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COMPARATIVE ASSESSMENT OF RURAL AND CIRCULAR PRACTICES IN ALBANIA, AUSTRIA, GREECE AND KOSOVO

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Table of Contents

List of figures

INTRODUCTION

This report provides an in-depth analysis of bio-waste management practices, laws, regulations, and institutional frameworks in four countries: Albania, Austria, Greece, and Kosovo. Section 1 compares the laws, regulations, and institutional frameworks for bio-waste management in these countries. Section 2 explores the different bio-waste management practices in each country, highlighting the strengths and weaknesses of each approach. Section 3 examines the various types of agricultural production in these countries and their impact on bio-waste management. Section 4 focuses on circular bio-waste management, including best practices and entrepreneurial activity in this field in Albania, Austria, Greece, and Kosovo. Section 5 analyzes support mechanisms for entrepreneurs in these countries, including funding, training, and other resources. Section 6 identifies ongoing or recent projects that the Balkan Environmental Center for Bio-waste Management and Composting (BECBA) can synergize with. By bringing together the best practices and resources from each country, BECBA can help promote sustainable and effective bio-waste management practices throughout the Balkan region. Finally, section 7 shows the results of the primary research conducted in the form of surveys and expert interviews.

1. Section 1: Comparative analysis of Laws, regulation and institutional framework for bio-waste management

Laws, regulations, and institutional frameworks are crucial to ensure proper bio-waste management. They provide guidelines and standards for waste generators, handlers, and disposal facilities, helping to minimize negative impacts of bio-waste on human health and the environment. They also promote resource conservation and sustainability. There has been a growing focus on sustainable ways of utilizing bio-waste in recent years. Instead of considering it as a waste product, it can be treated as a valuable resource that can contribute to the circular economy, creating new products and services. Bio-waste can be transformed into valuable materials, such as bioplastics, biofuels, biochar, and fertilizers. This not only reduces the pressure on landfills, but also promotes circular economy and reduces the reliance on finite resources. In this section, we explore the different laws, regulations, and institutional frameworks of bio-waste management in Austria, Albania, Greece and Kosovo.

1.1 Austria

Austria has emerged as a leader in waste management strategies by implementing comprehensive laws, regulations, and institutional frameworks to address the challenges posed by bio-waste effectively. Although, in 2014, the nation produced more municipal solid waste (MSW) per person than the average EU-28 country (566 kilos vs. 474 kilograms), it also had the highest organic waste recycling rate (31%) and one of the lowest landfilling rates (4%) in the EU-28. The EU Landfill Directive (1999/31/EC) mandates that Member States limit the quantity of their biodegradable municipal waste (BMW) that is landfilled to 75% of the total volume generated. As of 2006, Austria reported that no BMWs were dumped (Paleari, 2016).

The legal framework for waste management in Austria is primarily governed by the Waste Management Act 2002. The Waste Management Act 2002 (Abfallwirtschaftsgesetz) has five essential features:

- Waste prevention
- Preparation for reuse
- recycling
- Other recovery (e.g., energy recovery)
- Waste disposal

The Waste Management Act also governs requirements for the import, export, transit, processing, storage, and transportation of waste. Measure and target ordinances are tools for putting waste management ideas into practice, (Abfallwirtschaft im Betrieb - Allgemeine Informationen zum Abfallwirtschaftsgesetz 2002, 2013). The Waste Management Act of 2002 is supported by several ordinances (European Commission, 2015).

Ordinance on separate collection of bio-waste:

Austria implemented a policy requiring the separate collection of biogenic waste across the country in 1995. Unless the home or generator recovers it, biogenic trash must be collected separately under this regulation (Amlinger & Peyr, 2009).

Ordinance on compost quality:

The Compost Ordinance, FLG II Nr. 292/2001 established standard national regulations for the manufacturing, marketing, and labeling of compost as a product, allowing for its secure and environmentally responsible usage (Paleari, 2016). This regulation governs the quality standards for composts made from waste, the kind and origin of recycled materials, and compost marketing and labeling. Packing materials should not be disposed of in the bio bin to prevent compost contamination (Schneider & Lebersorger, 2016).

The 2011 Federal Waste Management Plan contains provisions for the proper treatment of specific waste streams. The Waste Prevention Programme was adapted to implement the Waste Framework Directive. Austria's federal and provincial governments are each responsible for a portion of municipal waste management. Federal authorities are responsible for enacting and enforcing hazardous waste laws. The Federal Ministry of Agriculture, Forestry, Environment, and Water Management takes responsibility only when nationwide rules are required for other waste categories. The Waste Management Acts of the nine Austrian Federal Provinces govern the collection of nonhazardous mixed municipal waste. In order to carry out the objectives and tenets of the Waste Management Act of 2002, the Federal Ministry of Agriculture, Forestry, Environment, and Water Management is required to produce a Federal Waste Management Plan. The Federal Ministry for Sustainability and Tourism drafts a Federal Waste Management Plan every six years after a process of public participation. The recent Federal Waste Management Plan was published in two parts in 2017. (*Federal Waste Management Plan*, 2017.).

For this research, we will be focusing on bio-waste. According to the Directive (EU) 2018/851, bio-waste is defined as **biodegradable garden and park waste, food and kitchen waste from households** (Directive (EU) 2018/851)**. It excludes sewage sludge, manure, or other biodegradable trash such as natural textiles, paper, or processed wood, as well as forestry and agricultural residues. Moreover, it does not include food manufacturing by-products that are never wasted** (European Union, 1995).

In the EU, a large share of municipal solid waste comprises bio-waste. On average, it is around 30%-40%, but it can go up to 60% in individual cases. Austria is one of those European countries with 15 years of experience in separating bio-waste collection and treatment systems (Severin et al., 2021).

According to the Austrian Federal Ministry, in the case of biodegradable waste, citizens are

advised to compost in their own gardens. If not, composting facilities recycle the organic waste that is collected in bio-waste containers into compost. Biogas plants produce, among other things, biogas that may be utilized for heating or electricity (*BMK*, n.d.).

In order to speed up the development of a circular economy, the European Commission published its Circular Economy Action Plan in 2015. In Austria, the Council of Ministers approved a national circular economy strategy created by the Federal Ministry for Climate Protection(BMK) in coordination with the Federal Ministry for Social Affairs, Health, Care and Consumer Protection (BMSGPK), Federal Ministry of Labor and Economy(BMAW), and Federal Ministry of Agriculture, Forestry and Tourism (BML) on December 7, 2022.(*Kreislaufwirtschafts-Strategie*, 2022)

The Austrian circular economy strategy (Kreislaufwirtschafts-Strategie) acknowledges that when it comes to biomass, there is much room for expanding and improving the usage of secondary raw materials made from biogenic waste, byproducts, and residues. Resource-effective or cascading uses can further boost the value of biomass. The cycle-oriented use of biomass must consider conservation objectives related to biodiversity, soil management, mitigating climate change, defense against natural hazards, and other potential demands in addition to the energy and material components. **Using biomass is crucial for value generation, employment opportunities, and supply security in rural areas.** In order to achieve this, the strategy sets the goal to boost agricultural productivity while diversifying agriculture to meet overarching conservation objectives and minimize waste and leftover resources. Unavoidable waste and residual materials must be recycled to add value and feed into energy or material recycling cycles. The following measures are some of the ways that will help achieve this goal (BMK, 2021).

- Create a data basis regarding the availability of biomass
- Push options for cascading use
- Avoid and reduce waste generation
- Optimize logistics of raw and residual material supply

Although the rules and regulations in place are to prevent waste, other initiatives may instead promote waste. Laws such as the **Viennese Wine Tavern Laws** (Wiener Buschenschankgesetz LGBl. Nr. 39/2013) or the **Viennese Kindergarten Ordinance** (Wiener Kindergartenverordnung LGBl. Nr. 20/2014) may cause food waste unintentionally in aims to ensure food safety (Schneider & Lebersorger, 2016).

1.2 Greece

Organic waste, or bio-waste, is defined as waste that can be decomposed in a reasonable amount of time. Bio-waste is defined as biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers, and retail premises, and equivalent waste from food processing plants in Greek Law 4042/2012 (*Νόμος 4042/2012 - ΦΕΚ 24/Α/13-2-2012 (Κωδικοποιημένος)*, 2012).
The waste management roadmap for Greece, published by the European Commission back in 2012, requires the Hellenic Republic to undertake, amongst others, the following key steps (European Commission, 2011):

- Introduce a landfill tax, to be progressively increased to divert waste from landfill
- Update regional and national waste management plans with specific policy measures on the basis of robust data and infrastructure required
- Implement a strategy to divert bio-waste from landfills
- Introduce door-to-door separated waste collection

According to the official website of the Ministry of Environment and Energy, the legal framework governing waste management in Greece can be summed up in the laws seen in Annex 1, fig.1, These laws are aimed at reducing waste production in Greece, endorsing the recycling and reusing process, and penalizing cases of environmental pollution through criminal law. **Law 4042/2012 'Criminal Protection of the environment**, aims at establishing effective and proportionate penalties for any case of environmental pollution that is or may be caused. Secondly, the law introduces important measures on environmental and human health protection, reducing the negative impact of generating and managing waste, and improving the general effect of waste management processes.

Law 4685/2020 provides for the National Waste Management Plan (NWMP) which is aims to the achieve following targets:

- Reduction of the amount of waste being buried in landfills to below 10% by 2030
- The implementation of the separate collection for waste and bio-waste materials:
- In particular, for bio-waste, article 41 of Law 4042/2012, as replaced by par. 2 of article 84 of Law 4685/2020, stipulates that from 31st December 2022, biological waste will be either separated and recycled at the source or collected separately and not mixed with other types of
- waste. Therefore, the separate bio-waste collection becomes mandatory as of 31 December 2022.
- The development of a network for collecting organic waste (coffee bin) by the end of 2022
- The recovery of energy from treating organic waste (biomass) and the production of secondary materials (compost)
- The construction and operation of waste management plants and bio-waste treatment

plants

Further, Law 4042/2012 aims at establishing effective and proportionate penalties for any case of environmental pollution that is or may be caused. On the second part, the law introduces important measures on environmental and human health protection, reduces the negative impact of generating and managing waste, and improves the general effect of the waste management process ("Waste Management in Greece under the Current Legislative Framework," 2021).

The Greek government also incorporates key European Union Directives on waste management as shown in Annex 1, figure 2, to reduce the landfill of waste and to prevent and reduce pollution for incineration of waste.

There have also been a series of Joint Ministerial Decisions (JMD) to regulate further individual issues that are worth mentioning. These JMDs are listed in Annex 1. Figure 2.

In addition, Ministerial Decision no. 99398/6484 (Government Gazette 4656 B'/2020) was issued concerning the classification of public and private projects and activities in categories and subcategories, according to article 1 par. 4 of Law 4014/2011'. Under this decision, the processing facilities (recovery and disposal) of municipal solid waste (MSW) were elevated from subcategory A2 (projects and activities that are likely to cause a significant impact on the environment) to subcategory A1 (projects and activities that are likely to cause a very significant impact on the environment). This ministerial decision contributes to a unified and stricter legislative framework regarding the environmental licensing for waste processing facilities while shortening the relevant procedures and guaranteeing a high level of environmental protection.

As far as the development of waste infrastructure is concerned, the Integrated Waste Management System of Western Macedonia (IWMS), the first waste management public-private partnership (PPP) in Greece, has successfully diverted the biodegradable fraction from landfills by over 80%, and the residue that goes to landfills is less than 36% of the produced urban solid waste. More specifically, the waste treatment plant is situated between Kozani and Eordea Municipalities, in the Lignite Centre of Western Macedonia of DEI (PPC), and has the capacity to take up 120,000 tons/year of Urban Solid Waste. The plant undertakes the reception and transportation of the total waste produced in the 12 Municipalities of the Western Macedonia Region through 10 waste transfer stations (WTS), the treatment in the waste treatment plant (WTP), and the residue burial in the residue sanitary landfill. The waste treatment plant succeeds in the highest possible retrieval of recyclable materials through the latest mechanical and optical sorting technology reaching over 35%. In parallel, it produces compost. There are companies in the private business sector that, in compliance with the regulatory system, cover important aspects of waste –and bio-waste– management, which are listed in Annex 1, figure 3.

1.3 Albania

The Albanian framework law on integrated waste management attempts to replicate EU waste legislation, including recycling and waste diversion targets. The plan for 2021 is to prepare acts that meet the requirements of the framework law on integrated waste management, with one act transposing the European List of Waste into Albanian legislation and another act transposing packaging producers' producer responsibility obligations. In the medium term, efforts will be focused on drafting/updating legal acts in compliance with the new EU directives and regulations, clarifying the roles and duties of institutions in waste management, and creating waste management reporting in all municipalities.(*Country Fact Sheet: Municipal Waste Management: Albania*, 2021).

The strategic policy document and national action plan on integrated waste management for the years 2020-2035, as approved by Council Members under decision No. 418 on May 27, 2020, is a new addition to the NWMP. Developed by the Ministry of Tourism and Environment of Albania and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in 2020, this plan outlines more practical targets (listed below), not derived from existing legislation or the revised Waste Framework Directive. Its objective is to shift from a linear to a circular economy that promotes the sustainable use of resources, with a significant emphasis on (i) determining costs and fees related to waste disposal at treatment plants and waste transfer stations, and (ii) a verifiable and transparent objective system of investment priorities related to waste management infrastructure that is built on the basis of needs and impact assessment.To achieve the 2035 targets, it may be necessary to develop additional infrastructure, which will depend on advancements in municipal waste management. These advancements include an increase in the segregation of packaging and bio-waste, as well as changes in waste generation patterns.

The NWMP (2020-2035) plans to establish waste management zones as essential elements of integrated waste management planning. These zones comprise one or more municipalities and are connected by a continuous road network that simplifies the transportation of waste to various pre-treatment, recovery, and final disposal sites.

The legal framework governing waste management includes the following laws:

- Law no. 10431, dated 9.6.2011, "On environmental protection," which has been amended
- Law no. 10463, dated 22.9.2011, "On integrated waste management," which has been amended;
- Law no. 8094/1996, "On public waste disposal," provides a legal basis for municipalities to contract third-party services with management agreements that can last up to five years;

Albania's solid waste management sector has various levels of institutional architecture. The Ministry of Tourism and Environment (MoTE) formulates strategies, drafts legislation, and monitors and enforces the waste acts. The national government invests in regional infrastructure, such as sanitary landfills, incinerators, and transfer stations, and the Ministry of Infrastructure and Energy (MIE) is responsible for managing waste and infrastructure projects. The Environmental Inspectorate is responsible for enforcing environmental legislation, and along with regional agencies and MoTE, is responsible for creating a waste management system and overseeing its implementation at all levels. (*Country Fact Sheet: Municipal Waste Management: Albania*, 2021).

1.4 Kosovo

The Ministry of Environment, Spatial Planning and Infrastructure in Kosovo (MESPI) is responsible for implementing Administrative Instructions and Laws related to waste management. The waste laws , including Law 04/L-060 of June 29, 2012, and Law 08/L-071, emphasizes the need to protect the environment and human health by reducing the negative impacts of waste generation and management. The law defines biodegradable waste as waste that can be broken down by microorganisms and requires separate collection and environmentally sound treatment. The law also establishes a hierarchy of waste management options, with waste prevention and reduction being the preferred options, followed by re-use, recycling, and energy recovery. Landfilling is the least preferred option. MESPI oversees the implementation of the Law on Waste and develops policies related to waste management. Local municipalities are responsible for implementing waste management plans, including the collection and treatment of biodegradable waste. Administrative Instructions approved by MESPI provide additional regulations for specific waste handling and management.

Overall, Kosovo has a legal and regulatory framework for managing biodegradable waste that emphasizes the need for environmentally sound waste management practices, including the separate collection and treatment of biodegradable waste and the promotion of waste prevention and reduction. (*Law Nr. 04/L-060 for waste- Annex*, 2012).
In addition to the law mentioned above, the handling and management of specific waste are regulated by Administrative Instructions approved by MESPI.
Table (below) lists relevant administrative instructions.

