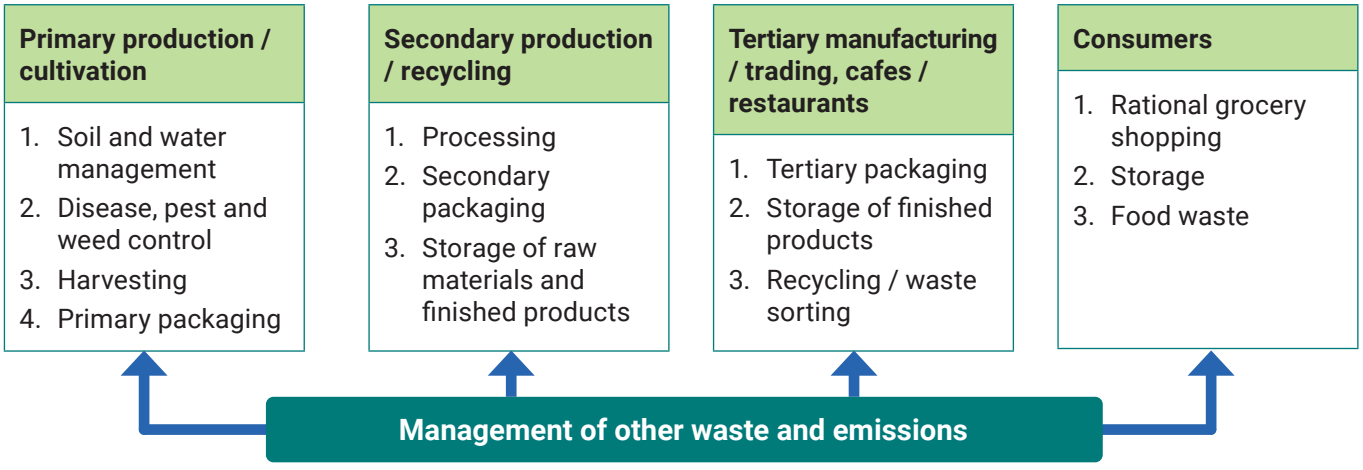


Figure 8. Schematic diagram of potato VAC with SCP approaches for application in practice. IPPM Integrated production and pest management

5.1.1. Primary production

Growing and harvesting potatoes

Growing potatoes requires fertile and healthy soil, sufficient water and nutrients, and the right lighting and temperature conditions. Although all of these are prerequisites for efficient potato growing, farmers make many decisions that affect the results of potato farming, on resources and on the environment.

Specific problems that arise in the use of resources:

Problems	Recommendations with SCP approaches
1. SOIL	
Mineral Fertilisers Excessive use of mineral fertilisers combined with excessive ploughing or cultivation can lead to soil depletion, water shortages, and potentially significant environmental problems.	
• Lack of knowledge about soil sampling • Lack of knowledge about application of mineral fertilisers in norms and dosage • Violation of the dosage of mineral fertilisers leads to the risk of 'freezing' microorganisms in the soil that affect fertility • Excess mineral fertilisers can build up in the soil, leach out of the soil and into the groundwater and air, leading to environmental problems • Nutrient deficiencies lead to soil depletion • Nitrogen fertilisers can decompose quickly after application, release ammonia, excess ammonia not absorbed by plants is released into the air as a gas, forming aerosols that are harmful to human health, or remain in the soil as heavy metals • Farmers do not use organic waste due to a lack of knowledge on how to prepare it	• Training farmers about the importance of soil analysis before planting crops • Timing and amount of mineral fertiliser application based on the results of soil analysis and crop that was planted on the place before • Practicing crop rotation • Using innovative technologies such as direct seeding (CA • Siderat planting to improve soil fertility. Siderats are natural fertilisers, grass is cut and incorporated into the soil to loosen the soil, which is enriched with nitrogen; this inhibits the growth of weeds and prevents the spread of diseases • Education and dissemination of information on the preparation and use of organic waste • Partial or complete replacement of mineral fertilisers with organic fertilisers (animal manure, compost, etc.) • Informing and communication on dissemination of integrated pest management (IPM) programme approaches – soil and waste management – food and vegetable
2. WATER MANAGEMENT	
According to FAO[41], over the past two decades available freshwater resources per capita have declined by more than 20% worldwide, highlighting the importance of the concept of 'producing more with less,' especially in the agricultural sector, which consumes 70% of the world's freshwater, more water than any other human activity. The FAO predicts that global agricultural water requirements will increase by 50% by 2050 to keep up with the growing population needs. Freshwater supplies are dwindling due to improper and/or indiscriminate water use and climate change. Water scarcity and water quality problems in many parts of the world pose serious threats to future food security and environmental sustainability.	

41 i7959e.pdf (fao.org), CB1447RU.pdf (fao.org)

• Improper and inefficient ary atering systems • Loss/evaporation of water from soil • Water pollution of water from mineral fertilisers and chemicals, among others • The use of polluted fresh or runoff water leads to deterioration of living conditions, diseases, and the disappearance of many species of plants and aquatic life	• Optimisation of irrigation planning based on demand • Application of more efficient irrigation systems: drip irrigation, irrigation techniques/sprinklers, creation of basins, etc. • Moisture retention through mulching • Selection of drought-resistant crops
3. PLANT PROTECTION FROM DISEASES, PESTS AND WEEDS	
The use of pesticides and herbicides leads to negative consequences for the environment and for human health; it disrupts the natural microbiocenosis of soil and water, reduces the biological and nutritional value of food; develops resistance microorganisms and pests; and can cause death and disease among animals and humans. Excessive use of pesticides and herbicides can cause allergic reactions, diathesis, pregnancy disorders, liver disease, etc.	
• Yield losses of up to 50% due to farmers' poor knowledge of plant protection against diseases and pests • Application without careful measurement of the dose of chemicals against weeds, pests and diseases can have devastating results, greatly reducing or even destroying future crops • Diseases develop due to over-watering, improper irrigation, inefficient use of water, over-consolidated soil, lack of air circulation, soil degradation and yield loss • Not ploughing in fall after harvest may leave residues of pest eggs, weed seeds • Failure to comply with the safety standards for field cultivation, harming the health of farmers, consumers, and the environment (soil, water, air)	• Teach farmers about the importance of preventive measures against diseases, pests and weeds, and waste management • Use quality certified seed material, treat tubers before planting • Training, information, dissemination and promotion of IPM programme approaches, that is, integrated plant protection from diseases, pests and weeds – clean seeds, crop rotation, attracting and propagating beneficial insects by planting the native wild plants/flowers that will attract them • Training, information, dissemination and outreach on safety technology in field treatment according to SCP principles – efficient use of resources (ER), substitution with safer raw materials (S), circularity (C).
4. HARVESTING AND WASTE	
In practice, farmers lose about 8–10 % on average of their crop during harvesting, sorting and primary harvesting. Post-harvest spoilage/loss of the crop occurs as a result of loading and unloading operations.	
• During potato harvesting, mechanical damage to potato tubers from 20–40% of the harvest • During loading, unloading and transportation, losses are about 4–5%. The loss is influenced by the wear and tear of MTS • After harvesting, farmers burn dried remains on the field, creating pollutants emitted into the air: soot particles, hydrocarbons, dioxins and furans – which are dangerous for public health • Too much potato residues/fodder is wasted in the field	• Use potato varieties that are resistant to mechanical damage • When transporting to storages, it is advisable to transport in packages/bags Upgrade and use modern machine and tractor stations (MTS) • Use alternative methods of crop residue management; e.g., ashes can be used as fertiliser • Waste management during harvesting: residues may be used as animal feed or compost fertiliser