No.20/2014	Biodegradable waste management
No. 06/2008	Administration of hazardous waste
QRK NO. 08/2017	Management of waste landfills
MEA No. 11/2020 for plastic bags	Determination of technical requirements and other requirements for plastic bags

MEPSI No. 22/2015	Management of waste containing asbestos
No. 06/2008	Administration of hazardous waste
MEPSI No. 14/2017	Waste containing solid organic pollutants
MEPSI No. 02/2017	List of hazardous waste categories by origin
MEPSI No. 10/2015	Treatment of waste from medicinal products
MEPSI No. 07/2015	Management of waste from construction and demolition activities

Table 1: List of administrative instructions in Kosovo

The Administrative Instruction No. 20/2014 for Waste Management in the Republic of Kosovo, regarding bio-waste, biodegradable waste management, composting, type of treatment, and transport contains a total of 26 articles, covering a range of topics related to waste management, including the classification of waste, waste collection, transportation, storage, and treatment. It describes bio-waste as waste that can be naturally broken down or turned into compost, including things like food waste and garden waste. The instruction gives instructions on how to manage biodegradable waste and outlines the necessary procedures and technology for waste management facilities to use when handling, storing, and getting rid of biodegradable waste. It also outlines the conditions for utilizing composting as a means of managing biodegradable waste. It establishes guidelines for the construction, design, and operation of composting facilities, as well as standards for the quality of the resulting compost. It provides guidance on different types of waste treatment methods, including mechanical, biological, and thermal treatment. It sets out specific requirements for each method and specifies the conditions under which each method may be used. The administrative instruction sets out requirements for the transport of waste, including the use of suitable vehicles, containers, and Packaging. It also provides guidelines for the labeling and documentation of waste during transport *(Adminstrativ Instruction Nr. 16/2010 për for biodegratable waste managment., 2010).*

The Kosovo Waste Management Strategy 2019-2028 was introduced to create a system for managing all forms of waste, including biodegradable waste, and to encourage sustainable waste management practices throughout the country. The institutional framework for biodegradable waste management comprises the Ministry of Environment and Spatial Planning, which is responsible for formulating waste management policies, and the Environmental Protection Agency (KEPA), which is responsible for supervising the implementation of waste management policies and regulations. The Waste Management Strategy sets forth various objectives and strategies for managing biodegradable waste in Kosovo, such as the following *(Kosovo Integrated Waste Management Strategy (2019- 2028) and Action Plan (2019- 2021), 2019*):

- Encouraging the separate collection of bio-waste in households and businesses.
- Developing composting and anaerobic digestion facilities for the treatment of bio-waste.
- Increasing public awareness about the benefits of separate bio-waste collection and the environmental impact of bio-waste.
- Promoting the use of compost as a soil amendment in agriculture and landscaping.
- Developing a legal and regulatory framework for the management of bio-waste.

Waste collecting companies in Kosovo*:* The objective of the Waste Management Strategy is to enhance competition and increase the number of waste management firms in Kosovo. The municipalities are responsible for managing waste based on the Law on Local Self-Government, and they have the power to form mechanisms and structures to improve waste management and provide funding for this purpose. While private businesses can participate in waste management, public enterprises currently have a greater presence in the sector. These enterprises operate according to the Law on Private Enterprises and are mainly engaged in waste collection and transportation to sanitary landfills, as stipulated by the Law on Commercial Companies (*Waste Enterprises: Kosovo Trust Agency :KTA*, n.d.).

Landfills in Kosovo: Currently, Kosovo relies heavily on landfilling as a waste management option. There are several landfills operating in Kosovo, including the Prishtina Regional Landfill and the Gjilan Regional Landfill. The Waste Management Strategy aims to reduce the amount of waste sent to landfills and to promote alternative waste management options, such as recycling and energy recovery. Based on Law No. 03/L-087 for Public Enterprises, the Landfill Management Company in Kosovo (KMDK S.A.) (*Law Nr. 03/L-087 for public enterprices*, n.d.) is a legalized and licensed company for the management of regional municipal waste sanitary landfills in the Republic of Kosovo, incorporated and registered as Joint Stock Company based on Law No. 02/L-123 for Commercial Companies (*Law Nr. 02/L-123 for commercial companies*, n.d.).

1.5 Conclusions

Austria has had a legal framework for bio-waste management in place since 1995, while Greece only made this a mandatory practice at the end of 2022. Albania and Kosovo are still in the early stages of developing a waste management framework and have set targets to improve in the coming years. Austria has a well-established composting system, supported by regulations that ensure the quality of the compost produced. In contrast, Greece is still in the early stages of organic waste recovery. Austria has embraced the EU's "Circular Economy" action and has developed strategies to promote the reuse of resources and encourage circularity of waste streams. Other countries have yet to take such steps. Perhaps Austria's path could be taken as an example for the other countries to follow. Austria implemented the separate waste collection plan in 1995 and by now has years of experience in collecting waste separately. the other countries could start there and also study the EU Circular Economy

action and make strategies to implement circular pathways early.

2. Section 2: The different bio-waste management practices

Bio-waste management practices are essential for reducing the negative environmental impact of organic waste. They help reduce greenhouse gas emissions and create new opportunities for sustainable resource management. Bio-waste can be transformed into bioenergy, bioplastics, and biofertilizers through innovative technologies, leading to a more sustainable and circular economy. In this section, we will explore the different bio-waste management practices in Austria, Greece, Albania and Kosovo.

2.1 Austria

In 2019, greenhouse gas emissions from Austrian sector Waste amounted to 1.6% of total national emissions in Austria. This was a steep decrease in the emissions from 68% in 1990. Waste management policies can be credited for this success. Waste separation, reuse and recycling activities have increased since 1990 and the amount of disposed waste has decreased correspondingly especially since 2004 when pretreatment of waste became obligatory (although some exceptions were granted to some Austrian provinces). The legal basis for the reduced disposal of waste as well as the landfill gas recovery is the Landfill Ordinance. Since 2009 all waste with high organic content has to be pretreated before deposition (without exceptions). Furthermore, methane recovery from landfills was implemented in the 1990s (Anderl et al., 2021).

Austria applied the proximity principle to its bio-waste management practices. The country's approach followed the, "As much home composting as possible – brown bin offered wherever home composting is not possible – as much decentralized agricultural (on-farm) composting as possible (Miza, 2022).

Some of the bio-waste composting practices in Austria are listed below:

- **Home composting or backyard composting in private gardens**

Home composting can process significant amounts of bio-waste, particularly in rural areas. According to the Bio-waste Act, organic household waste in Austria is primarily collected via a brown-bin system. Each home is given a brown container with a volume of 120 to 240 liters.

- **On-site composting**

On-site composting refers to the process of composting materials that originate from the same location where the compost is produced and utilized. This type of composting is similar to

household composting but is managed by a public, commercial, agricultural, or non-profit organization instead of a private individual. On-site composting aligns with the proximity principle and is considered a waste prevention method. It typically involves composting agricultural residues and manure.

- **Community composting**: small-scale 5 to approximately 100 m³ composting initiative of local communities.

- **On-farm composting plants:** involves farmers building small composting plants on their property;

Any regional collection and composting scheme which respects the proximity principle and · Special case 'urban-rural' cooperation model: In this case the collection and pretreatment of organic household waste and garden/park waste is done by a city/town local authority. The organic waste (raw compost) is delivered to decentralize on-farm composting sites for composting and maturation (Amlinger & Peyr, 2009).

- **Anaerobic digestion**

An alternative method for recovering energy from wastes is anaerobic digestion of various organic wastes, including separately collected organic fractions of urban wastes, agricultural and green wastes, wastewater sludge, and animal wastes. This supports efforts to create a circular economy and turns waste into capital while allowing the utilization of wastes with high energy content to meet energy needs. Urban, rural, and agricultural infrastructures receive clean electricity and heat from biogas produced from various waste sources. Even the existing natural gas networks have been improved and given an injection in 2018, Austria had produced 336 GWh from all plants (Psomopoulos et al., 2022).

- **Small-scale biogas plants**

The majority of Austrian biogas plants are farm-based. Farmers operate biogas plants on an average of 70 ha of agricultural land, which is significantly more than the Austrian average of 16.8 ha. Farmers who began before the year 2000 cultivate an average of 52 ha, whereas those who began after 2000 manage 85 ha. Most farms have both grassland and arable land, however 16% only have grassland and 16% exclusively have arable land. More than 90% of farmers have animals, with an average of 64 livestock units. Around two-thirds of farmers with animals retain dairy cows, one-quarter fatten cattle or pigs, and one-fourth keep poultry. Organic farmers operate 23% of biogas plants, despite the fact that only 9% of Austrian farmers are organic (Walla & Schneeberger, 2005).

Some rural communities in Austria also use bio-waste as animal feed. For example, food waste can be fed to pigs, and garden waste can be used as feedstock for composting worms or as fodder for livestock. The Ordinance on animal feed 2010 and the Ordinance on animal

by-products provide the legal frameworks for the safe and responsible use of certain types of waste materials. The Ordinance on animal feed 2010 allows for the use of waste bread as animal feed. Similarly, the Ordinance on animal by-products defines exceptions that prohibit feeding of former foodstuffs to farm animals and identifies minimum standards for biogas and composting plants. and contribute to the development of sustainable and circular waste management practices (Schneider & Lebersorger, 2016).

2.2 Greece

Some known practices of bio-waste management that are used in the rural areas of Greece are composting, anaerobic digestion and segregating methods. The government has tried to implement the segregation method as the easiest one in local municipalities. The Ministry of Environment and Energy has published a series of guidelines for more effective campaigns on how to recycle and compost.

Composting: Composting is often considered the leading technique for managing bio-waste. This process involves the controlled decomposition of organic materials through aerobic means, resulting in a nutrient-rich product. Microorganisms in the compost break down the waste, consuming carbon and nitrogen as they grow and reproduce, using water to digest materials and oxygen to breathe. Composting mimics nature's way of recycling organic matter, including food scraps and leaves, and transforms it into a valuable fertilizer that can enhance soil health and plant growth. This technique is highly effective in reducing waste, mitigating the impact of climate change, and improving soil quality. Composting can be carried out both indoors and outdoors (Shelia Hu, 2020).

The Municipality of Kalamata, located in the Peloponnese, has been awarded numerous times for its environmentally friendly approach. Beginning in 2004, 'Kalamata recycles whatever can be recycled', meaning packaging, electrical devices, batteries, toners, cooking oil, lamps and even clothing and shoes. Next goal, that is slowly being set, is the actual bio-waste management at a municipal level, since home-composting is already in use. As declared by the Head of the Recycling Department of the Municipality, 'We are currently doing home composting. In particular, we are turning the food that we throw away in the garbage, into organic matter, which can even be used as a soil conditioner. So the aim of the municipality is to install a network for sorting pre-sorted bio-waste, so that we can reach the targets set by the European Union. We also aim at increasing participation in the programmes we already have through various information campaigns. Finally, we will install a large green spot, a place where the citizens themselves can bring some things, such as furniture that the municipality could use, repair and give them back ' (Flash team, 2019).

The Municipality of Komotini is the first one in the Region of Eastern Macedonia and Thrace to start a separate collection of bio-waste (food waste) with the motto 'We protect the environment; we give life to our lives'. The Environment Department is piloting brown bins,

thus creating another recycling stream, reinforcing the environmental policy of the Municipality. The distribution of the bins will be done in phases, starting from the nurseries of the Municipality, the facilities of the Democritus University of Thrace, the General Hospital of Komotini, the Nursing Home and large supermarket chains. In the next phase, mass catering businesses, hotel units, farmers' markets, food and beverage retailers and residential areas of the municipality will also be included (Composting in municipalities across the country: Better in the soil than in the landfill (Green Agenda, 2021).

In May 2010, the Municipality of Karditsa started a pilot project of house composting, with the distribution of a total of 85 bins (1st phase: May 2010 - distribution of 50 bins, 2nd phase: December 2010 - distribution of 35 bins) in order to strengthen the ecological awareness of the Karditsa residents. The citizens are also provided with professional help during the whole process and are closely monitored by agronomists for any occurring (Municipality of Karditsa, 2018).

Another municipality experimenting with bio-waste management in the form of composting is the Municipality of Arta, located in West Epirus. Since the end of 2019, the local authorities have given 180 garden-composting bins to interested citizens in an effort to boost environmental consciousness and promote homemade soil improvers (Arkolaki, N, 2019).

The first effort by Greece to extract energy from organic waste was the establishment of the first dry anaerobic digestion plant in the Epirus region. The plant processes approximately 105,000 tons of municipal waste annually, with the organic portion extracted from two sorting lines in the mechanical biological treatment (MBT) system before being introduced into the digestion process. (Global Recycling, 2007).

2.3 Albania

In Albania, the amount of waste generated has increased in recent years, and there is still room for improvement in the way it is managed. Waste management is carried out in urban areas, but it is less common in rural areas. Local self-government units usually dump waste in designated storage areas, but some quantities are also dumped in unauthorized places such as along roads and near settlements. Waste management services are contracted out by local self-government units to private enterprises or their own companies for durations of 3-5 years. However, the collection infrastructure is weak, with an insufficient number of containers and outdated collection equipment (containers and trucks) that do not meet European standards and require constant replacement. The NWMP plan includes measures to promote separate collection of recyclable materials in urban areas and separate management of organic waste in rural areas. Encouragement will be given to decentralized and home composting in rural areas. Once the necessary equipment is in place to manage organic waste in urban areas, separate collection will be included as part of the waste management system. *(National Integrated Waste Management Plan, 2020-2035)*

Despite around 40% of the Albanian labor force being employed in the agricultural sector, only a limited number of farms are able to produce for the market due to high fragmentation of arable land. Organic farming that prioritizes quality over quantity is not well promoted. Local authorities are responsible for organizing municipal solid waste (MSW) collection and providing relevant data to the government. While most cities and towns have an MSW collection system, many rural areas lack an official collection system. Separate collection has only been introduced through pilot projects funded by intergovernmental organizations (IGOs) and NGOs, targeting the at-source separation of paper and cardboard, PET, and other recyclable plastic and metal waste streams from other waste types. The projects also covered separate collections of organic and small-scale agricultural waste from households in rural areas. As of 2016-2018, no quality management systems had been developed for the production of compost from bio-waste, including separate bio-waste collection, national compost quality standards, and quality management systems in Albania. *(National Integrated Waste Management Plan, 2020-2035).*

2.4 Kosovo

As a developing country, Kosovo faces numerous challenges in waste management. One of the critical issues is the management of bio-waste, which constitutes a significant portion of the waste generated in the country. Before 2012, bio-waste was not given much attention in Kosovo. However, with the establishment of the National Environmental Agency (NEA), the focus on bio-waste management increased. In 2012, the NEA initiated a pilot project in the city of Vushtrri to test a new approach to bio-waste management. The project involved the construction of a composting plant that could handle up to 200 tons of bio-waste per year. The compost produced was then used as a fertilizer for local agriculture.

Since then, several initiatives and practices have been developed to improve bio-waste management in Kosovo. For example, the Waste Management Strategy 2019-2028 includes a specific focus on bio-waste management, with the aim of increasing the percentage of bio-waste that is separated and treated from 5% to 30%. The strategy also includes plans for the construction of more composting plants, as well as the promotion of home composting.

In rural areas, bio-waste management practices are different compared to urban areas. In many rural areas, the use of traditional methods such as burning and burying bio-waste is still common. However, there have been some initiatives to improve bio-waste management in rural areas. For example, in the municipality of Istog, a pilot project was implemented to establish a composting site for bio-waste from households and agriculture. The compost produced was then used for local agriculture.

Current Practices that can be mentioned:

According to the Kosovo Municipal Waste Fact Sheet 2021 (*Kosovo - Municipal Waste Factsheet 2021 Municipal Waste Management in Western Balkan Countries — Country Profile, 2021),* only 5% of the total municipal waste generated in Kosovo is bio-waste. The city of Pristina has recently initiated a pilot project for the collection and processing of bio-waste, mainly from trees. Other initiatives are:

1. The “Clean and Healthy Environment” program: This is a project funded by the European Union that aims to improve waste management practices in Kosovo, including bio-waste management. The program includes activities such as raising public awareness, developing waste management infrastructure, and promoting sustainable waste management practices.
1. Kosovo Recycles campaign: This is a public awareness campaign launched by the Ministry of Environment and Spatial Planning in Kosovo, which aims to promote recycling and sustainable waste management practices, including bio-waste management.
2. Green Waste Management project: This is a project implemented by the Kosovo Environmental Protection Agency that aims to promote the sustainable management of organic waste, including composting and biogas production.
3. The Waste to Value project: This is a project implemented by the United Nations Development Programme in Kosovo that aims to promote sustainable waste management practices, including the management of bio-waste. The project includes activities such as developing composting facilities, promoting public awareness, and providing technical assistance to local municipalities.
4. Composting Scheme for Germia Park and Other Pristina Public Green Areas: The aim of the project is to establish a composting scheme for the organic waste generated in Germia Park and other public green areas in Pristina, the capital city of Kosovo.
5. Compost Valorisation via Worm Farming in Lipjan: The aim of the project is to establish a worm farming system for the valorization of compost in the municipality of Lipjan.
6. Let’s Talk About Food Waste: The aim of the project is to raise awareness about food waste and promote sustainable food consumption practices among the general public.
7. Composting Scheme for Rural Neighborhood The aim of the project is to establish a composting scheme in a rural neighborhood in Kosovo, with the goal of promoting sustainable waste management practices and reducing the amount of organic waste that is sent to landfills.
8. Linear Economy: The aim of the project is to raise awareness and understand the causes and consequences of linear waste disposal and circular waste economy.

Additionally, in rural communities, the use of traditional methods such as backyard composting, livestock feeding, and open burning is one of the main practices. Backyard composting involves the decomposition of organic waste in a controlled environment, and the resulting compost is used as a soil amendment. Livestock feeding involves the feeding of organic waste to animals, which helps to reduce the amount of waste generated while providing a source of nutrition for the animals. Open burning is an illegal practice that involves the burning of waste in open areas, which causes air pollution and creates health hazards.

2.5 Conclusions

Austria was able to diminish emissions generated by waste over a period of thirty years. Much of the organic waste is composted by multiple stakeholders in different sites. Other practices include using anaerobic digestion to produce biogas. Austria has several farm-based biogas plants. Others also use leftovers for animal feeds but it's regulated through an ordinance on animal by-products. Greece might not have implemented a nation-wide bio-waste management measure but has taken steps to promote better bio-waste practices in selected regions. It also has a few biogas production plants and is also working on nutrient recovery in some capacity. In Albania, although MSW collection systems are prevalent in most cities and towns, official collection systems are absent in numerous rural areas. In such regions, pilot projects financed by intergovernmental organizations (IGOs) and NGOs have introduced separate collection systems that focus on the separation of paper and cardboard, PET, and other recyclable plastic and metal waste streams from other waste types. These initiatives also encompass the separate collection of organic and small-scale agricultural waste from households situated in rural areas. Other EU funded projects are also exploring ways to better utilize leftovers from agricultural produce. In rural Kosovo, the practice of burning rural bio-waste exceeds all other practices but there are small steps towards improvement that need to be made in this area.
Austria's bio-waste management strategy prioritizes local composting. Greece, Albania, and Kosovo can implement a similar strategy that relies on individuals taking care of bio-waste in-house, in the garden, or on the farm. This approach demands minimal investment and requires knowledge sharing.

3. Section 3: The different types of agricultural production

Agriculture production is a vital contributor to the economy of many countries, including Austria, Greece, Kosovo, and Albania. Agriculture provides employment and food security. These countries have unique geographical features and diverse climatic conditions that have led to the development of different types of agriculture production. Austria is known for its high-quality dairy and livestock production, while Greece has a long history of cultivating olives and grapes. Kosovo's agriculture is characterized by smallholder farms that grow various crops, and Albania has a mix of agriculture production, ranging from crops like wheat and corn to livestock rearing. In this section, we will explore the various types of agriculture production in these countries and provide insights into their agricultural practices and how they contribute to the overall economy.

3.1 Austria

Austria is known for its vital industrial and service sectors, but agriculture is also important to its economy. The agricultural sector in Austria employs approximately 4% of the

population and remains to hold a humble share of 1.1% in the overall (Statista, 2022). Austria's fertile land and favorable climate make it a prime location for producing high-quality crops and livestock. Additionally, the country has a long history of sustainable agriculture, with many small-scale farmers utilizing traditional and organic farming methods. Austrian farmers play an essential role in other industries. 30% of the renewable energy is sourced from farmers, and they also take care of landscape management of the alpine regions. Mountains comprise seventy percent of the Austrian countryside. Farming also plays a vital role in helping regulate the beautiful Austrian landscape by preserving green pastures for summer tourism and ski slopes for winter. Two-thirds of Austria's 165,000 farms are in the alpine mountains, where cattle and sheep are often raised to produce dairy products and meat. This type of farming is native to western Austria. The weather in eastern Austria makes it ideal for growing corn, cereals, sugar beets, rapeseed, and sunflower. Recently, Austria has taken the lead in soy production and has become the second-largest soybean producer in the European Union. Pig and poultry production is also popular in Austria's arable regions (Taste of Austria, n.d.). Lastly, it is essential to note that Austria accounts for 1% of global wine output (Ag News, 2020).

Farm Structure Survey 2020

The EU Member States are required to conduct a complete Farm Structure Survey (agricultural census) after every ten years. According to Austria's 2020 Farm Structure Survey results, family farms remain the backbone of Austrian agriculture and forestry, accounting for 93% of all farms. Following are some of the finding of the Farm Structure Survey 2020:

- Austria had 154,953 million agricultural and forestry holdings in 2020. This number is an 11% decline from the previous record.
- The agricultural and forestry holdings employed a total of 420,018 persons.
- There is a sharp increase in organic farming. 22.4% of the holdings followed organic farming principles.
- Over 90% of the farms are family run, with about 4 out of 5 persons working on farms are family members.
- Agriculture uses 38 % of Austria's land.
- Animal husbandries in Austria are small-scale. 82,001 holdings contained agricultural animals. On average, each holding housed 34 cattle, 112 pigs, 33 sheep, and 12 goats.

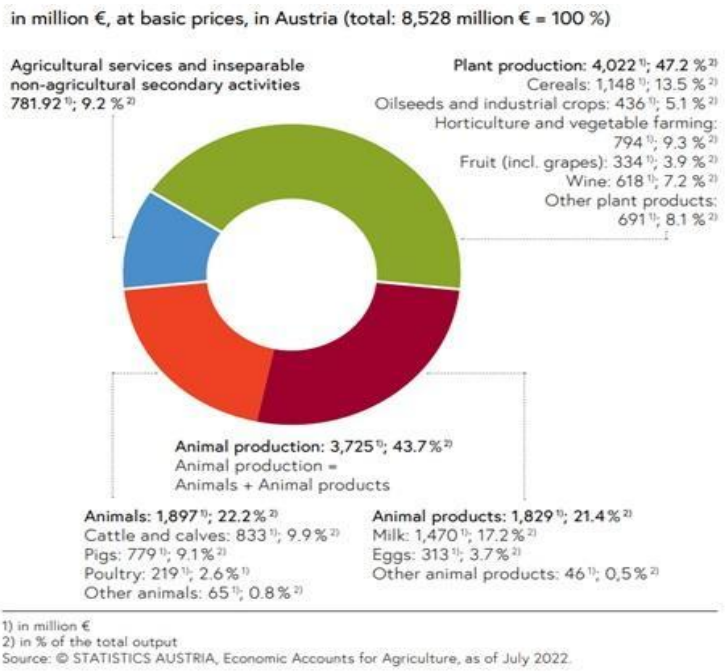


Figure 1: Output of agriculture produce 2021
Source: (FMRA, 2022)

3.2 Greece

Greece is known as a country with big agricultural production, at least for its size and population. However, in recent years, although politicians constantly state their support for farmer unions, more needs to be done to improve their situation. The agricultural sector is key to increasing the GDP in small economies like the Greek one. It is a disappointing reality that the annual performance of the agricultural sector has been steady and slowly decreasing in the past years. Agricultural exploitation has dropped by 22.4%, stock-farmer exploitation by 20%, and mixed exploitation has decreased by 45.7% since 2009. The land exploitation in the Greek economy can be distributed to five big categories, such as arable crops reduced by almost 35% (34.6), vinery crops reduced by 41.3%, forest area reduced by 22,8%, greenhouses increased by 13.7% and the rest of land exploitation reduced by 31.1%.

Regarding the stock-farmer industry, data show the same wave of reduction in every part of the industry. In detail, both the number of animal stock is decreased (chicken stock presents the most significant difference – 26.7%), and the breeding industry is also showing a decreasing trend: cuttle -34.9%, sheep -38.3%, goats -48.3%, chicken stock -66.3% and pork stock -69.4%. In addition to these, various other sectors of the agricultural industry are following the same reductive stream such as: the beekeeping industry reduced by 17.5% and

biological agriculture reduced by 23.5%. However, it is worth mentioning that the land used by biological agriculture increased by almost 20% (+19.3%) in the last 10 years. Lastly, the only sector that seems to increase its numbers is that of biological livestock breeding: cuttle +289.8%, sheep +145.6%, goat +90.4%, pork -60.9% and chicken -17.6%.

In the region of Thrace and East Macedonia, where 80.2% of the agricultural production is based on arable crops, a reduction of 10.8% of used land was monitored. In contrast, at the same time, in the region of Central Macedonia, where the majority of the production is also based on arable crops, the reduction was even more considerable (-15.5%). Almost the same decrease is monitored for the region of West Macedonia (-15.7%), while the situation is worse for the region of Epirus. The statistics indicate that the agricultural sector is shared almost equally among arable crops, forest areas, and the rest of agricultural activity. However, in the end, land use for these purposes also decreased by 31.3%. Moving on to the region of Thessaly, the decrease percentage is lower (-11.5%), and in Central Greece, with fewer arable crops (49.6%), the reduction of agricultural land is -25.5% since the year 2009. In the region of the Ionian Islands, almost half of the land exploitation is on forest land (49.4%), while in the total amount, it was also decreased by 27.1%. As for the region of West Greece, arable crops have a higher percentage of land exploitation (37.9%), and so do forest regions (37.7%), but the results remain the same. The total land used for agricultural purposes has fallen by 19.7%. In the region of the Peloponnese, the situation is again similar (total decrease of 24.1%), but the majority of land exploitation is for forest areas (71.1%). Even in the region of Attica, where the agricultural sector is not important, a decreasing trend is being monitored (-13.6%). The rest of the Greek regions (North Aegean, South Aegean and Crete) indicate that the country's agricultural sector is not thriving. Although they have small agricultural production, the land exploitation for agricultural purposes also decreased: North Aegean -25,4%, South Aegean -34%, and Crete -18.4% (Hellenic Statistical Authority, 2022)

Lastly, there is in the Greece **Electronic Waste Register** (EWR), which is a service provided by the Ministry of Environment and Energy, that businesses and organizations can use to register their activities and declare their waste management policies. According to data provided by the official website of EWR, 37,069 businesses registered and active in the waste management sector, 341 registered municipalities, 37,541 active facilities, and a total of 138,375 waste reports were submitted.

3.3 Albania

Agriculture remains one of the largest and most important sectors in Albania. Twenty-four percent of soil is used for agricultural reasons. South-east of Albania is considered one of Europe's earliest lands used for agriculture (IIA, 2019). Compared to other countries in the European Union, where the agriculture sector represents around 2 percent of the GDP and 36.4 percent of overall employment, agriculture in Albania represents 18.9 percent of the GDP (2019), according to the National Institute of Statistics (INSTAT). In 2019, there were

351,600 registered farms in Albania, and the total export of agricultural goods was valued at Lek 35,300 million. Agricultural statistics are an essential tool for monitoring and managing the market of agricultural products. The growth of agricultural production not only develops the economy and reduces unemployment but also helps lower the prices of the major consumer products consumed by the population and the country's dependence on imports. *(Invest-in-albania.org, 2016)*

- **Field crops**

The vegetable production in 2021 was 1,338,218 tons, increasing by 3.28% compared to 2020. The highest level of vegetable production was achieved in the prefectures of Fier, with 541,792 tons, Tirana, with 133,579 tons, and Berat, with 131,830 tons. Cereal production in 2021 is 691,353 tons, increased by 1.04 % compared with the previous year. The highest level of cereals production was achieved in the prefectures of Fier with 168,385 tons, followed by Elbasan with 98,249 tons and Korça with 85,094 tons. In 2021, potato production was 258,862 tons, which increased by 1.56 % compared with 2020. The highest level of potato production was achieved in the prefectures of Korça with 63,418 tons, followed by Fier with 44,636 tons and Elbasan with 29,986 tons. On the other hand, compared with the previous year, white bean production decreased by 12.98% *(INSTAT, 2021)*.

Agriculture production	2017	2018	2019	2020	2021
Field crops					
Cereals	701.7	678.2	666.1	684.0	691.4
Vegetables	1,151.9	1,166.3	1,258.0	1,295.7	1,338.2
Potatoes	249.8	254.5	260.7	254.8	258.9
White beans	21.2	24.5	24.8	25.8	22.4
Industrial crops	32.7	30.8	33.7	30.1	27.3
Medicinal crops	12.8	12.5	12.9	14.4	16.0
Forage	6,688.6	7,050.1	7,115.2	7,170.5	7,054.0
Permanent crops					
Fruit trees	262.6	274.3	272.6	273.7	287.2
Olives	107.8	117.6	98.3	131.9	110.2
Citrus	41.0	45.5	46.9	49.2	50.5
Grapes	202.9	184.8	189.9	199.1	212.2

Figure 2: Agriculture production (thousand tons)
Source: (INSTAT, 2021)

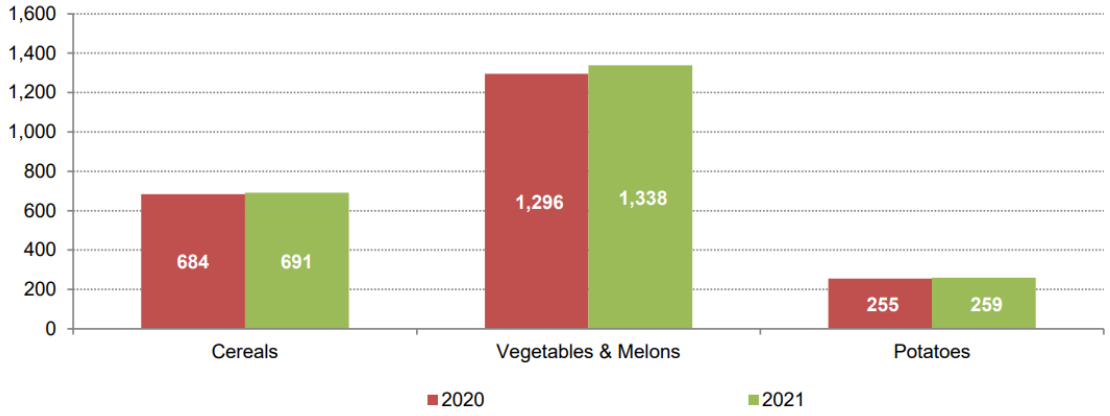


Figure 3. Production of cereals, vegetables and potatoes (thousand tons)
Source: (INSTAT, 2021)

Fresh vegetables represent 66.48 % of total vegetables followed by melons with 24.03% and dried vegetables with 9.48%.

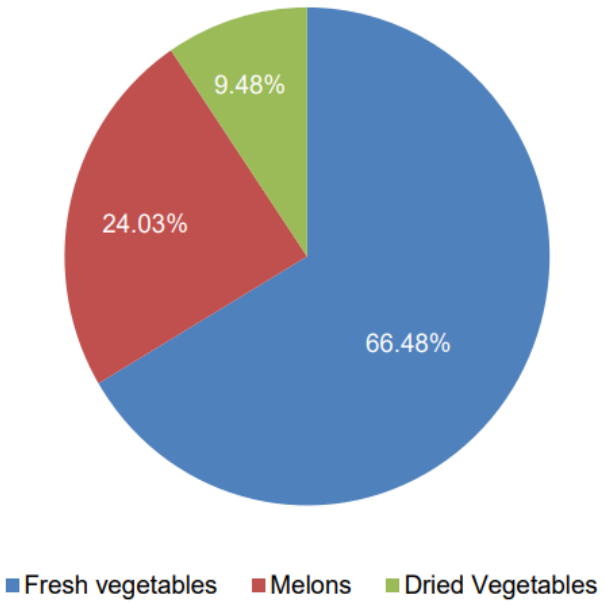


Figure 4: Structure of vegetable production, 2021 (in %)
Source: (INSTAT, 2021)

Fresh vegetables production in 2021 was 889,693 tons, increasing by 1.69%, also melons production and dry vegetables increased with 7.60% and 4.11% respectively, compared with the year 2020. In the group of fresh vegetables, the most representative crops are tomatoes with 35.35%, cucumbers with 13.28% and peppers 11.17%. In dried vegetables, dry onions represent 85.32% of total production, while in the production of melons, watermelon represents 84.25% of the production.