5. PRIMARY PACKAGING AND STORAGE	
For primary packaging/packing & transport of potatoes, propylene or jute bags are used to contain and prevent contamination and spoilage.	
• Inefficient packing/ poor packaging result in more waste generated in the field • Using mixed composition/composite materials for packaging • Residues of substandard bags may be lost in the fields • Lack of information from farmers to consumers about the availability of recycling companies	• Reduce the amount of packaging waste generated in the field • Avoid using composite materials that prevent or interfere with the recycling of packaging waste • Label packaging to inform consumers that packaging waste can be recycled or reused, and provide addresses of recycling companies. or recycling without harming the environment
Storing potatoes The biggest losses of potatoes occur at the storage stage. This is due both to the poor quality of the potatoes put in storage and to imperfect storage facilities.	
• Non-standard tubers and rejects during storage damage the rest of the potatoes, 4–5% of the waste • When potatoes are not sorted and are stored in bulk, resulting losses are more than 60%42 • Storing potatoes separately by variety is not possible because farmers mostly do not specialise in growing specific varieties • Lack of or insufficient knowledge of technology during storage and frequent power outages lead to spoilage of products	• Separate storage of potatoes by varieties: after 6.5 months of storage of single-variety potatoes, the yield of standard tubers is 92.0%, and when storing a mixture of varieties, it falls to 79.1% • Within cluster associations, specialization in growing certain varieties • Practice waste management during storing • Improve the capacity of employees at storage facilities and logistics centres; modernise storage facilities

Ecosystems and biodiversity

The Sustainable Development Goals related to the Green Economy and SCP programmes are listed in Annex 1 and directly relate to the protection, restoration and sustainable use of terrestrial ecosystems (including rivers and inland waters) and halting the loss of biodiversity. Due to the use of various chemicals combined with land-use practices, agriculture, especially under intensive management, is one of the main sources of pressure on nature. Changes in agricultural practices must be considered not only in terms of resource use, but also in terms of their impact on nature, taking into account ecosystems and biodiversity.

5.1.2. Secondary production

Potato processing, packaging and storage

Potato processing includes a wide and diverse range of activities as shown in Figure 9. In addition, the transport and local storage of raw/fresh and processed potatoes must be taken into account.

42 Kirby farm agronomist data.

PREPARING

- Sorting

PROCESSING

- Cleaning
- Rinsing
- Slicing
- Repated washing
- Starch removal
- Blanching
- Heat treatment
- Freezing

PACKAGING AND STORAGE

- Packing
- Transportation to storage

Figure 9. Secondary production steps in potato processing (Resource: Authors)

Problems	Solutions
1. PREPARATION OF RAW MATERIALS	
Sorting/calibration Inspection: rotten, broken, irregularly shaped tubers and foreign substances are removed. The tubers with damaged surfaces are easily exposed to microorganisms and undesirable biochemical processes occur in them, which affect the taste of the finished product. This results in the formation of food waste.	Food waste: the substandard potatoes are used for the preparation of animal feed or for composting.
2. PRODUCTION	
Cleaning and washing	
Potato cleaning consists in the cleaning of raw materials. Potato tubers arriving for processing are washed in order to remove soil residues and/or traces of pesticides. The following methods are widely used for potato cleaning: chemical, steam and mainly hydrothermal (steam and water). This produces solid, liquid and gaseous wastes.	Potato pieces, peels, processing water, and pulp are used for the preparation of saccharifying material, alcohol, starch and animal feed. In addition, thermal dewatering of liquid waste (15–16%), dry matter in settling tanks with further centrifugation should be used to supply fodder to nearby farms, along with thermal dewatering in dryers for fodder purposes, to replace expensive and scarce materials in flotation of potassium ores, in drilling of oil, gas and hydrogeological wells
Slicing	
he slicing of potatoes is done on the machine. During the cutting process, water is constantly supplied to the machine. An elevator, which then receives the tubers, ensures that they are constantly fed to the potato slicing machine. A mechanical slicer (or hydro slicer) slices the potatoes into chips, either plain or wavy. On the inspection belt, the chip is visually inspected for defects. Food waste (broken chips, splinters and small pieces of potato residues) and sewage waste are generated.	Food waste can be used to make animal feed (in the form of flour or flakes) and compost. Wastewater can be used for primary washing or for irrigation.