Vegetable production in greenhouses represents 21.67% of total vegetable production, where the prefectures of Fier represents 52.00% of the production. Greenhouse vegetable production in 2021 increased by 2.64% compared to the previous year where tomato production represented 51.9% of total production. *(INSTAT, 2021)*

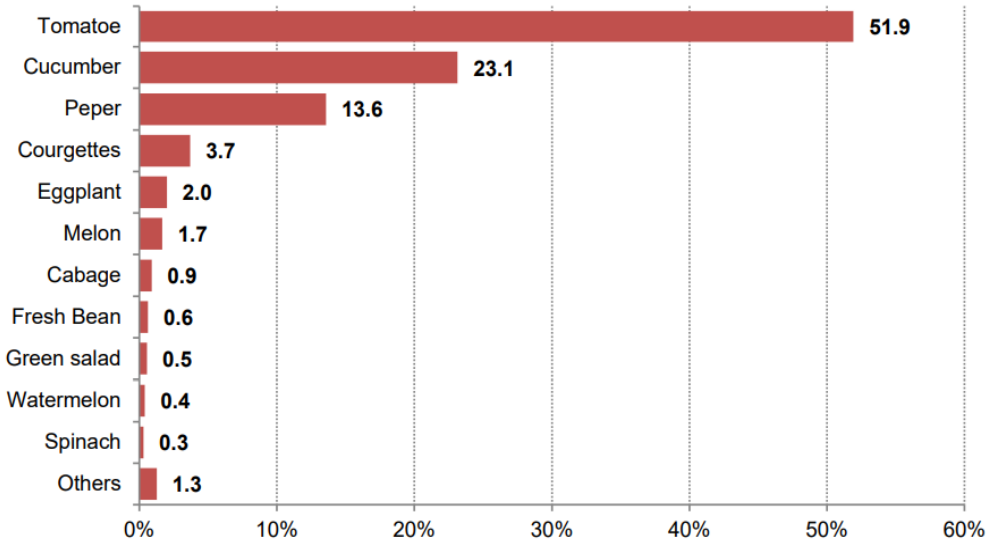


Figure 5: Vegetables production by crops in greenhouse (in %)
Source: (INSTAT, 2021)

The highest level of greenhouse vegetable production from the total vegetable production was achieved in Berat prefecture with 64.62%, and Fier with 27.79%. The lowest level was achieved in Korça and Gjirokastër prefectures with 0.16% and 0.42%.

- **Permanent Crops**

The production of fruit trees, olives, citrus, and grapes represents the production of permanent crops. Fruit tree production in 2021 is 287,210 tons increase of 4.92% compared with 2020. The highest production level was reached in the prefecture of Korça with 89,753 tons, followed by the prefectures of Elbasan with 39,118 tons and Fier with 33,774 tons.

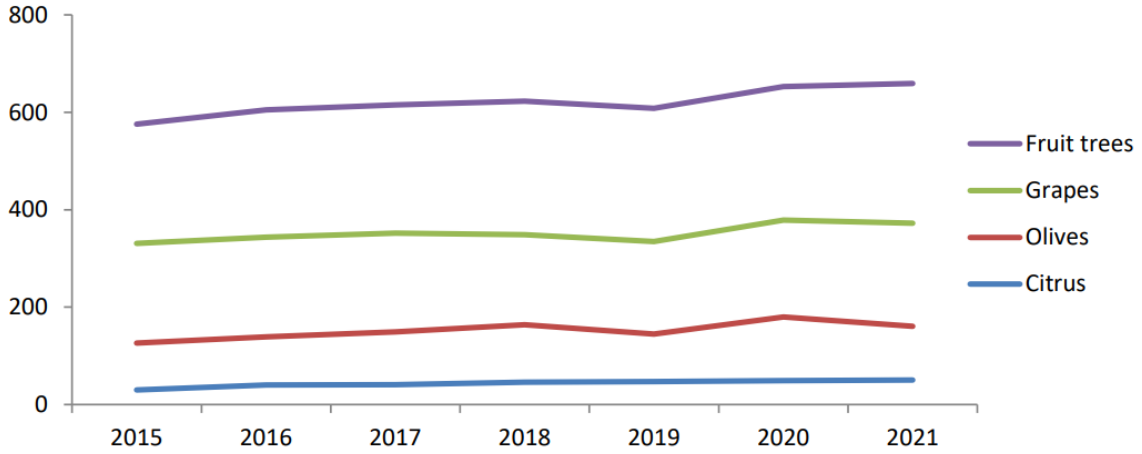


Figure 6: Production of permanent crops (thousand tons)
Source: (INSTAT, 2021)

The pome fruits group occupies 45.43% of the total production, represented by apples with 85.25 %. Korça prefecture occupies 66.02 % of the total apple production in the country.

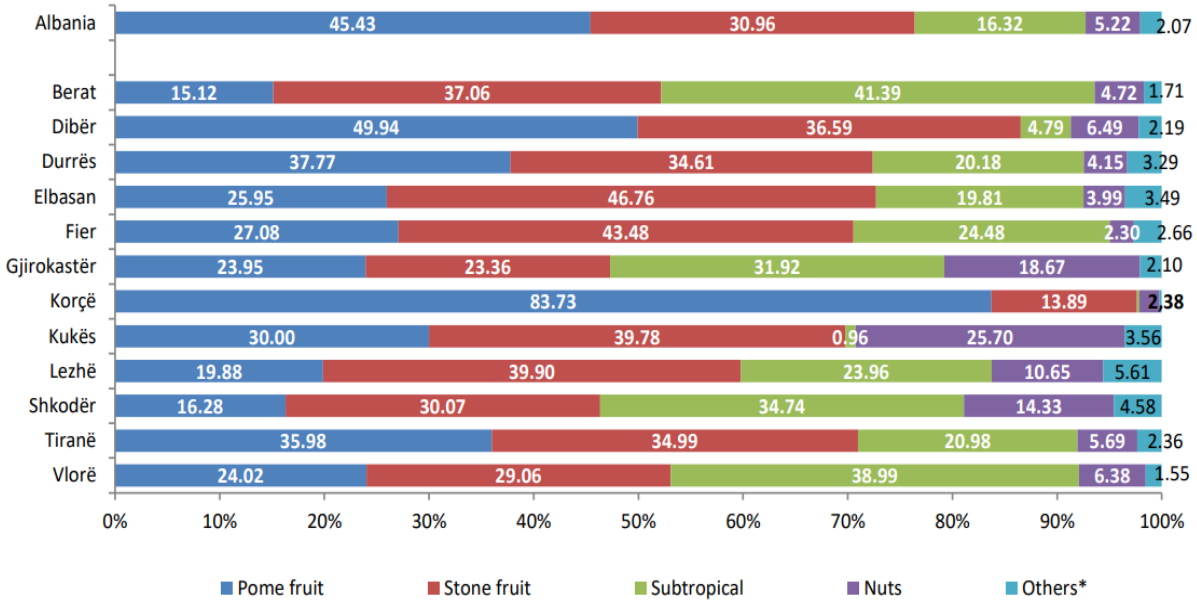


Figure 7: Structure of fruit trees production by kinds and prefectures, 2021 (in %)
Source: (INSTAT, 2021)

The largest category in the stone fruits group is represented by plums at 46.33%, cherries at 24.80%, and peaches at 23.18 %. In the subtropical fruits, the primary group is represented by figs at 51.40 %, followed by pomegranates at 17.76%. The highest level in the nuts group is achieved in Kukës prefecture, and the main category is occupied by nuts at 46.37 %, followed by chestnuts at 33.96%.

In 2021, 110,164 tons of olives were produced, increasing by 16.52 % compared to the previous year. The highest level of olive production was reached in the prefecture of Fier with 34,241 tons, followed by the prefectures of Elbasan with 21,102 tons and Vlora with 20,298 tons. *(INSTAT, 2021)*

The highest level of citrus production was achieved in the prefecture of Vlora, with 64.41% (32,518 tons). The citrus production in 2021 was 50,485 tons, increasing by 2.61 % compared with the previous year, where 65.04% of total citrus production was occupied by Clementine production.

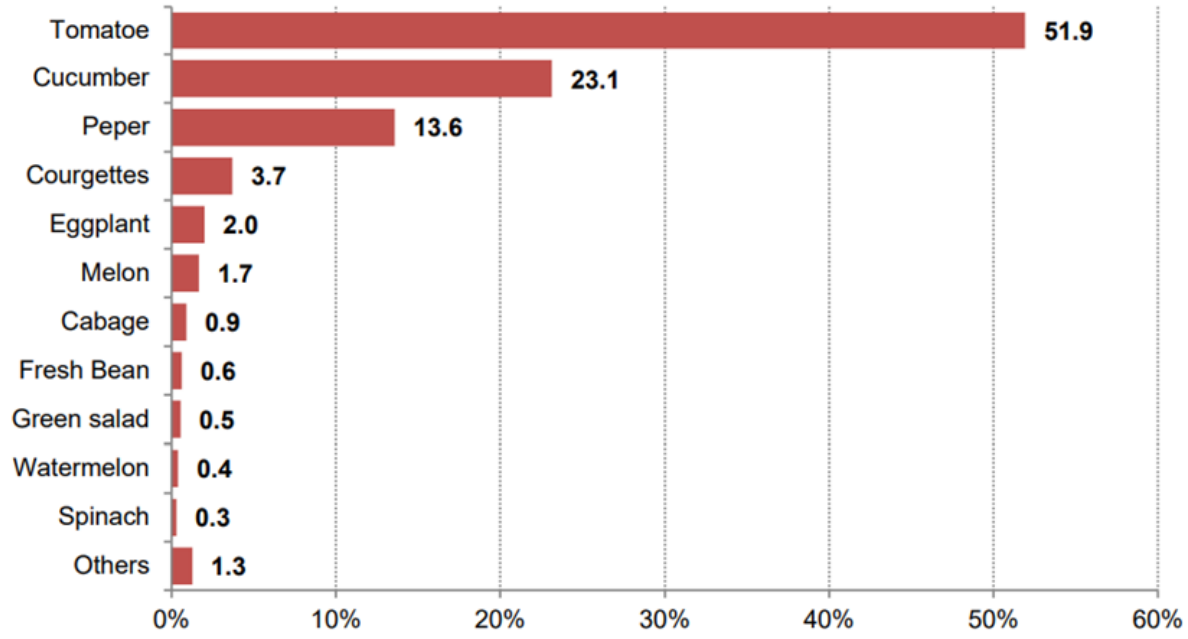


Figure 8: Vegetables production by crops in greenhouse (in %)
Source: (INSTAT, 2021)

3.4 Kosovo

Kosovo's agriculture is characterized by medium-sized small farms, where about 90% of farms have an area of less than 5 ha, a key factor that directly affects low productivity and the increase in production costs. The total utilized area of agricultural land in 2021 was 420,327 ha. According to the use categories, Arable land - fields, including vegetables in the open field and vegetables in greenhouses, has a share of (44.8%), Tree plantations 2.4%, Vineyards 0.8%, meadows and pastures (including common land). 51.7% and gardens 0.3%.In 2021, plant products have increased by 11.5%, compared to 2020. *(Kosovo Green Report 2022, 2022).*

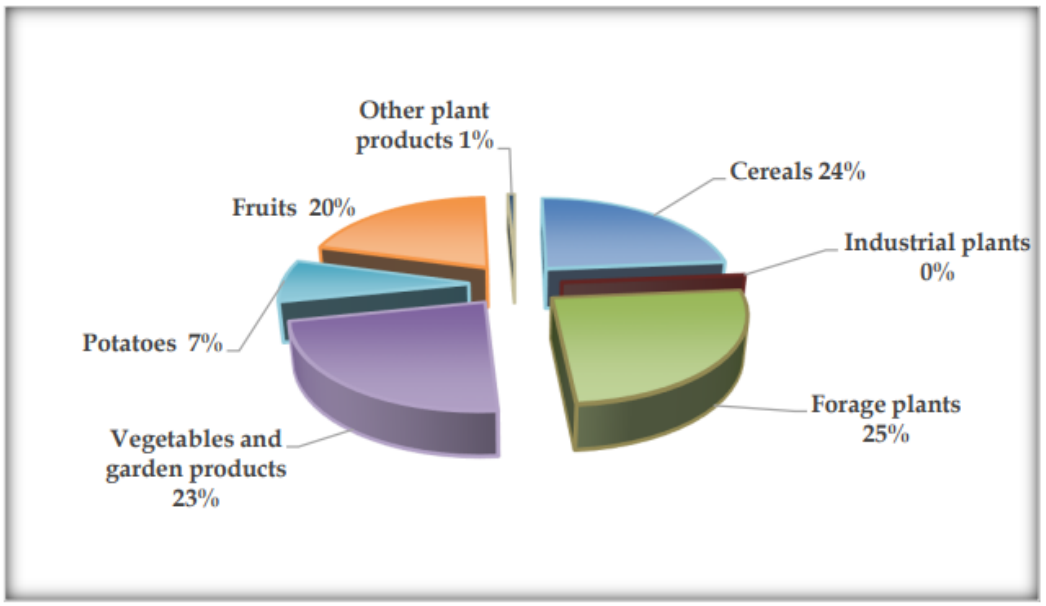


Figure 9: Share of agricultural crops in total production, 2021
Source:(Kosovo Green Report 2022, 2022).

The above figure shows the share of agricultural crops in the total plant production for the year 2021, where forage plants lead with the highest percentage, followed by cereals, vegetables, fruits and others.

- **Agricultural Production**

The total utilized area of agricultural land in 2021 was 420,327 hectares. More than half of the agricultural land in the given area comprises meadows and pastures, covering an area of 217,107 hectares. The second largest category is arable land, which includes fields and vegetables grown in the open and greenhouses as a first crop. This category represents 44.8% of the total agricultural land, covering an area of 188,375 hectares, with an additional 9,053 hectares allocated for vegetable production. *(Kosovo Green Report 2022, 2022).*

	2017	2018	2019	2020	2021	Difference 2021/2020 in %	Share in % 2021
Arable land – fields	186,954	188,359	188,365	188,372	188,375	0.0	44.8
- From which with vegetables in the open field (first crop)	8,033	7,818	8,319	8,435	8,491	0.7	
- From which with vegetables in greenhouses (first crop))	467	468	518	547	562	2.8	
Garden	1,199	1,003	1,122	1,133	1,089	-3.8	0.3
Fruit trees	6,247	7,687	9,244	10,029	10,144	1.1	2.4
Vineyards	3,199	3,272	3,367	3,437	3,471	1.0	0.8
Plant nursery	159	109	111	137	140	2.4	0.0
Meadows and pastures (including common land)	218,314	218,152	217,932	217,102	217,107	0.0	51.7
Total area of agricultural land in use	**416,072**	**418,582**	**420,141**	**420,210**	**420,327**	**0.03**	**100.0**

Figure 10: Agricultural land use by categories, hectors
Source: (Kosovo Green Report 2022, 2022)

- **Cereal Production**

In 2021, 124,477 hectares of cereal crops were cultivated in Kosovo, with wheat being the most dominant crop, followed by corn, barley, oats, rye, and other cereals. Although the areas cultivated with most crops increased, the overall production of cereals decreased, except for rye and other cereals. Wheat accounted for most cereal production, covering 69.6% of local consumption needs, while the rest was imported. Domestic wheat production was valued at €64.4 million, mainly used for human consumption, with the remaining used for animal feed. Despite the increase in prices in the international market, the trade balance remained negative due to the increase in imports. Each person in Kosovo consumed 207 kg of wheat and wheat-containing products in 2021. *(Kosovo Green Report 2022, 2022).*

Crop	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area			**ha**			
Cereals	***120,746***	***123,869***	***124,199***	***124,714***	***124,477***	**-0.2**
Wheat	80,519	81,123	80,273	80,473	79,970	*-0.6*
Maize	35,951	38,453	39,441	39,684	39,710	*0.1*
Barley	1,605	1,948	1,954	1,982	2,060	*3.9*
Rye	318	434	420	425	555	*30.7*
Oat	2,320	1,797	1,975	2,009	2,030	*1.1*
Other grain crops	33	113	136	141	153	*8.4*
Production			**t**			
Cereals	***477,880***	***441,757***	***459,404***	***529,112***	***504,371***	**-4.7**
Wheat	320,136	280,616	284,999	341,818	322,018	*-5.8*
Maize	147,200	151,921	163,930	175,180	170,393	*-2.7*
Barley	4,687	5,124	5,159	5,764	5,610	*-2.7*
Rye	866	1,049	1,010	1,153	1,409	*22.2*
Oat	4,862	2,751	3,954	4,769	4,500	*-5.7*
Other grain crops	129	296	352	427	441	*3.3*
Yield			**t/ha**			
Wheat	*3.98*	*3.46*	*3.55*	*4.25*	*4.03*	*-5.2*
Maize	*4.09*	*3.95*	*4.16*	*4.41*	*4.29*	*-2.8*
Barley	*2.92*	*2.63*	*2.64*	*2.91*	*2.72*	*-6.3*
Rye	*2.72*	*2.41*	*2.41*	*2.71*	*2.54*	*-6.5*
Oat	*2.10*	*1.53*	*2.00*	*2.37*	*2.22*	*-6.6*
Other grain crops	*3.87*	*2.62*	*2.59*	*3.03*	*2.89*	*-4.7*

Figure 11: Cereal area, production and yield, 2017-2021
Source: (Kosovo Green Report 2022, 2022)

- **Vegetable Production**

In Kosovo, the total area of vegetable cultivation in open fields, greenhouses, and gardens in 2021 is estimated to be 19,399 hectares. The most commonly grown crops include potato, pepper, pumpkin, beans, onion, watermelon, cabbage, stella blue squash, tomato, melon, cucumber, and others. Overall, there was a slight increase in the total area of vegetable cultivation in 2021, except for cucumber, tomato, and garlic, which decreased.
According to estimates for 2021, the total area dedicated to second crops after the first harvest has increased by 1.3% compared to the previous year, amounting to 285 hectares. Among the second crops, onion has shown a significant increase in area with a growth of 13.1% compared to 2020, followed by cabbage with a 3% increase. However, the areas for spinach and lettuce have decreased compared to the previous year. In terms of production, except for onions which have seen an increase, the production of other crops has decreased

compared to 2020. The production value was €9.6 mil., while the trade balance continues to be negative. *(Kosovo Green Report 2022, 2022).*

Crop	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area		**ha**				
Vegetables	**208**	**233**	**278**	**281**	**285**	**1.3**
Cabbage	92	99	81	88	91	3.0
Spinach	80	66	155	145	142	-2.4
Lettuce	9	18	4	6	6	-4.2
Onions	15	10	27	28	32	13.1
Others	12	41	11	14	15	8.8
Production		**t**				
Vegetables	**2,406**	**3,451**	**3,000**	**3,008**	**2,992**	**-0.55**
Cabbage	1,987	2,362	2,000	2,106	2,090	-0.75
Spinach	187	271	596	466	426	-8.72
Lettuce	81	124	14	18	17	-6.01
Onions	39	80	186	187	208	11.33
Others	113	614	204	231	251	8.63
Rendimenti		**t/ha**				
Cabbage	21.53	23.81	24.68	23.93	23.05	-3.6
Spinach	2.34	4.12	3.84	3.21	3.01	-6.4
Lettuce	8.67	6.75	3.46	2.98	2.93	-1.8
Onions	2.66	8.34	6.95	6.68	6.58	-1.5
Others	9.75	15.16	17.91	16.48	16.45	-0.2

Figure 12: Area, production and yield of second crops after the first harvest
Source: (Kosovo Green Report 2022, 2022)

- **Fruits Production**

In 2021, Kosovo's fruit cultivation area increased slightly to 10,382 hectares, with apples, plums, raspberries, and walnuts being the most extensive crops. However, fruit production decreased by 6.5% compared to the previous year, with most crops experiencing a decline. Apples were the most produced fruit, followed by plums, raspberries, pears, and walnuts. The total production value was €14.8 million, but the trade balance remained negative. *(Kosovo Green Report 2022, 2022).*

Crop	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area		**ha**				
Fruit	**6,422**	**7,922**	**9,479**	**10,265**	**10,382**	**1.1**
Apple	2,155	2,556	3,006	3,068	3,083	0.5
Pear	456	479	610	614	618	0.7
Quince	39	64	90	91	93	2.6
Medlar	41	50	51	51	53	4.0
Plums	1,524	1,821	2,096	2,201	2,210	0.4
Apricots	11	14	22	22	24	5.9
Peach	26	34	47	48	51	5.5
Cherry	78	82	107	108	110	2.0
Sour Cherry	149	167	232	233	240	3.0
Walnuts	340	608	886	1,295	1,352	4.4
Hazelnuts	95	119	252	390	391	0.3
Strawberries	175	234	235	236	238	1.0
Raspberries	1,231	1,537	1,637	1,661	1,665	0.3
Blackberries	21	24	30	31	32	3.9
Blueberries	33	37	57	86	93	8.3
Chokeberries	-	-	88	98	98	0.4
Other fruits	48	94	31	32	30	-6.2
Production		**t**				**%**
Fruit	**34,207**	**53,606**	**67,294**	**72,265**	**67,533**	**-6.5**
Apple	13,159	26,093	33,835	38,049	37,381	-1.8
Pear	2,083	3,500	5,110	5,586	4,953	-11.3
Quince	255	925	1,283	1,264	1,266	0.2
Medlar	129	179	222	219	213	-2.6
Plums	7,393	10,643	12,745	13,147	11,247	-14.5
Apricots	59	38	100	94	94	0.2
Peach	130	199	330	288	262	-9.1
Cherry	298	410	586	538	485	-9.9
Sour Cherry	599	427	777	740	705	-4.7
Walnuts	405	761	2,028	2,591	2,108	-18.6
Hazelnuts	17	29	80	116	101	-12.7
Strawberries	1,328	1,316	1,677	1,487	1,439	-3.2
Raspberries	7,747	8,267	7,206	6,659	5,840	-13.2
Blackberries	181	246	239	233	223	-4.6
Blueberries	271	306	310	464	469	1.0
Chokeberries	-	-	666	692	656	-5.2
Other fruits	153	265	101	97	90	-7.2

Figure 13: Area and production of fruits, 2017 – 2021
Source: (Kosovo Green Report 2022, 2022)

- **Grape Production**

In 2021, The production value of this crop was €3.9 million, but the trade balance continued to be negative, with a value of €1.4 million. *(Kosovo Green Report 2022, 2022).*

Crop	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area			**ha**			
Vineyards	**3,199**	**3,272**	**3,367**	**3,437**	**3,471**	**1.0**
Table grapes	799	816	878	911	938	2.9
Wine grapes	2,400	2,455	2,489	2,526	2,533	0.3
Production			**t**			
Vineyards	**15,364**	**27,322**	**19,318**	**26,330**	**26,527**	**0.7**
Table grapes	3,187	4,998	4,546	6,281	7,435	18.4
Wine grapes	12,177	22,324	14,772	20,049	19,091	-4.8
Yield			**t/ha**			
Vineyards	**4.8**	**8.4**	**5.7**	**7.7**	**7.6**	**-0.2**
Table grapes	4.0	6.1	5.2	6.9	7.9	15.0
Wine grapes	5.1	9.1	5.9	7.9	7.5	-5.0

Figure 14: Grape's area, production and yield, 2017-2021
Source: (Kosovo Green Report 2022, 2022)

- **Organic Farming**

There is no direct information on hectares planted with organic farming since most of the organic production in Kosovo is based on the wild collection and a tiny portion in cultivation. However, this table presents the number of applicants for subsidies provided by the state *(Kosovo Green Report 2022, 2022)*.

Organic farming	Number of applicants	10	37	27	48	35
	Number of beneficiaries	6	24	26	38	11
	Number of ha paid	118	443	1,050	1,672	197
	Payment per ha	+300	+500	500	1,000	125/200 450/500
	Total amount paid	35,373	277,578	524,900	1,672,210	81,150

Figure 15: Number of applicants for subsidies per organic
Source: (Kosovo Green Report 2022, 2022)

- **Forage crops and green cereals**

In 2021, there was a slight increase in the area of fodder crops and cereals harvested while they were still green. However, the production of these crops decreased in most cases, except for green corn, which was grown as a second crop. The decrease in production was due to a

decrease in yield. The most significant decrease in yield was for grass, hay, clover, and other crops, ranging from 1.7% to 6.1%. *(Kosovo Green Report 2022, 2022).*

Crops	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area			**ha**			
Forage and cereals harvested green	**105,613**	**107,099**	**108,480**	**108,436**	**108,560**	**0.1**
Green corn	8,830	7,085	7,082	7,037	7,061	0.4
Green corn (second crop)	379	212	304	205	210	2.6
Hay (meadows)	69,235	70,679	70,679	70,717	70,723	0.0
Grass	8,847	9,200	9,253	9,261	9,293	0.3
Alfalfa	15,747	17,182	18,293	18,329	18,360	0.2
Clover	798	854	901	904	931	2.9
Other green forage	1,776	1,887	1,967	1,984	1,982	-0.1
Production			**t**			
Forage and cereals harvested green	**486,989**	**480,966**	**504,406**	**503,758**	**481,952**	**-4.3**
Green corn	149,487	109,532	118,504	120,653	118,937	-1.4
Green corn (second crop)	4,057	2,260	4,322	2,851	2,875	0.9
Hay (meadows)	226,288	249,559	249,683	247,921	233,323	-5.9
Grass	26,707	30,786	31,689	30,584	28,819	-5.8
Alfalfa	67,748	73,754	84,257	85,503	82,330	-3.7
Clover	2,620	3,065	3,446	3,652	3,551	-2.8
Other green forage	10,082	12,010	12,506	12,595	12,117	-3.8

Figure 16: Area, production, yield of forage crops and cereals harvested green, 2017-2021 Source: (Kosovo Green Report 2022, 2022)

- **Livestock Product**

The data depicts the sale of diverse livestock categories, including cattle, pigs, sheep, goats, poultry, other animals, and livestock products such as milk and eggs. It is observed that the sale of beef, sheep, goat, and poultry meat witnessed a decline in 2021 in contrast to 2020. On the other hand, there was a rise in the sale of pork meat. Regarding livestock products, the production of eggs saw a surge in 2021 compared to the preceding year, while milk production decreased. *(Kosovo Green Report 2022, 2022).*

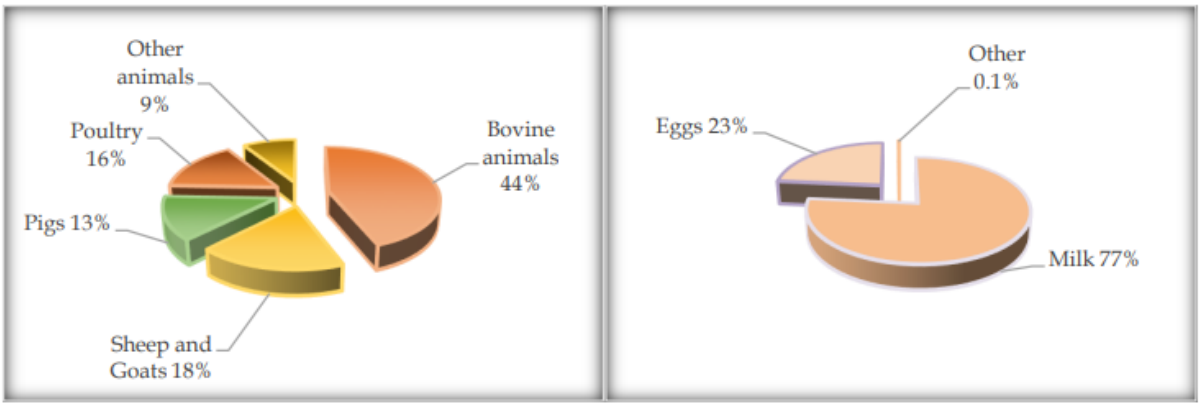


Figure 17: Livestock share
Source: (Kosovo Green Report 2022, 2022)

- **Value Chain**

The following example is representative for most of the fruits and vegetables in Kosovo. The quantification scenario builds on peppers as one of the most important cultivated crop.

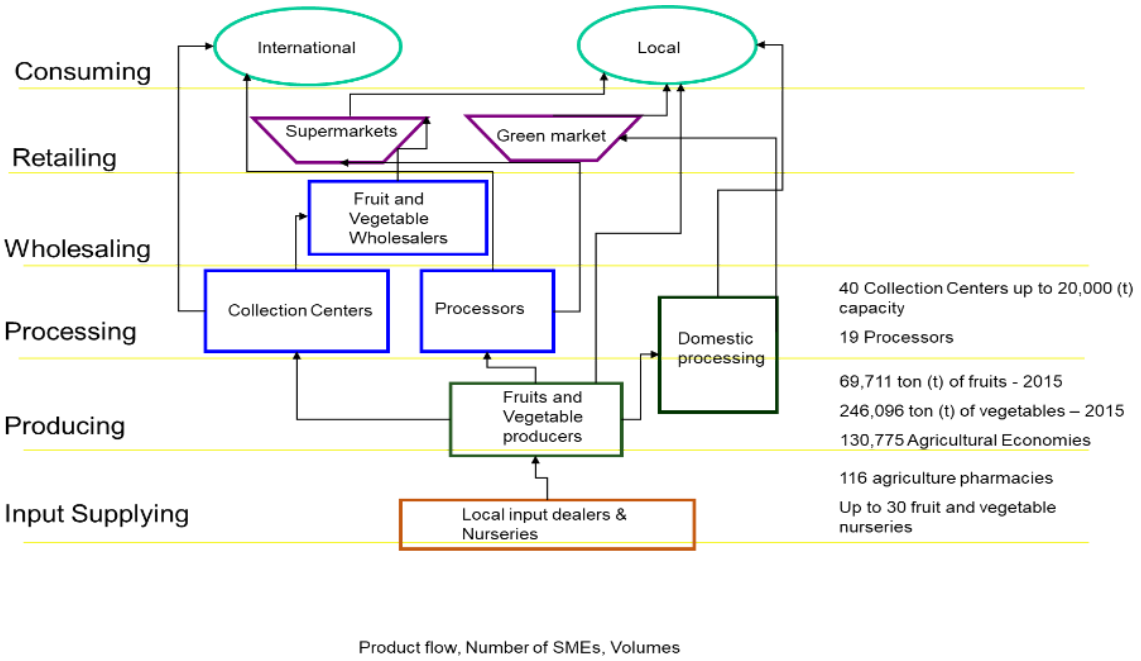


*Figure 18: Product flow in Kosovo**

**Information on collection center capacities in the value chain is based on individual research and may not be exhaustive due to the absence of comprehensive databases. However, the findings may hold relevance in 2023.*

4. Section 4: Circular bio-waste management, best-practices and entrepreneurial activity in this field

Circular bio-waste management is becoming increasingly important in today's world as it addresses both environmental and economic issues. The concept of circular economy revolves around keeping materials in use for as long as possible, minimizing waste, and creating value from waste. In this context, bio-waste plays a crucial role in the circular economy, as it can be turned into valuable resources such as energy, fertilizers, and other bioproducts.

This section of the report aims to identify best-practices in circular bio-waste management in four different countries: Austria, Greece, Albania, and Kosovo. The purpose is to showcase examples of entrepreneurial activity that demonstrates, contributes to, and fosters those best-practices. By highlighting successful initiatives and innovative solutions, this section aims to inspire and motivate policymakers, businesses, and individuals to adopt circular bio-waste management practices in their own countries.

It is important to showcase these examples as it not only helps to address the pressing issue of waste management but also contributes to the development of a sustainable and circular economy. The circular economy has the potential to provide significant economic and environmental benefits, including reduced waste, lower greenhouse gas emissions, and increased resource efficiency. The examples presented in this section can serve as a guide for businesses and policymakers in implementing circular bio-waste management practices in their own countries, contributing to a more sustainable and prosperous future.

4.1 Austria

Find a list of best-practices of circular bio-waste management. Under each, or several examples of those best-practices, a or multiple Austrian start-up(s) that demonstrate, contribute to and/ or foster those particular best-practices:

Source separation: Proper separation of organic waste at the source of generation is essential for efficient circular bio-waste management. It helps to minimize contamination and maximize the recovery of valuable resources.

Innovation and technology: Innovation and technology can play a critical role in circular bio-waste management. Emerging technologies such as blockchain, artificial intelligence, and machine learning can help to optimize waste management processes and improve resource recovery.

Monitoring and reporting: Monitoring and reporting systems can help to track the progress of circular bio-waste management initiatives and identify areas for improvement. Regular reporting can also help to build trust and accountability among stakeholders.

Start-up: SLOC - the **SLOC Waste Bin** is an Austrian invention that measures information in containers of various sizes and filling materials. Possible information: Filling level, temperature (incl. alarm function), lid position, lid openings, movement musert (e.g. emptying). It is linked to the **SLOC Waste Collection Portal**, which is a web-based application that enables dynamic route planning based on the fill level information of the SLOC Waste Bin. https://www.sloc.one/

Decentralized systems: Decentralized circular bio-waste management systems can help to reduce transportation and processing costs and minimize greenhouse gas emissions. They can also provide local economic benefits by creating jobs and producing local resources.

Composting: Composting is a natural process that turns organic waste into a nutrient-rich soil amendment that can be used for agricultural and landscaping purposes. It is a cost-effective and environmentally friendly method of waste management.

Start-up: Öklo is an Austrian start-up that provides dry, compost toilets. https://oeklo.at/

Start-up: Traceless is a German start-up, active in Austria, that creates a naturally biodegradable plastic: https://www.traceless.eu/

Vermicomposting: Vermicomposting is a process that uses worms to break down organic waste into nutrient-rich compost. This method is particularly suitable for small-scale and home-based waste management.

Start-up: **Wurmkiste** is a prominent Austrian startup which provides a household solution for private composting with worms. It uses vermicomposting to break down organic waste and stimulates citizens to arrange their organic waste composting themselves, at home, preventing it from having to be transported. https://wurmkiste.at/

Anaerobic digestion: Anaerobic digestion is a process that converts organic waste into biogas, which can be used for energy production. This process also produces a nutrient-rich digestate that can be used as a fertilizer.

Biogas reforming: Hydrogen can be produced through a process called biogas reforming, which involves using steam to convert methane and other gases in biogas into hydrogen and carbon monoxide. This process is also known as steam methane reforming. The resulting hydrogen can be used as a fuel or a feedstock for various industrial processes.