Starch extraction or removal	
In this process, the potatoes are shredded and the starch grains are released from the destroyed cells. The root cells of potato plant tubers contain leucoplasts (starch grains). The released starch contains small amounts of impurities (fine pulp, coagulated proteins, cell sap). In order to remove impurities, the xstarch is mixed with water and refined, i.e., it is cleaned from impurities on sieves, washed with water and then the starch milk is concentrated and the water is separated from the starch and sent for drying or for further processing. When obtaining starch, waste products are formed: pulp and juice water.	The pulp is used as livestock feed. Juice water is usually pumped out to filtration fields, although it can be used as a medium for growing fodder yeast. The processing line does not include starch processing, and is discarded as municipal solid waste (MSW), which is bad for the environment. The starch can be used to make biodegradable bags.
Blanching	
For potatoes, blanching (in water or steam) is used, which is considered the main condition for preserving the high quality of frozen products during long-term storage. Waste is produced in the form of liquid or gas.	Liquid waste, used for primary washing, for irrigation, etc.
Freezing	
The duration of freezing chilled French fries by blast chilling: the water contained in the cells does not have time to turn into large ice crystals, destroying the cell membranes. This preserves the vegetables' pristine shape, colour, and flavour. According to experts, almost all the unique flavour and nutritional properties of fresh vegetables are also available in frozen products, because the blast chilling method used by producers makes it possible to save vitamins and minerals in vegetables for a fairly long period of storage. Waste occurs if the technology of freezing is not followed, or if there are technical failures of the equipment.	Improving the capacity of employees, upgrading equipment. Compliance with all quality standards for recycling.
3. STORAGE	
Packaging is necessary for the distribution, storage, presentation to consumers in retail outlets and storage of food products (including potatoes) in the kitchens of households, institutions and hotels. Thus, it serves several purposes: it protects products from contamination, ensures their efficient transportation and storage, serves as a means of advertising and communicating the product to the customer/consumer, and provides convenience for the consumer. Waste is generated by the use of non-environmental packaging that is not suitable for further recycling.	Using the most acceptable ecological packaging that can be recycled with the least impact on the environment. Informing consumers about the separate sorting of waste for recycling.

5.1.3. Tertiary production

Retail – shops, cafes, restaurants

Fresh potatoes, chips, fries, croquettes, and other potato products are purchased by consumers at retail outlets, local markets, supermarkets, stores, etc. Some marketplaces make their products available to consumers through a delivery service using online services. While good practices apply to all types and scales of retail outlets, the comments and discussion below are directed primarily at supermarkets and specialty stores.

Resources consumed	Waste and emissions
• Fresh and processed potatoes (RE, C) • Packaging (RE, S, C) • Energy – heating, cooling, freezing, lighting, etc. (RE, S, C) • Water (RE) • Transportation (delivery to fill internet orders) – (RE, S, C)	• Food Waste • Packaging Waste • Other MSW, including used lamps and other equipment • Air emissions, including refrigerants • Waste Water

Food waste

It is important that all producers and consumers take a conscious approach to reducing food loss in supply chains, including post-harvest losses to achieve SDG 12.3.

Food waste in retail outlets is generated as a result of violations of regulations concerning storage, packaging, and display conditions at the sale point. Waste also results from point-of-sale policies and practices regarding the labelling of products 'by expiration date,' which result in products being removed from sale if they are not sold by the deadline, and removed products ending up in the waste stream.

Food losses can also occur indirectly as a consequence of point-of-sale practices. For example, large supermarkets may have contractual agreements with commercial farmers that stipulate (unjustifiably) strict standards for the appearance of potatoes. The application of such standards may require the farmer to discard the harvested produce as waste if it does not meet these standards. Another example is when, for reasons of hygiene and safety, the retail outlet (and supplier) labels products for sale with expiration dates. However, excessive caution can lead to a housewife throwing away a food product that is approaching or exceeding its expiration date, even if its appearance (appearance, smell, etc.) is not a cause for concern, as just one example.

Best practices for preventing and minimising food waste should be applied to all retail outlets. This can include participation in food banks, where canned and other unwanted but packaged food can be made available to less affluent members of the local community. Available food waste should be collected separately and transferred to recycling centres for the production of organic fertilisers.

Packaging materials and packaging waste

The retail sector is the main recipient of packaging (primary, secondary and tertiary). However, large retail outlets, such as large supermarket chains, in many ways act not only as retailers, but also as wholesalers. They can thus put pressure on their suppliers to implement good packaging practices. Whenever possible to optimally reduce packaging waste and increase resource efficiency in the supply chain, the following is recommended:

- Ensure that all primary, secondary and tertiary packaging waste is collected separately
- Discontinue the issuance/sale of polyethylene packaging to customers. Replacing with paper or durable bags made of natural materials

- Replace thin-film plastic bags with packaging made of compostable cellulose material
- Inform or encourage customers to reuse bags and recycle substitute bags
- Participate in schemes (surrender and return of glass bottles) that allow customers to return empty bottles (with or without payment) for transfer in bulk from the retailer to the bottling plants

5.1.4. Final consumption

Potatoes are prepared, sold and consumed in households as well as in the hospitality sector (cafes, restaurants, hotels, canteens, hospitals, educational institutions, etc.).

End-use resources and end-use waste and applicable SCP activities

Resources consumed	Waste and emissions
• Food, including beverages (RE) • Energy – cooking, heating, cooling, freezing (RE, S) • Appliances – cooking, cooling, freezing (RE, S, C) • Water – cooking, cleaning (RE)	• Food waste • Packaging waste • Wastewater • Emissions, direct and indirect

Food waste

Storing food in the household or after cooking produces food residues and can result in food waste. Much of the waste results from consumer behaviour, which can be more or less amenable to change. Through advocacy and education, it is possible to change consumer behaviour to effectively use food and minimise waste.

Energy consumption and emissions[43]

A variety of appliances are used to cook, cool, freeze, food, using electricity, gas, and other fuels. Energy efficiency, as well as direct and indirect emissions, including greenhouse gas emissions, depend on the age, design and condition of these appliances.

Restaurants and other businesses, institutions, establishments can consider using local renewable energy sources, such as heat pumps and solar panels to reduce greenhouse gas emissions and air pollutants.

Packaging materials/waste

Waste packaging materials are largely outside the direct control of the consumer; people buy what they need as they go. However, consumers can influence to some extent the amount of packaging waste generated and how efficiently it is used and recycled.

In 2022, a workshop was organized for representatives of SMEs and government agencies on the theme: 'Sustainable Consumption and Production Tools (SCP) in the agribusiness of the Kyrgyz Republic'. The aim of the workshop was to support SMEs by introducing SCP approaches to greening the supply chain of agri-food products, and minimise the use of natural resources, toxic materials, and reduce the generation of waste and pollutants during the life cycle of products. See Appendix 3 for more information.