Integration with agriculture: Circular bio-waste management can be integrated with agriculture to create closed-loop systems. For example, organic waste can be used to produce compost or biogas, which can be used to fertilize crops or power farm equipment.

Upcycling and repurposing: Upcycling and repurposing of organic waste can help to create new products with added value. For example, waste materials can be turned into biodegradable packaging, animal feed, or even fashion products.

Start-up: **Hempstatic** - Manufacturer of biobased insulating products from hemp-lime intended for the field of building acoustics. The company specializes in developing recyclable materials from **agro-byproducts** and aspires to revitalize the regional economy with its regenerative approach, enabling consumers with a pilot product line that is based on eco-soundproofing systems. https://hempstatic.at/

Start-up: **Hut & Stiel.** Austrian Start-up Hut & Stiel collects organic coffee grounds, waste from restaurants and hotels, to use as soil for mushrooms to grow. https://www.hutundstiel.at/

Start-up: **SENNSenn** is making vegan cheese from apricot kernels. http://www.sennsenn.at/

Start-up: **Vienna Textile Lab** – is an Austrian biotech start-up that produces textile dyes using naturally occurring microorganisms. https://www.viennatextilelab.at/

Resource recovery: Circular bio-waste management should prioritize the recovery of valuable resources from organic waste, such as nutrients, energy, and other useful products.

Start-up: **Homebiogas** – Homebiogas is originally an Israeli start-up, but has been implemented in community homes in Austria. Their product is as simple as a "tent" in which residents throw their bio-waste, and the homebiogas transforms it into gas, which residents can use to cook on. https://www.homebiogas.com/meet-our-customers/

Start-up: **Livin Farms** – Livin Farms feeds bakery and other bio-waste to insects, cleaning up the waste and delivering end-products: Insect proteins, insect oil, high value organic fertilizer. Definitely a good entrepreneurial example of protein upcycling! https://www.livinfarms.com/

Policy and regulatory frameworks: Policies and regulations can play a critical role in promoting circular bio-waste management. Governments can incentivize waste reduction, promote waste separation at source, and support the development of circular bio-waste management infrastructure.

Food waste reduction: Entrepreneurial activities that focus on reducing food waste can help to minimize the amount of bio-waste that needs to be managed. These activities can include food rescue organizations, meal planning apps, and food waste tracking systems.

Education and awareness-raising: Education and awareness-raising initiatives can help to promote the benefits of circular bio-waste management and encourage behavior change among waste generators.

Too Good to Go Austria – originally a Danish company, too Good to Go is now also based in Austria. The start-up really makes it their priority first and foremost to educate its audience and raise awareness for preventing food waste in the household, and also offers the opportunity for consumers to use their app and pick up leftover food from restaurants and supermarkets for a small price. https://www.toogoodtogo.com/de-at

Glacier – Glacier offers online climate education for businesses. With their climate academy, they offer participants to learn climate action skills and training for companies and leaders. They make employees ready for a sustainable business future. https://glacier.eco/en

Collaboration and partnerships: Collaboration and partnerships between different stakeholders can help to create synergies and maximize the benefits of circular bio-waste management. For example, waste management companies can partner with renewable energy producers to create integrated waste-to-energy systems.

Stakeholder engagement: Circular bio-waste management requires the participation and engagement of stakeholders, including waste generators, waste management companies, and policymakers. Effective communication and collaboration are essential for successful circular bio-waste management.

Social and environmental sustainability: Circular bio-waste management should prioritize social and environmental sustainability. It should aim to create social and economic benefits for local communities while minimizing negative impacts on the environment and public health.

In Austria there are plenty of initiatives to connect and engage stakeholders and promote CSR. **ClimateLab** was founded recently to bring corporations, civil society and start-ups together on the journey to becoming climate neutral by 2050. https://climatelab.at/en/home/

RespACT, the Austrian council for sustainable development, is the largest CSR platform connecting over 350 Austrian companies, placing sustainability topics on their agenda. https://www.respact.at/

Circular economy principles: Circular bio-waste management should be guided by circular economy principles, which prioritize the efficient use and reuse of resources. This includes **designing products for reuse and recycling,** using renewable energy sources, and **promoting closed-loop systems**.

Promoting closed-loops systems is something that the following two start-ups active in Austria do particularly well. **Aquaponics** is a method of growing plants and raising aquatic animals in a symbiotic environment. It is a combination of aquaculture (raising aquatic animals) and hydroponics (growing plants in nutrient-rich water). In an aquaponics system, fish waste provides the nutrients that the plants need to grow, while the plants help to purify the water for the fish. The system is self-sustaining and highly efficient, with very little waste produced. Both **Blün** and **Blue Planet Ecosystems** are Austrian aquaponic start-ups both functioning in their own ways:

Blue Planet Ecosystems turns sunlight into seafood by replicating aquatic ecosystems. Their product, a fish system, functions as a completely natural ecosystem. Algae, that consumes sunlight, is being fed to zooplankton, which is being fed to the natural food of fish, consumed by fish. The wastewater coming from the fish tank is recirculated to the algae. The big advantage of such a system is that you can feed your fish organically, and hold fish sustainably on land. https://www.blueplanetecosystems.com/

Blün approaches their aquaponic cycle slightly differently, because they are purifying the wastewater coming from their fish tanks in a biofilter and then irrigating their fruits and vegetables fields with it. The purified wastewater returns to the fish. Blün's end products are both fish and fruits and vegetables. https://bluen.at/

There are plenty of Austrian entrepreneurial examples of waste valorisation. These examples provide just a fraction of the possibilities out there. In an interview with Johannes Kisser, technical director of alchemia-nova, institute for circular economy and nature-based solutions, based in Vienna, the following roadmap examples for **bio-waste valorisation** were provided. The table provides opportunities, some more complex than others, depending on the need for certain equipment or a particular educational background, but most would be achievable for any of the BECBA project participants.

Examples of agricultural by-products		
Agricultural by-product	**Actions/cascading processes**	**End products**
Wheat (bran, middlings, straw)		Livestock feed, insect feed, hay, bedding for livestock
All sorts of bio-waste (food waste)	Grow molds	Mycelium blocks/bricks, or packaging, insulation panels
Apple Pomace/Pulp (the residue after processing apples)	Extract: all sorts of sugars Pectin wax from the peel	Biopolymer (PHA) Leather-like material Gelatine in marmalade Nutraceuticals Glue
Fruit seeds and stones (grapes, apples, apricots, peaches)		Flour Nutraceuticals Oils Nutri bars
Food residues	Protein upcycling: Feed the food residues to insects: black soldier fly larvae	Chicken or Fish Food Aquaponic loops (cooperation between fish and plants)
Bio-waste	Home biogas system	Energy
Grass, fruits	Extract the green, red.	Coloring agent (e.g. green in toothpaste, creams, etc)
Wastewater	After naturally purifying, add bacteria and extract ectoine	Skin cream with naturally derived ectoine
Sugars	Sugar Refinery - Get access to Molasses (residue after refining the sugar) - bacterial fermentation. Take out a string for volatile fatty acids. You do need a bioreactor for this	Biogas Bioplastics
Glee (wine & beer production, rich in vitamins		Plant boosting agents

4.2 Greece

Circular economy is a production-consumption model quite different from the linear model that economies have followed for years. It involves sharing, leasing, reusing, repairing, refurbishing and recycling that aim at elongating the life cycle of the materials for as long as possible. One of the key elements of a circular economy is the reduction of waste to the minimum along with the recycling and reusing practices in order to create further value. However, reduction of waste is not the only solution, since waste management is also equally important as an issue (*Circular economy: definition, importance and benefits.* (2023). News European Parliament.) (*Moving beyond waste management towards a green economy.* (2016). European Environment Agency.).

In the Greek economy, the most popular method of bio-waste management is **composting**, both as an at-home practice and as a business activity. Composting can be described as a natural process that turns bio-waste into a thick, brown mud, known as compost or simply fertilizer. Compost owes its popularity to a lot of factors, such as the low rate of bio-substance that the Greek soil suffers from (1%), desertification danger, high levels of CO^2 and climate change effects, and of course the low cost and easy production (*What is composting.* Ecological Recycling Company.).

As for **recovering of nutrients** there is the use of plant biomass, which is any plant substance originating from agricultural production, food waste and wood materials. Plant biomass can be used again as energy supplier (at home, greenhouses or for industrial use) or as organic soil improver in waste management units. Greece has a big production of plant biomass (7,500,000 tons/ agriculture and 2.700.000 tons/ as residues of forest origin) and uses its energy to cover 3% of the country‘s energy needs (*Organic Waste Management With Composting And Suitable Selection Building Materials.* (2018). Aristotle University Of Thessaloniki).

Furthermore, due to the size of the agricultural sector, Greece has managed to produce **animal feed** originating from bio-waste. The first project, ‘Food 4 Feed’, started at 2018 and used hotel food waste as its main source. Mainly, the aim was to construct a solar drying unit that could fit 40-50 tons of dry product in order to be distributed as animal feed (*Life F4F : Animal feed production from hotel food waste.* (2018). Greenagenda.).

Also, in September 2021, a project named ‘Olivefeed’ started with the aim to produce high quality animal feed that would be consumed in chicken farms. The innovative part of the project was that the feed would be rich in pheniloc compounds, since its coming from bioactive extracts of by-products and wastes of oil production. In the end, the project will be responsible to develop new ways of bio-waste management that are friendly for the environment, take advantage of the rich composition of olive by-products and increase the production of chicken farms through higher food quality (*OliveFeed: By-products and waste from olive production become 'green' biofunctional animal feed.* (2022). Greenagenda.).

It is also worth mentioning a few **initiatives** that are active in the sector of circular activities dealing with bio-waste. According to data provided by the Ministry of Environment and Energy in 2021, there is an innovative project called 'Fishbone' that aims at improving the management of waste coming from the local trout industry. In detail, they use the fishbone (after the fish being filleted and ready for consumption) to produce a substance called hydroxyapatite and can be used as biomaterial and also the tails and heads to produce the protein collagen (*Circular Economy, Greece's New Action Plan.* (2021). Ministry of Environment and Energy.).
Another initiative is the project 'Wastes-to-Biopolymers' that aims at converting food waste into bioplastic products. The plan is to utilize liquids originating from the cheese making industry and along with liquid waste from the fruit and vegetable industry, compose biodegradable polymers that will be used as food packaging (bottles, cups).

Eco-Park, is a park dedicated to displaying recycling practices, teaching children and adults about the advantages of waste management and helping them with applying these practices in their everyday life, is due to open to the public by 2025 in Heraklion, Crete.
Though bio-waste management is a developing sector in the Greek economy, there are a few projects and entrepreneurial activities that are heading in the right direction:

a) LIFE-F4F (Food for Feed): An innovative process for transforming hotels' food wastes into animal feed (Project Number: LIFE15 ENV/GR/000257): This is a project coordinated by the United Association of Solid Waste Management in Crete, and funded by the European Commission under the LIFE Programme. The main aspiration of the project was to evaluate, through a pilot-scale demonstration, an innovative and simple technology, and a low-emission process that enables the safe transformation of food waste, mainly from hotels (and more generally from the hospitality industry and restaurants), into animal feed. The process included the pasteurisation of food scraps through enhanced solar drying, the manual sorting and eventually shredding of the residues. Main goal of the project was for the final product to be evaluated both for use in productive animals and in companion animals.

b) Olivefeed is a project that also aims to produce an innovative animal feed product, this time generating from waste and residues of the olive oil industry.
The results of the project will be the following: 1) Collection and monitoring of the stability of olive oil by-products/waste oils, based on their phenolic content, 2) Application of green extraction techniques to oil industry by-products and wastes - Analysis of produced extracts and enriched fractions - Isolation and identification of chemicals, with emphasis on hydroxytyrosol, 3) Study of the biological activity of the extracts/enriched fractions/isolated substances produced, 4) Pilot production of innovative biofunctional feeds, evaluation of their quality characteristics and identification of target-indicator compounds, 5) In vivo experiments for the evaluation

of innovative feeds in the rearing of laying and broiler hens, 6) Oxidative stability control and identification of target marker compounds in finished poultry products, and 7) Analysis of the feasibility of production and commercialisation of finished products.

c) Circular Greece (Project Number: LIFE-IP CEI-Greece - LIFE18 IPE/GR/000013) is a project developing in Greece with a duration of 8 years (2019-2027) and aims to contribute towards the implementation of the National Waste Management Plan, the National Waste Prevention Plan and the National Strategy for Circular Economy.
The project has mainly the following objectives: 1) Development of actions to promote the practical implementation of waste hierarchy (integrated waste management, preparation for reuse and segregate waste, hazardous waste produced in houses and implementation of financial tools), 2) Actions to eliminate food waste and development of Agro-Food waste management alliances, 3) Reeinforcment of the use of circular economy tools, 4) Raising awareness on the general topic of waste management in relation to the concept of circular economy and 5) Actively search for funding resources that could support the National Waste Management Plan.
The project results can be found here.
The project is co-funded by the LIFE programme and the Green Fund, and supported by the Ministry of Environment and Energy, the Hellenic Recycling Agency, the Green Fund, the Natural Environment and Climate Change Agency, a number of municipalities across the country and other organizations.

At a municipal level, the **Municipality of Kozani** (Western Macedonia) has been exploring the potential for creating new growth and employment through better bio-waste management. The Western Macedonia has traditionally been reliant on mining and energy production. However, now that the age of coal is coming to an end, authorities are focused on developing a green, circular bio-economy in the region. Members of the recently launched 'Kozani Bio-waste Club' will work together to revolutionize the Integrated Regional Waste Management System, making the city a circular economy pioneer in Greece. The Bio-waste Club is managed locally by CluBE, the Cluster of Bio-energy and Environment of Western Macedonia.
A pilot project collecting organic waste from 100 households was launched in 2016, in collaboration with the Waste Management company of Western Macedonia (DIADYMA). Due to its success, the scheme has been expanded, and in 2019, over 50 tons were collected from more than 500 households. Organic waste is currently treated to produce compost, which is made available for use by residents. The Bio-waste Club supports the Municipality to roll-out separate collections in pilot neighborhoods across the city, and explore opportunities to transform bio-waste into valuable products such as bioplastics and fertilizers (*Integrated Waste Management Project in the Region of Western Macedonia/HELECTOR*. ELLAKTOR GROUP.).

The initiative is part of a project called SCALIBUR - Scalable Technologies for Bio-urban Waste Recovery (Project Number: 817788), which has received funding from the European Union's Horizon 2020 Research and Innovation Programme.

The **Municipality of Rethymno** (Crete) has adopted a new smart collection system to optimize the Used Cooking Oil (UCO) to biodiesel value chain. This action aims at increasing the UCO recycling rate and enhancing its safe disposal by expanding and optimizing the collection network with 'smart' bins, integrating sensors with GSM technology and a web-based monitoring platform.
The platform allows real-time monitoring of the bins' fulling level and optimisation of the collector drivers' routes. It sends alerts at selected fill rate, temperature raise, unauthorized movements or vandalism incidents. Through the smart management system, the collection efficiency is increased and operational costs are reduced. Fewer collection trips mean less fuel consumption and less greenhouse gas emissions. Targeted communication activities for citizens and schools challenge a behavioral change towards UCO proper recycling (*From UCO to Biodiesel*. Renewable and Sustainable Energy Local Planning Toolbox.).

4.3 Albania

A pilot project for separate collection and composting of bio-waste in Cërrik, Peqin, Rroskovec and Belsh includes providing dedicated bins and implementing door-to-door collection (Albanian Environment Agency, 2021).

Decentralised composting and **home composting** will be encouraged in rural areas. **Separate bio-waste collection** in urban areas will be incorporated into the system once facilities are in place for the management of these waste streams. A new composting plant is scheduled to start operation in the Cërrik municipality in autumn 2021, with a capacity of 1000 tons annually. The plan is to produce compost for use in landscaping (Albanian Environment Agency, 2021; UNICE, 2018).

In addition, the Albanian Government intends to implement a Solid Waste Management Project in the northern part of the Vlora district. Investment measures in this project include a new regional sanitary landfill, a **waste separation plant** mainly for previously separated recyclable materials, a **composting plant** for previously separated organic waste, equipment for the collection and transport of municipal waste and the **closure and rehabilitation of existing major landfills**. The implementation of the project started in 2017, financed by KfW Entwicklungsbank within the framework of the Germany-Albania Financial Cooperation.