43 From the report of the international expert R. Frost.

5.2. Scope of the potato value chain in the Republic of Belarus

5.2.1. Primary production – Potato production and consumption in the Republic of Belarus

Specific problems encountered in the use of resources for potato production

Problems	Recommendations with SCP approaches
1. SOIL	
Mineral fertilisers Excessive use of mineral fertilisers combined with excessive ploughing or cultivation can lead to soil depletion, water shortages, and potentially significant environmental problems.	
• Lack of potato cultivation information on methods of application and doses of mineral fertilisers to increase yields and quality,44 with resulting loss of more than 15–20% of yields • Due to insufficiency of crop rotation, the proportion of suitable soils, soil conditions are unsuitable for some crops, loss of more than 15–20% of the crop45	• Improve the technology of growing potatoes based on the use of norms and doses of fertilisers (organic and mineral fertilisers), reducing labour costs and increasing yields and quality of products • Adherence to crop rotation practice
2. WATER RESOURCE MANAGEMENT	
One of the main documents in the Republic of Belarus is the National Strategy for Sustainable Development of the Republic of Belarus until 2030, which includes the 'Water Strategy of the Republic of Belarus' interrelated with the objectives and target indicators of SDG 6. Individual indicators of SDG 6 objectives implementation are taken into account as indicators of sectoral and regional programmes that address water use and protection issues.[46]	
• Loss/evaporation of water from soil • Water pollution from mineral fertilisers and chemicals, among other sources • The use of contaminated fresh water or effluent water leads to deterioration of living conditions, diseases (including life-threatening), and the disappearance of many species of plants and aquatic life	• Application of more efficient irrigation systems: drip irrigation, irrigation techniques/sprinklers, creation of pools/basins, etc. • Moisture retention through mulching • Selection of drought-resistant seeds
3. PLANT PROTECTION AGAINST DISEASES, PESTS AND WEEDS	
The use of pesticides and herbicides leads to negative consequences for the environment and for human health; it disrupts the natural microbiocenosis of soil and water, reduces the biological and nutritional value of food, develops resistance in microorganisms and pests, and can cause death and disease in animals and humans.	

44 https://elib.bsu.by/bitstream/123456789/170684/1/89-93.pdf
45 file:///D:/Admin/Downloads/territorialnaya-spetsializatsiya-selskohozyaystvennogo-proizvodstva-i-eyo-sootvetstvie-usloviyam-belarusi.pdf
46 https://elib.bsu.by/bitstream/123456789/251167/1/11-14.pdf

Yield losses of yield of up to 30% due to increased diseases and pests from climate change and climatic variations (increased air temperature, soil temperature, drought)[47]	• Teach farmers about the importance of preventive measures against diseases, pests and weeds, and waste management • Improve technologies of potato cultivation based on the use of effective technical means and protective measures • Introduction of irrigation equipment
4. HARVESTING AND WASTE	
In practice, farmers on average lose about 8–10% of their crop during harvesting, grading and primary harvesting. Post-harvest spoilage/loss of the crop occurs as a result of loading and unloading operations.	
• During potato harvesting, mechanical damage/ loss of potato tubers ranges from 20–40% of the harvest • During loading, unloading and transportation losses are about 4–5%. The loss is influenced by the wear and tear of the machine and tractor station (MTS).	• Use potato varieties that are resistant to mechanical damage • When transporting to storage facilities, it is advisable to transport in packages/bags Upgrade and use modern MTS.
5. PRIMARY PACKAGING AND STORAGE	
For the primary packaging/packing & transport of potatoes, propylene or jute bags are used to contain and prevent contamination and spoilage.	
• Inefficient packing or poor packaging results in more waste generated in the field • Using mixed composition/composite materials for packaging	• Reduce the amount of packaging waste generated in the field • Avoid using composite materials that prevent or interfere with the recycling of packaging waste • Label packaging to inform consumers that packaging waste can be recycled or reused and provide addresses of recycling companies, or recycling without harming the environment
6. POTATO STORAGE	
More than 20–25% of potato losses occur at the storage stage due to poor quality during storage, also due to imperfect storage facilities	
• Non-standard tubers and rejects during storage damage the rest of the potatoes, 4–5% of the waste • When potatoes are not sorted and are stored in bulk, resulting losses are more than 6048 • Lack of or insufficient knowledge of technology during storage and frequent power outages lead to product spoilage • Insufficient number of modern potato storage facilities	• Separate storage of potatoes by varieties: after 6.5 months of storage of single-variety of potatoes, the yield of standard tubers is 92.0%; when a mixture of varieties is stored together it is only 79.1%. • Quality assortment • The use of resistant varieties in storage • Within cluster associations, specialisation in growing certain varieties • Waste management in storage • Improved capacity of staff in storage and logistics centres • Modernisation of storage facilities

47 https://potatosystem.ru/kartofelevodstvo-belorusskij-podhod/
48 https://potatosystem.ru/kartofelevodstvo-belorusskij-podhod/

5.2.2. Secondary production – potato processing, packaging and storage

Potato processing encompasses a wide and diverse range of steps, as shown in Figure 10.

PREPARING

- Steam cleaning and checking

PROCESSING

- Cutting
- Blanching
- Pre-drying
- Pre-frying
- Freeze

PACKAGING AND STORAGE

- Package
- Storage

Figure 10: Secondary production steps in potato processing

Losses	Recommendations
Preparation	
• Pre-sorting – waste more than 15–20% discard rotten, broken tubers and foreign impurities • Steam cleaning: potato peels (waste) • Waste water after washing	• Production of animal feed, compost • Production of compost, animal feed from spent peels • Pre-arrangement with livestock farms • Secondary use of water for primary washing or for irrigation
Processing	
• Cutting: waste in the form of small pieces of potato unsuitable for fries • Blanching: removing excess sugar, starch and regulating enzymes for marketable appearance/colour and texture of fries	Expansion of assortment, production of other types of fries Production of alcohol, bio-packs, etc. Use of mash for animal feed Liquid waste for primary washing, for irrigation, etc.
Freezing – electricity	• Equipment modernisation – the use/ introduction of RES
Packaging – use plastic bags, cardboard boxes	• Use of eco-packaging • Informing consumers about separate sorting of waste for recycling

5.2.3. Tertiary production

Retail – shops, cafes, restaurants

Fresh potatoes, chips, fries, croquettes, and other potato products are purchased by consumers at retail outlets, local markets, supermarkets, stores, etc. Some marketplaces make their products available to consumers through a delivery service using online services. While good practices apply to all types and scales of retail outlets, the comments and discussion below are directed primarily at supermarkets and specialty stores.

Resources consumed	Waste and emissions
• Fresh and processed potatoes (RE, C) • Packaging (RE, S, C) • Energy – heating, cooling, freezing, lighting, etc. – (RE, S, C) • Water (RE) • Transportation (delivery to fill internet orders) – (RE, S, C)	• Food Waste • Packaging Waste • Other municipal solid waste (MSW), including used lamps and other equipment • Air emissions – including refrigerants • Waste Water

Food waste

Recommendations:

- Apply/implement best practices to prevent and minimise food waste generation at all retail outlets
- Inform consumers about separate sorting of waste for recycling
- Ensure that all primary, secondary and tertiary packaging waste is collected separately
- Discontinue the issuance/sale of polyethylene replacement bags to customers and instead provide eco-packages – paper or sturdy bags made of natural materials
- Replace thin-film plastic bags with packaging made of compostable cellulose material
- Inform or encourage customers to reuse bags and recycle substitute bags along with eco-friendly waste – promote use of reusable bags

5.2.4. Final consumption

Potatoes are prepared, sold and consumed in households as well as in the hospitality sector (cafes, restaurants, hotels, canteens, hospitals, educational institutions, etc.).

Resources consumed	Waste and emissions
• Food – (RE) • Energy – cooking, heating, cooling, freezing – (RE, S) • Appliances – cooking, cooling, freezing – (RE, S, C) • Water – cooking, cleaning – (RE)	• Food waste • Packaging waste • Wastewater • Emissions – direct and indirect

Energy consumption and emissions[49]

A variety of appliances are used to cook, cool and freeze food, using electricity, gas, and other fuels. Recommendations:

- Implementation of good practices
- Information campaigns on the application and use of local renewable energy sources – such as heat pumps, solar panels in order to reduce greenhouse gas emissions and air pollutants

5.3. Comparative analysis/benchmarking of potato production in the Kyrgyz Republic and the Republic of Belarus

A comparative analysis of potato production in the target countries revealed the following indicators.

Stages of production	Kyrgyz Republic	Republic of Belarus

Primary production	• The total area under potatoes is 74 thousand ha, of which:
	  • 0.009% (700 ha) large farms
	  • 99.9% small
	• Total volume – 1 million 200 thousand t, average yield of 16 t per ha. Because of small marketability, Kyrgyz farmers get on average 4 tones less potatoes per ha than Belarusian farmers.
	• In Kyrgyzstan, the climate is arid, the evaporation rate is four times higher than precipitation, so potatoes have to be irrigated up to 5–6 times a season, whereas the irrigation norm is three times a season. In addition, irrigation is carried out by irrigation by ditch method, and because of this, water consumption is higher than normal by 35–40%.
	• Each farmer tries to have his own agricultural machinery. For example, 100 ha can be handled by up to 10 tractors, and this increases fuel costs by 30–40% and emissions into the atmosphere.
	• Worn out agricultural machinery increases repair costs. During potato harvesting, mechanical damage/loss of potato tubers is 20–30%.
	• Small farmers store potatoes in basements that do not meet the requirements for storage and losses are 20–25%.
		• The total area under potatoes is 268 thousand ha, of which:
		  • 20% large farms
		  • 80% small
		• The total volume is 6 million t, the average yield is 22 t per ha.
		• In Belarus, the climate is moderate, the evapotranspiration is equal to the amount of precipitation. In rainy years, farmers hardly water the potatoes. Large farms irrigate using mechanised irrigation, which saves up to 40% of water consumption. Large farms irrigate using mechanised irrigation, which saves up to 40% of water consumption. In a large farm one tractor handles about 500–600 ha.
		• Agricultural machinery is constantly renewed or is under good repair.
		• Large farms have temperature-controlled storage facilities for storing potatoes and losses are less than 5%.

49 From the report of the international expert R. Frost.

Secondary production	• The only potato processing company in the country produces chips. • Waste is disposed of, there is no tertiary processing.	Large processing companies – production of chips, fries and starch.
	In recycling the loss of resources in the two countries: • At least 20–25% of electricity due to lack and high cost of renewable energy sources (solar panels, energy efficient building materials, etc.) • Lack of financial resources to improve technologies for tertiary use or water purification, recycling of potato waste to produce fertiliser for Kyrgyzstan	
Tertiary production	Plastics recycling facility in operation since 2022	Waste is used to make fodder and given to livestock farms
	Waste in tertiary production: • Food, packaging waste • Other MSW, including waste lamps and other equipment • Air emissions, including refrigerants • Wastewater	
Final consumption	Mini production of bio-fertilisers from food waste, capacity 300 t per year of finished products.	Widespread separate waste collection: plastic packaging and household food waste is recycled

Based on this analysis, Chapter VI provides recommendations for SCP approaches for SMEs in the Kyrgyz Republic.

6. Recommendations for greening supply chains to support SMEs in agribusiness to improve resource efficiency

These activities will serve as the basis for the development/development of the section of the Green Economy Development programme – 'Green Agriculture' for 2024–2030 on greening the supply chain of agro-food products to improve the use of SCP concepts and tools in Kyrgyzstan, which is an important factor in achieving a circular economy as one of the elements of the Green Economy programme.

At the government level:

- Reducing government demand for energy by applying energy efficiency policies and measures in agriculture at all stages of production
- Development of a programme for the implementation of SCP approaches/concept in the agri-food in the Kyrgyz Republic
- Unambiguity and clarity of applied documents on the implementation of SCP approaches in the agri-food and their feasibility
- Availability of SCP tools and relevant information for use in the production and supply sector
- Capability of actors in the production and supply sectors to apply SCP tools and, if their capacity is limited, assistance in capacity building and advisory support
- Ability of actors in sectors of the economy belonging to identified national key value chains to undertake coordinated SCP activities as part of a circular economy programme
- The goal, the SCP programme itself, the practical steps, the SCP tools that help identify and implement measures, must be effectively communicated to the manufacturing and supply sectors
- Motivating consumers to purchase environmentally friendly products, and producers and suppliers to supply them
- Procurement by ministries and agencies of goods and services in accordance with the State Programme 'green economy', consistent with the concept of SCP
- Training of specialists/consultants on SCP for all participants of agro-clusters
- Strengthening and development of agro-clusters to implement SCP practices
- Implementation of SCP tools in educational programmes and pedagogical practices – schools, universities, lyceums
- Availability of financial resources to stimulate the above-mentioned measures