During the recent years, several business companies in Albania have shifted their business activity towards the circular economy concept, by applying efficient waste management

practices and turning waste to resources. Several circular economy activities in Albania comprise the following initiatives:

I.N.C.A. NORD FISH SH.P.K. Established in 2004, the company is known for processing products of animal origin (cattle intestines). It was presented as the only producer of Natural Casing and animal by-products in Albania. As the only company of its kind in Albania and the Balkan region, it supplies products to large companies in the country and region, which are specialized in the treatment of meat and sausage products.
A considerable part of the revenues is invested in the development of treatment technology, which in turn has increased the volume of production. Currently, the company is employing about 110 workers, which will be doubled in the near future. However, to avoid the economic loss from the products which do not meet the clients' requirements, faulty products are further recycled through technological processes. After being processed, the products are exported elsewhere in Europe as food for animals under the EU standards.
From 2008 to 2015 they had a linear approach about manufacturing and distribution of natural casing through importing raw materials. From 2017 they went towards a Circular Approach, thus investing in casing cleaning machineries and collecting and processing 5 tons/month of Albanian casing for the Albanian market. During this time 5% of organic waste disposed of by the slaughterhouse was reduced.
Further on, from 2017 to 2018 they started to collect and recycle the entire intestinal tract and to export Albanian products to a lot of European countries. After 2018, they went to a fully circular system by investing in a new pet chews production facility, new mucosa treatment plant destined for the pharmaceutical industry, recycling 40-50% tons/month of organic animal by products. They reduced the organic waste disposed by slaughterhouses and their own company by 30% and continue exporting to EU countries and other countries worldwide.
In 2020 they invested in the only rendering plant in the Western Balkans area, recycled 200 tons/month of organic waste created by the food industry and reduced all organic waste disposed in Albania by 98%.

AGRIMONA is an environmentally friendly initiative (organic shop) with the mission to contribute to social impact in a financially sustainable way, with all profits dedicated to the social mission. Their social goals are to: promote development of high quality local and traditional Albanian food products; support smallholder products and remote areas; promote customer education on healthy nutrition and environmental protection.
They aim to reduce waste and pollution by short term inventory and reduce food waste; paper packing and unpacked products; promote natural production techniques; promote reusable shopping bags; buy back used jars and bottles.

AIBA COMPANY. Established in 1993, AIBA Company is a leader in the field of cattle food production, breeding and growth of chickens for meat consumption and eggs production. The

number of eggs produced annually reaches around 100 million per year, which in turn generates about 40 tons of waste due to excessive moisture.
Nevertheless, AIBA Company has invested in technology that reduces the moisture and benefits about 20 tons of soil fertilizers per day. The end product is compressed in packages and sold to farmers for the production of agricultural products. Also, AIBA company is investing in creating a new system that will make the drying of waste possible. It will improve the quality of fertilizers, ensure better environmental conditions and a higher quantity of products for selling.

SOAP PRODUCTION is a project initiated by the EU, which takes place in the city of Roskovec located in the south-central part of Albania. The city is known for being rich in olive trees, generating large amounts of olives and extracting 23 oils for trade purposes. However, the oil extraction process leaves behind a considerable amount of organic sludge. The project aims to refine organic waste into organic soap, which benefits both the environment and the social economy of the region.

AGRICULTURAL PRODUCTS INITIATIVES. Over the recent years, agricultural initiatives have been developed increasingly in the market by promoting agricultural products and services in different shapes, be it shops, restaurants, deliveries, etc.
The focus of these entrepreneurs is to offer domestic products which either grow them in the backyard, as happens with restaurants, or collect them from local farmers who provide seasonal products of high quality as is the case in shops.
Some of the well-known restaurants in the country that serve local food are “Uka Farm”, “Mrizi i Zanave”, “Agroturizem Huqi”, “Ferma Albanik” etc., which are located in remote areas where it is possible to build their own farms and obtain additional products from other farmers without additional cost in transportation.
On the other hand, there are several shops selling local agricultural products collected from farmers from different localities; just to mention a few, “Ferma Jone”, “Agrimona”, “Zepa Natyral”, etc. This way, not only do the local products prevail over imported ones, but they also help in the economic development of rural areas.
During December 2020, from the Environmental Council of Tirana, a group of professionals in environmental, climate, urban planning and energy issues, brought together voluntarily, organized an online meeting about the new initiative of Tirana Municipality on “Green Business Grant Tirana”. During this meeting was discussed about the grant that will be disseminated to the green businesses (start-ups or existing ones).
Any project that has access to reduce environmental pollution, installation of new technologies environmentally friendly, adaptation of renewable energy to business needs, etc. will be subject to financial support from the grant of the Municipality of Tirana.

4.4 Kosovo

Kosovo has recently focused on developing a circular economy, with a particular emphasis on managing bio-waste. Several initiatives, pilot projects and activities are ongoing, including the construction of the Composting Plant in Mramor, Pristina, which has the potential to process 3,000 cubic meters of organic waste annually. The Let's Talk About Food Waste pilot project aims to establish a system for collecting and processing organic waste into high-quality fertilizers. Biotech Team has developed a business model for creating biogas through agricultural and food waste, which has been selected for a trip to World Urban Forum 11 in Katowice, Poland. There have also been initiatives aimed at promoting the use of biogas as an alternative energy source, including the 2017 project "Promotion of Biogas in Kosovo" by the German Development Cooperation. The Swedish International Development Cooperation Agency has supported small-scale composting schemes in several municipalities, and there have been community composting sites set up in public spaces in the municipality of Prishtina. While there is **not yet any concrete and viable company/corporate that deals with bio-waste** and bio-based materials, these initiatives and business ideas promote organic waste management production.

Kosovo is making strides towards sustainable waste management, particularly in the area of bio waste. Several initiatives are underway, including vermicomposting, composting plants, waste separation and classification plants, and innovative solutions for recycling organic waste.

One of the activities taking place in Kosovo is vermicomposting in the city of Lipjan. This process involves using worms to decompose organic materials into organic matter, which is then sold as fertilizer. This method has proven successful in managing bio waste related to agriculture.

In 2021, a composting plant co-financed by the Centre for International Cooperation and Development (CMSR), the municipality of Pristina, and GIZ will begin operations. The plant, located in Pristina, has a capacity of 3,000 m³ and will initially treat garden and park waste. The composting of household organic waste is also planned for a later stage. While no separate collection for food waste is currently planned, this composting plant will make significant progress in reducing biodegradable waste in municipal solid waste.

Another initiative is a **pilot project led by GIZ** aiming to foster **home composting**. Nearly 1,900 composting containers with a capacity of 280 l have been distributed to households in the municipality of Vushtrri and six other municipalities. Technical support and training are also provided to encourage successful composting. Data and results will become available in 2022.

The government has also financed a waste separation and classification plant in the municipality of Mitrovica, which is expected to begin operating later in 2021. This plant is designed to separate and classify paper waste, plastic, metals, glass, and organic waste from mixed municipal waste. However, most of the valuable recyclables are taken out by the

informal sector before the waste reaches the plant, which may undermine the plant's financial viability.
In addition to these **larger-scale initiatives**, a group of young people from Kosovo have introduced a new eco-friendly waste management concept for organic waste. Diella, Visar, and Natalia have started recycling small amounts of organic waste, transforming it into organic fertilizer for plants. They use a special kind of worm that uses organic waste as food, which decomposes the waste and creates fertilizer for natural plant growth.

The Municipality of Fushë-Kosovo and the Municipality of Gjakova in Kosovo are taking significant steps towards reducing waste and promoting composting at the local level. In Fushë-Kosovo, the Municipality is continuing the expansion of the project for the separation of organic waste at the source, with the aim of expansion in the entire territory of the municipality. As part of this project, the Municipality is distributing composters to 1000 households in six villages, including Graboc i Poshtëm, Henc, Harilaç, Miradi e Poshtme, Miradi e Epërme and Vragoli. The aim is to reduce the total amount of municipal waste through domestic composting and provide an economic profit for family economies through the production of organic manure.

To inform and **raise awareness about composting** and the benefits it brings, several NGO`s are working with the Municipality of Fushë-Kosovo and KRM "Pastrimi" to develop informative **lectures in educational institutions** in the areas before they are equipped with infrastructure for the separation of organic waste. These activities will help to ensure that residents are well-informed about the importance of composting and how it can benefit both the environment and the local economy.

In the Municipality of Gjakova, the **Directorate of Public Services with the Waste Management Sector**, in cooperation with **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH** and the **non-governmental organizations** are also taking significant steps towards **promoting composting** at the local level. The Municipality is a beneficiary of the "Sustainable Municipal Services" (SMS) project of GIZ in Kosovo, which is focused on implementing new reforms in the field of waste management.

As part of the project "Piloting of Composting at Home in 6 Municipalities of Kosovo," the Municipality of Gjakova is preparing to start the separation of organic waste in households. The first phase of the home composting pilot project will include 306 households in the central area of the city, the Neighborhood of "Bllokut te Ri" and the Neighborhood of "Cabrati," and a part of the villages of Dol, Pjetershan, and Dobrigje. These households will be equipped with a 280l home composter for the separation of organic waste. The aim of this project is to try out home composting in a range of different neighborhoods and villages and to expand the project in the future.

These initiatives are important steps towards promoting sustainable waste management practices in Kosovo. They will help to reduce the total amount of municipal waste, promote the production of organic manure, and raise awareness about the importance of composting in local communities. By working together, the municipalities, NGOs, and other organizations involved in these projects can help to create a more sustainable future for Kosovo.

The European Commission has funded the construction of a **factory** in Drenas, Kosovo, for the processing and disposal of dead animals and food waste. The project, costing 7.7 million euros, is expected to create up to 50 jobs and will process organic animal waste in six cities across Kosovo. The factory will separate fat from bones and other parts of the waste, with the fat used primarily in the energy industry. The final product will be used in the cosmetic and animal feed industries. The factory will help protect the environment and public health, while also reducing the need for animal waste and food waste disposal.

Green Foundation launches **foodsafe community platform** to reduce food waste in Kosovo On World Food Day, the Green Foundation launched the foodsafe community platform to reduce food waste and promote environmental sustainability in Kosovo. The platform connects businesses that have food at risk of being thrown away with citizens interested in consuming the food. All food on the platform is offered for free, and the user experience is designed for ease of use. The foodsafe community application was developed within the **"Let's Talk About Food Waste" initiative**, which aims to initiate a public dialogue on the socio-economic, political, and environmental impacts of food waste and pilot innovative solutions for the problem. The initiative is supported by the Swedish Government, the Kosovo Civil Society Foundation, and the Albanian Partners for Change and Development.

5. Section 5: Support mechanisms for entrepreneurs

Entrepreneurship and innovation are essential drivers of economic growth and job creation. Start-ups are an essential element of entrepreneurship, and they play a crucial role in the development of a sustainable and circular economy. In recent years, there has been an increased focus on start-ups in the bio-waste circular economy sector, as it presents significant opportunities for environmental and social impact.

This chapter provides a comparative analysis of support mechanisms available for start-ups in Austria, Kosovo, Albania, and Greece, with a particular focus on bio-waste circular start-ups. The analysis considers various factors, including government policies, funding opportunities, incubation and acceleration programs, and the overall business ecosystem.

Austria, Kosovo, Albania, and Greece each have their unique strengths and challenges in supporting start-ups in the bio-waste circular economy sector. Austria has established itself as a leading country in circular economy and has various funding and incubation programs to

support circular start-ups. Kosovo and Albania are emerging markets with a growing interest in entrepreneurship and innovation, and they are beginning to implement policies to support start-ups in the circular economy. Greece has a long-standing entrepreneurial culture and a robust ecosystem for start-ups, but there is room for improvement in the support for circular start-ups.

5.1 Austria

Austria has been actively promoting entrepreneurship and innovation, particularly in the field of bio-waste. The country has recognized the growing need for sustainable and eco-friendly solutions to address the issue of waste management. This has led to the emergence of a number of bio-waste startups that are developing innovative technologies and business models to reduce waste and promote a circular economy.

Austria stands out as:

- hub between East and West
- gateway to DACH (Germany, Austria, Switzerland), the largest European market with a common language.
- an ideal starting point for introducing products on a manageable, highly affluent market, where rapid expansion is possible.
- International appeal: In the European Startup Initiative (esi) survey,the 700 participating company founders voted Vienna among the ten most popular destinations.
- Unprecedented networking opportunities: Talent Garden, Europe's largest startup campus network, shall open its first office in a Germanspeaking city in Vienna.
- Greatest appeal: With the launch of weXelerate, the largest startup hub in CEE is located in Vienna, covering more than 8,000 square meters (Invest in Austria, ABA, 2018)

The Austrian Startup Ecosystem

The different type of supporting organs with the aim to foster and support entrepreneurship in Austria:

- Universities and their start-up centers, programs, incubators and accelerators
- start-up hubs
- NGO's
- private incubators and accelerators
- co-working spaces
- corporates: that want to support and collaborate with start-ups
- service providers

- public and private funding organisations
- events

The important role of universities

Universities in Austria play an important role in promoting and supporting the development of start-ups in the country. These institutions serve as **hubs of innovation** and provide a fertile ground for new ideas and businesses to take root and thrive. One of the ways universities support start-ups in Austria is by offering **entrepreneurship programs** and courses that help students develop the skills they need to start and grow a business. Additionally, many universities have **business incubators and accelerators** that provide resources and support to start-ups, such as mentorship, office space, and access to funding.

Connecting all start-up centers run by Austrian Universities there is the Entrepreneurship Center Network (ECN). The network is connecting many centers located in 12 different cities in Austria: https://ecn.ac.at/

For fresh beginners in the world of entrepreneurship, the ECN offers a glossary with definition of important start-up terms: https://ecn.ac.at/get-active/glossar

Examples of university start-up centers in Austria

University of Natural Resources and Life number Sciences / Universität für Bodenkultur (BOKU) – **BOKU:BASE** Vienna. https://base.boku.ac.at/

Wirtschaftsuniversität Wien (WU) – **Gründungszentrum Wien** https://www.wu.ac.at/gruenden/

Technische Universität (TU) Wien - **TU Wien Innovation Incubation Center i²c** - https://i2c.tuwien.ac.at/

Universität Graz – **Unicorn** start-up & innovation hub - https://www.unicorn-graz.at/

Joint initiative of the University of Graz, Graz University of Technology, and the University of Applied Sciences FH Joanneum – **Gründungsgarage** - https://www.gruendungsgarage.at/

All the players in the entire start-up landscape can be found in below **tool** provided by the **WKO (Wirtschaftskammer Österreich)** and other parties. Here **3028 Austrian start-ups** are stored, as well as **corporates** willing to cooperate with start-ups or having their own start-up programs, **investors**, **universities**, **accelerators**, **workspaces** (hubs and co-working spaces), and **more organizations** such as **service providers, government** & **non-profits**, among which **public funding organisations**, and relevant **events**.

https://austria.dealroom.co/companies.startups/f/all_slug_locations/anyof_austria/data_type/anyof_Verified

Co-working spaces

Jungewirtschaft.at listed each co-working space per city district, per province: https://www.jungewirtschaft.at/oesterreich/was-wir-bieten/coworking/verzeichnis-coworking.html

Fiscal measures

- **How to start a business in Austria**

The following linked article provides an overview of the key steps and requirements for starting a business in Austria. It covers legal entities, registering with relevant authorities, obtaining licenses, complying with regulations, financing options, managing finances and taxes, finding premises, and networking. Overall, it's a helpful guide for anyone interested in starting a business in Austria: https://www.expatica.com/at/working/self-employment/starting-a-business-in-austria-84592/

Also, the ABA INVEST in AUSTRIA provides a clear plan with steps on how to set up a GmbH: https://investinaustria.at/en/doing-business/starting-a-business-in-austria/

For EU citizens it is not hard to start a business in Austria, for non-EU citizens it is a bit more difficult to get the business visa. Also, hiring non-EU employees is not easy: as employers will often have to sponsor them for a red-white-red-card.

INVEST in AUSTRIA supports business owners that want to settle in Austria https://investinaustria.at/en/our-services/

- **Tax benefits for start-ups**

Austria has an investment-friendly tax system, with a 14% tax credit for investment in research and a uniform corporate tax rate of 25%. A digital one-stop shop that enables the foundation of a company quickly and inexpensively. The “privileged position of a GmbH [Limited Liability Company]” facilitates the entry into self-employment, with a minimum payment of 5,000 euros (Invest in Austria, ABA, 2018).

1. Tax Exemptions: New startups in Austria may be eligible for a tax exemption for the first three years of operation. During this time, they will not have to pay corporate income tax or municipal tax.
2. Investment Deductions: Austrian startups can claim a tax deduction for investments made in certain qualifying assets, such as machinery, equipment, and intangible assets like patents, software, or licenses. This deduction can be up to 30% of the total investment amount.