At the level of producers and suppliers

- Application of SCP tools – (1) resource efficiency, (2) substitution for safer raw materials and supplies, (3) circularity to identify and then implement specific measures that will contribute to the achievement of the green economy programme in the KR agribusiness to reduce resource use, including recycling
- Minimising freshwater demand in river basins and watersheds through policy measures and agricultural water efficiency activities. Co-benefits include conservation of water resources and biodiversity
- Adapting agricultural practices to minimise, where not possible, the use of inorganic nitrogen and phosphorus fertilisers, pesticides and other chemicals; minimising crop emissions, manure and crop residue management
- Reuse/recycling/recycling of agricultural waste

Consumers

Consumers can be individuals, businesses, and government organisations for whom a variety of tools and approaches are available to stimulate events. The role of consumers is as follows:

- Responding positively to messages about the green agenda
- Purchasing and stimulating demand for green products, communicating their wishes to suppliers
- Responsible use of products, avoiding, if possible, generation, waste, excessive use of water, energy, etc.
- Responsible compliance with requirements, e.g., separation of solid waste at source prior to collection, and disposal of end-of-life products in accordance with regulatory requirements and using available facilities
- Minimisation of food waste generated in the agricultural production cycle and, where possible, its recovery, recycling and return to the cycle; introduction of elements of a regenerative economy
- Designing all material goods and packaging using sustainable production principles and motivating consumers to base their purchasing and disposal decisions on these principles

Annex 1: UN Sustainable Development Goals relevant to the concept of 'green economy' and SCP in the Kyrgyz Republic

The main SDG relevant to the 'green economy' programme under the SCP is Goal #12 'Ensure transition to sustainable consumption and production patterns'. However, other goals are also relevant, as indicated in Table 10. To achieve the SDG goals and targets at the country level, each UN member state can set national indicators in addition to the global indicators.

Table 6. Sustainable development goals and targets related to the SDGs and GEPs

Sustainable Development Goal and Selected Targets	
SDG.02	**SDG.02 End hunger, achieve food security and improved nutrition and promote sustainable agriculture**
SDG.03	**SDG.03 Ensure healthy lives and promote well-being for all at all ages**
SDG.06	SDG.06 Ensure availability and sustainable use of water and sanitation for all
SDG.07	**SDG.07 Ensure access to affordable, reliable, sustainable and modern energy for all**
SDG.08	**SDG.08 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**
8.4	Throughout the period until the end of 2030, progressively improve global resource efficiency in consumption and production systems and strive to decouple economic growth from environmental degradation, as called for in the 10-year Strategy for Action on Sustainable Consumption and Production, with developed countries taking the lead
SDG.09	**Building resilient infrastructure, promoting inclusive and sustainable industrialisation and innovation**
9.5	Intensify research, build the technological capabilities of industrial sectors in all countries, especially developing countries, including by stimulating innovation and significantly increasing the number of research and development (R&D) personnel per million people and public and private spending on R&D by 2030
9.b	Support domestic technology development, research and innovation in developing countries, including by creating a policy environment conducive, inter alia, to industrial diversification and value addition in the commodity sectors
SDG.11	**Ensure that cities and human settlements are inclusive, safe, resilient and environmentally sustainable**
11.6	By 2030, reduce the per capita negative environmental impact of cities, including by focusing on air quality and urban and other waste management
SDG.12	**Achieving a shift to sustainable consumption and production**
12.1	Implement the 10-year strategy for action on sustainable consumption and production patterns, with all countries taking the lead, developed countries taking the lead and developing countries taking the lead

Sustainable Development Goal and Selected Targets	
12.2	By 2040, achieve sustainable management and efficient use of natural resources
12.3	By 2040, reduce by half the global per capita retail and consumer food waste and reduce food losses in the supply chain, including post-harvest losses
12.4	By 2030, achieve environmentally sound management of chemicals and all wastes throughout their life cycle, in line with internationally agreed principles, and significantly reduce their release into air, water and soil to minimise their negative impact on human health and the environment
12.5	By 2040, significantly reduce the volume of waste by taking measures to prevent, reduce, recycle, and reuse it
12.6	Encourage companies, especially large and multinational companies, to adopt sustainable production practices and to report on sustainable resource use in their reports
12.7	Promote green public procurement practices in line with national policies and priorities
12.8	By 2030, ensure that people everywhere have relevant information and knowledge about sustainable development and lifestyles in harmony with nature
12.a	Assist developing countries in building their scientific and technological capacity to move towards more sustainable consumption and production patterns
12.b	Develop and implement tools to monitor the sustainable development impact of sustainable tourism that promotes job creation, local culture and local production
SDG.13	**Take urgent action to combat climate change and its impacts**
13.2	Integrate responses to climate change into policies, strategies and planning at the national level
13.3	Improve education, information dissemination, and the capacity of people and institutions to mitigate, adapt to, and early warnings of climate change
SDG.15	**Protect and restore terrestrial ecosystems and promote their sustainable use, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss**

Annex 2: The Butterfly Diagram: visualizing the Circular Economy

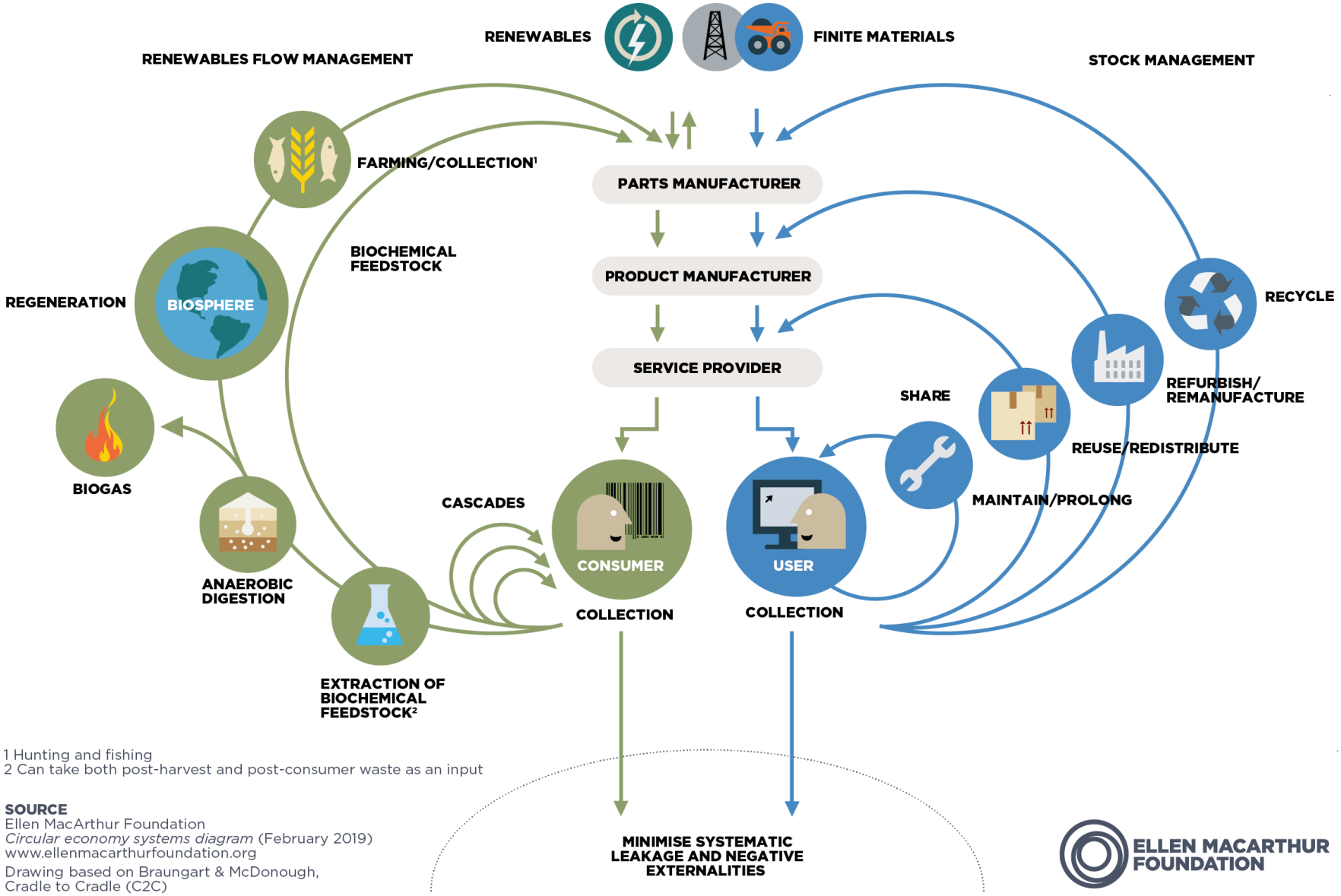
Figures 2 and 3 in Chapter I provide a diagram illustrating and comparing the characteristics of linear and circular economic systems. Below, Figure 9, a diagram developed by the Ellen MacArthur Foundation, further illustrates the circular economy.

This visualisation of the circular economy (closed-loop economy) is known as the butterfly diagram and is available in only English. It shows the flow of materials in the economy as two main cycles: the biological cycle, i.e., renewable energy (on the left side of the diagram), and the technical cycle, i.e., end materials (on the right side of the diagram):

'*The circular economy system diagram, known as the butterfly diagram, illustrates the continuous flow of materials in a circular economy. There are two main cycles – the technical cycle and the biological cycle. In the technical cycle, products and materials are kept in circulation through processes such as reuse, repair, remanufacture and recycling. In the biological cycle, the nutrients from biodegradable materials are returned to the Earth to regenerate nature.*'[50]

Leakage of biological and material resources occurs during the production and consumption of 'goods', i.e., intermediate and final products. Leakage takes the form of various solid wastes, including end-of-life consumer goods, atmospheric emissions and wastewater discharges. In terms of sustainable resource use, the closer auxiliary cycles or 'circuits' (resources held in circulation) are to the points of leakage, the more efficient their exploitation.

50 https://ellenmacarthurfoundation.org/circular-economy-diagram



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Cradle to Cradle (C2C)

Figure 11. The Butterfly Diagram – a visualisation of the closed-loop economy (Resource: Ellen McArthur Foundation)

Annex 3. Event for representatives of SMEs and government agencies

Seminar for SMEs in the agro-industrial complex of the Kyrgyz Republic

On May 26, 2022 in Bishkek the seminar 'Sustainable Consumption and Production Tools (SCP) in agri-food sector of the KR' was held for small medium-sized businesses in agriculture. The purpose of this workshop was to introduce SCP approaches to greening the supply chain of agro-food products in support of SMEs to minimise the use of natural resources, toxic materials, and reduce the generation of waste and pollutants during the life cycle of products.

More than 50 people attended the roundtable, including:

- The business community in the agricultural sector – 16 people
- 28 farmers
- Experts in the field of agriculture, industry, ecology, MSW management, economy – 8 people

Figure 12. Participants at the SME workshop

The format of the workshop was hybrid, where SCP experts from Kazakhstan and Tajikistan joined online, as well as some SME representatives from the southern region of the country.

Figure 13. Welcoming speech by Z. Zikrina, coordinator of the SWITCH-Asia programme

The agenda of the seminar was as follows:

Time	Activity	Responsible
08:30 – 09:00	Registration Coffee break	
09:00 – 09:10	Welcome speech and executive summary of the project	Representative of SWITCH Asia Zulfira Zikrina
09:10 – 09:30	Results of the SCP analysis in the agri-food sector of the KR Q&S	Duishebaeva A.
09:30 – 10:00	Recommendations for the implementation of SCP in the agri-food sector of the KR Q&A	Kazylaeva K.
10:00 – 10:20	Coffee break	
10:20 – 10:40	SCP and Organic Consumption Development = Basic Factor of Organic agricultural development	Zhamilya Imankulova Cofounder of 'EcoFerma 'TM Ecomade'
10:40 – 10:55	SCP tools implementation in the organic farming – production of potato, vegetables and berries (case study)	Aisuluu Duishebaeva Eco-farm 'Jannat Garden'
10:55 – 11:15	Practical application of a SCP in a grain legume processing enterprise (case study)	Arstanbekova Asel LLC 'Dan Agro Products'

11:15 – 11:30	SCP tools implementation in the berry processing plant (case study)	Ahtyam Kashkeev LLC 'OSKO'
11:30 – 12:00	Green building and green technology financing for sustainable agriculture	Nurzat Abdrasulova PU 'Unison group'
12:00 – 12:30	SCP implementation success and SCP Cells development in agri-food production and processing	Valeriya Orlova REAP project manager Rajat Batra, Senior Technical Expert, STENUM Asia
12:30 – 13:30	Lunch	
13:30 – 14:00	Work in 3 groups: - farmers, - processors - experts Proposals of VAC participants on the implementation of SCP in the agri-food sector of the KR	Kazylaeva K. Duishebaeva A.
14:00 – 14:45	Presentation of 3 groups on different models	Participants
14:45 – 15:00	Summing up the results. Closing of the workshop	Kazylaeva K. Duishebaeva A.

The seminar started with the welcoming speech of the representative of SWITCH-Asia Zulfira Zikrina, where she briefly spoke about the goals and objectives of the SWITCH-Asia program.

Then the experts of SWITCH-Asia programme provided information about SCP, about the difference between linear and circular economy. Benefits and advantages of the circular economy. Also, they acquainted with the Laws, concepts and programmes of KR on achieving the goals of sustainable development.

Figure 14. Presentation by the expert Abdrassulova N. 'Green building and financing of green technologies'

In addition, farmers, processors shared their experiences on the application of SCP approaches in production.

Figure 15. Implementation of PPM tools in organic farming, founder of Eco-farm 'Jannat' Duishebaeva A.

At the end of the workshop, the participants proposed the following activities for the development and implementation of SCP in the agro-industrial complex of the Kyrgyz Republic:

- Elaboration of relevant documents on the implementation and development of SCP in the agro-industrial complex of the Kyrgyz Republic
- Training of consultants on SCP for all participants of the supply chain in the agro-industrial complex
- Creation and development of model enterprises, farms on the implementation of SCP for multiplication purposes
- Attracting investment for the implementation and development of SCP in the agro-industrial complex of the Kyrgyz Republic

Round table for representatives of state agencies

On 15th of June 2022 in the small hall of the Ministry of Agriculture of Kyrgyz Republic the round table discussion 'Sustainable Consumption and Production Instruments (SCP) in the agro-industrial complex of the Kyrgyz Republic' was held. The purpose of this event was to familiarise with the result of the analysis of sustainable consumption and production tools on greening the supply chain of agri-food products in support of SMEs in order to transition to a circular economy.

The round table was attended by 12 people, including:

- Deputy Minister of the Ministry of Agriculture of KR – Mukashev Azamat Felkisovich
- Head of Cluster Development Department of the Ministry of Agriculture of the Kyrgyz Republic – Chekirbaev Uran

- Representative of the Ministry of Economy and Commerce, Strategic Planning Department – Zhunushov M.
- Experts in the field of agriculture, industry, ecology, MSW management

In 2018, Kyrgyzstan developed a 'Green Economy Development Programme' for the period 2019–2023. The programme identified seven priorities: green energy, **green agriculture**, low-carbon transport, green industry, sustainable tourism, green cities, waste management. This is a unique opportunity to integrate SCP (Sustainable Consumption and Production) principles and circular economy approaches into national policies and sectoral plans, to support the implementation of the seven priorities and the achievement of the SDGs in Kyrgyzstan.

In order to implement the principles of 'green economy' and the development of sustainable production and consumption in agriculture, the Decree of the President of the Kyrgyz Republic dated February 8, 2021 'Development of cluster production in the agro-industrial complex of the Kyrgyz Republic' was issued.

In accordance with the Decree of the President of the Kyrgyz Republic, the Concept of cluster development of the agro-industrial complex of the Kyrgyz Republic was developed. The main goal of the state policy of cluster development in the agro-industrial complex is to develop agro-clusters through incentive programmes, taking into account the application of circular economy to ensure food security with high added value and deep processing level.

At the end of the round table, A.F. Mukashev, Deputy Minister of the Ministry of Agriculture of the Kyrgyz Republic said that to develop sustainable production and consumption in agriculture it is necessary to interact with such programmes as SWITCH-Asia in order to effectively implement the main 7 priorities of green economy of the Kyrgyz Republic. In addition, it was proposed to develop a section on the development and implementation of SCP in agri-food sector of the KR in the 'Programme for the development of green economy' for the period 2024–2029.

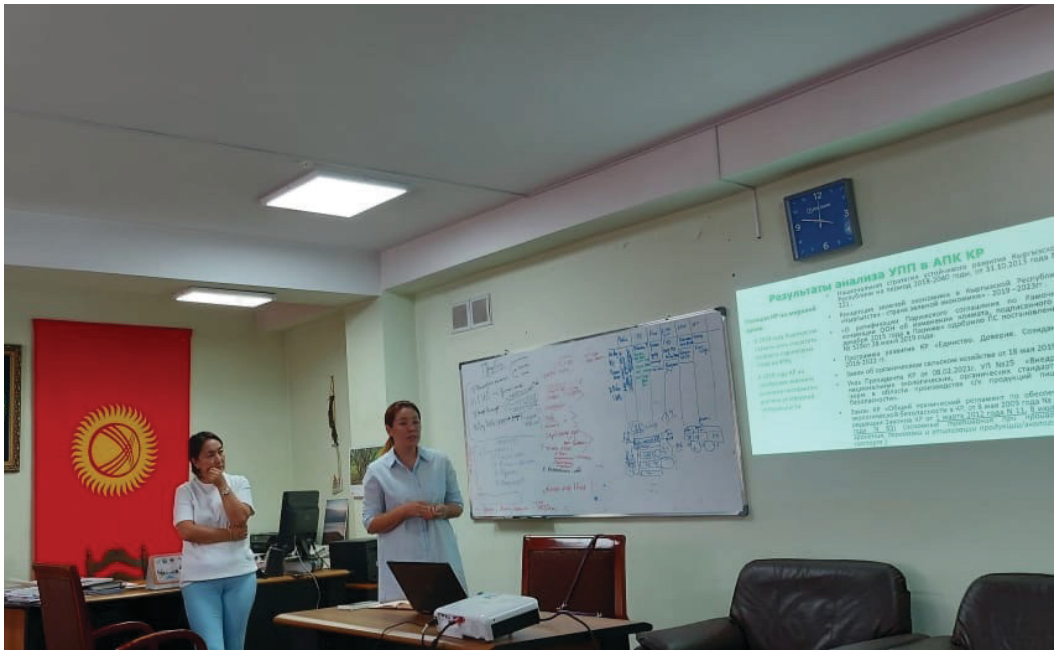


Figure 16. Presentation on the results of the analysis of SCP in the agro-industrial complex of the Kyrgyz Republic for representatives of government agencies

Figure 17. Roundtable participants

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