3. Loss Carryforward: Austrian startups can carry forward losses incurred during the first five years of operation and offset them against future profits. This can help to reduce tax liabilities in subsequent years.
4. Research and Development Tax Credits: Startups that invest in research and development can claim a tax credit of up to 14% of their R&D expenses.
5. Employee Share Ownership Plan: Austrian startups can offer their employees an employee share ownership plan, which allows employees to acquire company shares at a reduced price. This can help to incentivize employees and boost morale while also providing tax benefits to the company. (Puchner & Gloser, 2021)

It's important to note that the eligibility criteria and specific tax benefits available to startups may vary based on factors such as the industry, the size of the company, and the location. Therefore, it's recommended to consult with a tax professional or business advisor to understand the specific tax benefits that may apply to your startup in Austria.

- **Access to finance for entrepreneurs in Austria**

Austria has a relatively vibrant startup scene, and there are a number of funding options available to help support early-stage companies.

Besides plenty of public funding programs, startups in Austria can also access funding from private sources, such as **venture capital firms**, **angel investors**, and **crowdfunding platforms**. Some Austrian startups have even been successful in securing funding from international investors. Austria has a growing community of **impact investors** who are interested in supporting businesses that have a positive social and environmental impact (*Angel Investing Report 2020*, 2020).

One of the key challenges for startups in Austria, however, is the relatively small size of the domestic market. As a result, many startups aim to expand their customer base beyond Austria's borders in order to achieve scale and attract more investment.

Overall, the funding landscape for startups in Austria is relatively diverse, and there are a number of resources available to help support entrepreneurs at different stages of their journey.

- **Public funding**

Generous public funding is one of the many factors attracting startup founders and workers to Austria (Sunil, 2022). Overall, the Austrian government has demonstrated a strong commitment to fostering a thriving start-up ecosystem, with a range of programs and initiatives designed to support entrepreneurs and help them succeed. Public funding organizations provide **financial assistance**, **mentorship**, **networking opportunities**, and

other resources that can help start-ups succeed. These are some of the most prominent public organizations that provide funding for start-ups:

Public funding organizations in Austria

Austrian Research Promotion Agency (FFG) The Forschungsförderungsgesellschaft (FFG) is a national funding agency that provides funding and support to businesses, research institutions, and other organizations engaged in research and innovation projects. They offer a range of funding programs to support innovation and R&D in Austria, including funding for startups. Their website is https://www.ffg.at/en.

Austria Wirtschaftsservice Gesellschaft (AWS) The Austria Wirtschaftsservice Gesellschaft (AWS) is a federal funding agency that supports startups and innovative businesses in Austria. They offer various funding programs, such as grants, loans, and guarantees, to support the growth and development of startups. AWS offers companies and startups various grants, they are:

1. **"soft loans"** (low-interest loans)
2. **guarantees** (to companies that need to apply for bank loans yet fail to do so as default risk is too high)
3. **repayable** and **non repayable grants** (the latter being essentially free money)

Their website is https://www.aws.at/en/

Vienna Business Agency (Wirtschaftsagentur Wien) The Vienna Business Agency (Wirtschaftsagentur Wien) is a municipal funding agency that supports startups and businesses in Vienna. They offer funding and support services for startups at all stages of development, from ideation to market launch. Their website is https://viennabusinessagency.at/.

Austrian Business Agency (ABA) The Austrian Business Agency (ABA) is the national investment promotion agency of Austria. They help international startups and businesses establish operations in Austria by providing assistance with funding, location selection, and regulatory requirements. Their website is https://investinaustria.at/en/.

Austrian Federal Economic Chamber (Wirtschaftskammer Österreich) is the largest business association in Austria. They offer a range of support services for startups and businesses, including funding, training, networking, and advice. Their website is https://www.wko.at/service/wirtschaftsfoerderung-in-oesterreich.html.

Business Upper Austria - OÖ Wirtschaftsagentur GmbH Business Upper Austria is a regional development agency that supports startups and businesses in Upper Austria. They

provide funding, consulting, and networking services to help entrepreneurs and businesses grow and succeed. Their website is https://www.biz-up.at/en.

Salzburg Research Forschungsgesellschaft mbH Salzburg Research is a research and development organization that supports startups and businesses in Salzburg. They offer funding, consulting, and technology services to help entrepreneurs and businesses develop and implement innovative technologies. Their website is https://www.salzburgresearch.at/en.

Styrian Business Promotion Agency (SFG) The Styrian Business Promotion Agency (SFG) is a regional funding agency that supports startups and businesses in Styria. They offer a range of funding programs, including grants, loans, and equity investments, as well as consulting and networking services to help businesses grow and succeed. Their website is https://www.sfg.at/en/.

Burgenland Business Agency (Wirtschaftsagentur Burgenland) The Burgenland Business Agency (Wirtschaftsagentur Burgenland) is a regional funding agency that supports startups and businesses in Burgenland. They offer funding, consulting, and networking services to help businesses grow and succeed in the region. Their website is https://www.wirtschaftsagentur.at/en/.

Carinthian Economic Promotion Fund (KWF) The Carinthian Economic Promotion Fund (KWF) is a regional funding agency that supports startups and businesses in Carinthia. They offer a range of funding programs, including grants, loans, and equity investments, as well as consulting and networking services to help businesses grow and succeed. Their website is https://www.kwf.at/en/.

To find the right match between specific grant and project, Alchemia-nova, institut for circular economy and nature-based solutions, based in Vienna, created a publicly accessible (language: German) database to find funding for activities contributing to the circular economy in Austria: https://kreislaufwirtschaft.at/financial-instruments/

Specific public funding programs provided by these organisations:

Austria has a well-established system of public funding organizations that offer various grants and financial assistance to support the growth and development of startups and innovative businesses. These organizations aim to provide tailored funding solutions to meet the specific needs of each founder and their business.

Aws Creative Impact - one of Austria Wirtschaftsservice's grant programs for startups and small businesses. It is a grant program that aims to promote innovative new products and services. Therefore, the funding covers for expenses incurred for the development of prototypes and go-to-market strategy and implementation. Successful applicants receive up to **€200,000 non-repayable grant**, to be be disbursed in 3 tranches over the life of the project (1

to 3 years max.) and which shall cover 50-70% of the eligible project costs. https://www.aws.at/en/aws-creative-impact/

AWS Growth investment - Growth investment is specifically aimed at projects that focus on strengthening a company's market position.Successful applicants receive on average anywhere between **€300,000 to €400,000 non-repayable grant funding**, to be disbursed in phases, over the life of the project (2 years maximum). https://www.aws.at/en/aws-growth-investment/

AplusB ScaleUp by AWS - This program supports technology-oriented start-ups in Austria by providing funding, coaching, and networking opportunities. It targets entrepreneurs who have already founded a company and are looking to grow and scale. https://www.aws.at/en/aws-aplusb-scale-up/

AWS i2 Business Angels - This is an initiative that brings together investors and entrepreneurs in Austria. They provide funding, mentorship, and networking opportunities for young entrepreneurs. It is a matching service! https://www.aws.at/aws-i2-business-angels/

Austria Wirtschaftsservice (AWS) PreSeed - Deep Tech, we finance and accompany deep-tech companies in the pre-foundation phase. Goal: technical and commercial preparation, implementation and validation of the "Proof of Concept". - https://www.aws.at/en/aws-preseed-deep-tech/

FFG impact innovation - The FFG's Impact Innovation funding scheme encourages you to find or test your ideas using innovation methods, and will pay half of the costs. Up to 75,000 euros are available, no matter which topic you choose or which sector you operate in. https://www.ffg.at/en/programme/impactinnovation

Markt.Start (FFG) - Markt.Start is a substential funding instrument adressing small-sized companies only. The funding goal is to support small companies for the market entrance and therefore launch of product innovations, service innovations and process development after successful driven R&D. Funding is provided up to max. € 250.000,- each for market transition by funding with low-interet loans. https://www.ffg.at/en/programme/marktstart

FFG Start-up funding - Unlike Markt.Start, this grant isn't just for go-to-market expenses. Instead, start-ups can use the loan for any type of expenses, as long as it covers a maximum of 70% of the total costs (i.e. you will need to fund the other 30% yourself). https://www.ffg.at/en/programme/startup

Private funding

The options to privately fund a business in Austria are by **Angel investment**, **Venture Capital investment**, **Crowdinvesting** or **Crowdfunding**.

Private Start-Up investment data Austria

The EY-Start-up-Barometer Europe shows that in 2021 a much higher amount was invested in start-ups in Austria than in 2020, 1242 million compared to 212 million. The amount invested in 2021 was invested in fewer financing rounds (130) than in 2020 (145). The EY barometer Europe with the numbers for 2022 will likely be published soon, but the EY Start-up-Barometer Österreich 2022 is published with the following data:

- The **total value** of investments in Austrian startups in 2022 **decreased by 18%** compared to the previous record year of 2021 - there was a decrease of 83% in the second half of the year compared to the previous year.
- The **number of financing rounds increased by 16%** from 122 to 141 compared to 2021, while the **volume decreased by 18%** from **1.23 billion euros to 1.0 billion euros**.
- The **downturn in the financing market** can be seen in the figures with a delay: a clear deterioration in the second half of the year after a strong start to the year.
- **55% of the total volume** is accounted for by the **two largest financing rounds** of **GoStudent** and **TTTech Auto**.
- The majority of financing rounds were in the **software** and **technology sectors**.
- **Vienna** is far ahead in terms of investment volume and deal number compared to other areas in Austria.
- **Sustainability** in startups is becoming **more of a focus** for investors.

The **Vienna Business Agency (Wirtschaftsagentur Wien)** lists

- **33 active Venture Capital firms** in Austria,
- **4 crowdinvesting platforms**,
- **6 crowdfunding platforms** and
- **4 angel investment specialists/networks**

Including a description of their particular field of expertise and link to their website. Although there seem to be quite a bit more companies active in this field, the list is a good start to get in touch with them: https://viennabusinessagency.at/startup-city-vienna/startup-ecosystem/angel/venture-capital/

Data on Business Angels in Austria

With **over 250 members**, the Austrian Angel Investors Association is Austria's leading network for private start-up investors. The AAIA matches start-ups and investors behind the scenes, educates investors and organizes networking and start-up events. The network currently consists of mostly Business Angels, but the organization aspires to expand their community with Venture Capitalists in the near future. https://www.aaia.at/en/

According to the **Austrian Angel Investors Association Report 2020**, 75% of all Business Angels in Austria choose "**smart money**" as their preferred investment option, meaning they prefer to invest "hands-on", in a venture and to contribute way more than just with money: with **industry know-how, experience** and a **valuable network**. For investors, angel investments play a vital role in their asset allocation: 11% of all investors put more than 30% of their private money into startups. In 2020 53% of the total Angel Investments went to software start-ups and 44% in health-tech / life-science as the two largest categories. Interestingly enough, **impact investing**, with 20% of the total investments, can not be called a minority anymore. The growing interest for sustainable investment, also under Business Angels in Austria, is apparent (*Angel Investing Report 2020*, 2020).

Crowdfunding

From 10 November 2021, the European Crowdfunding Service Provider Regulation ((EU) 2020/1503 - "ECSPR") began to be enforced. This regulation covers various services including loan facilitation and investment brokerage, which are carried out through online platforms. Such services are required to be independently licensed, with a priority given to the licensing requirements of ECSPR over those of section 34f of the German Trade Regulation Ordinance (GewO) and section 15 of the German Investment Firm Act (WpIG) (Jünemann et al., 2023).

The **Austrian Crowdfunding Implementation Act** transposes relevant provisions of the Crowdfunding-Regulation into Austrian Law, under the authority of the Financial Market Authority (FMa), entry into force December 2021.

Crowdfunding in Austria has quadrupled since their own **new Crowdfunding Act**: first entry into force september 2015. Crowdfunding has experienced significant growth in Austria. Initially, only **equity-based crowdfunding** was permitted under regulatory laws, but in recent years, **lending-based crowdfunding** projects and platforms have also emerged. With **equity crowdfunding** investors receive ownership of the project or the promise of return based on the profits of the company invested in, also referred to as **crowdinvesting**. **Lending-based crowdfunding** is a form of investment in which investors are promised repayment of their loan with interest (*Review of Crowdfunding Regulation 2017 - Interpretations of Existing Regulation Concerning Crowdfunding in Europe, North America and Israel.*, 2017).

Find an overview of the best crowdfunding platforms in Austria:
https://thecrowdspace.com/directory/crowdfunding-platforms-in-austria/

Plenty of organizations attempt to **support founders in the process of investor negotiations**. As an example, **NGO AustrianStartups** together with the **Austrian Angel Investor Association** made a standardized template for convertible loan agreements, which

aims to help founders navigate the legal side of investor negotiations. https://austrianstartups.com/convertible/

5.2 Greece

The **Common Agricultural Policy (CAP)** supports rural areas and their economic stability and viability through various actions of funding. It is important to mention that rural development is the second pillar of CAP and it contributes to sustainability of rural areas through three main objectives: the increase of competitiveness levels of agriculture and forestry, the assurance of the viable management of natural resources and climate action, and the balanced development of rural economies through boosting the employment sector.

As part of the EU, Greece can also take advantage of the EAFRD funding through **Rural Development Programs (RDP)**. RDPs are co-funded by the national budget and can be formed at a national or regional basis. Each RDP should be committed to at least four of the following objectives:

1) promotion of knowledge and innovative techniques on the field of agriculture, forestry and rural areas
2) improvement of the viability and competitiveness of all kinds of agriculture and promotion of innovative rural technologies and forest management
3) promotion of the organization of the food chain, of the treatment of animals and of risk management situations in the agricultural field
4) promotion of the efficient use of available resources and support to a less coal-depended and climate change resistant economic model
5) restoration, maintenance and boosting of rural and forest ecosystems
6) promotion of social inclusion, reduction of poverty and economic development of rural areas.

The European Rural Development Network (ERDN) is supporting the effective implementation of the RDPs through knowledge sharing all over rural Europe.

The **European Innovation Partnership for Agricultural Productivity and Sustainability** (EIP-Agri) also has a supportive role in rural development and the encouragement of innovation in rural communities. EIP-Agri aims at bringing together developing innovative research products with the increasing use of new technologies by people living and working in rural areas. The goal is to accelerate the change of techniques used and the improvement of agricultural production.

The new **National Strategy for Circular Economy** (December 2018), in compliance with the european one, involves 73 actions per year until 2025 and the initiatives that need to be taken by businesses (product implementation), by consumers (sustainable consumption), by waste management agencies and by the state (ministries involved) in order to bring funding

from national and european programs with a total value estimated in more than 3 billion euros.

This further supports Greece's economic strategy in its key quest to 'Green' the economy in a way that creates jobs, especially for women and youth, and supports long-term equitable and inclusive growth based on resource efficiency, promotion of SMEs, innovation and investment in new technologies, and strengthening of the 'social economy' potential. The long-term (2030) goals of the National Action Plan on Circular Economy can be summarised as follows:

- moving up the waste hierarchy by focusing on preventing waste and improving recycling
- supporting circular entrepreneurship by promoting 'industrial symbiosis' and business clusters
- supporting circular consumption patterns of reusing, restoring and repairing rather than buying new products, especially for electrical and electronic devices
- enhancing multi-stakeholder partnerships across industry, academia, and civil society
- monitoring progress towards a circular economic model through SMART (specific, measurable, achievable, relevant and time-bound) indicators.

The National Strategy includes the following pillars and elements:

- Sustainable Resource Management, basically aiming at increasing their efficiency, reviewing value chains, rational waste management, reuse of buildings and re-usage of water or the collection of rainwater and spring-water
- Support of Circular Economy, encouraging the idea of eco-design, producing long life span products, repair, innovation, re-usage, regeneration, promotions of industrial symbiosis (clusters, innovation parks, business incubators, knowledge-information exchange platforms), promotion of innovative entrepreneurship models (e.g., sharing economy), support of bio-economy, promotion of green and circular public procurement, support of secondary material use.
- Circular Consumption, with full notification of citizens, use of the Eco Mark and other incentives, training and basic aspirations for sustainable food consumption (deter rejections, urban cultivation), deterring overuse of resources (food-drinks, garments, packaging, EEE), prevention of waste generation through preparing for re-usage, repair and maintenance, auditing retail e-commerce and, finally, promoting use/usage services rather than product supply.

It is the belief of the Ministry of Environment & Energy that the circular economy model can be easily adapted to the Greek economy due to the multitude of opportunities and the potential for using the country's resources, the knowledge and specialization of young Greek professionals, as well as the changes currently taking place in the country with respect to the economy and growth in general and the waste management industry in particular.

5.3 Albania

Albania's start-up ecosystem is still in its early stages, but it has been growing in recent years. The country has seen an increase in entrepreneurial activity, with several start-ups emerging in the tech and innovation sector.
One of the most significant developments in Albania's start-up ecosystem is the establishment of Tirana Ekspres, which serves as a co-working space and a hub for innovation and entrepreneurship in the country. Tirana Ekspres provides a platform for start-ups to network, collaborate and access funding opportunities.
Other notable initiatives include the ICT Association of Albania (ATA), which aims to promote the development of the ICT sector in the country, and the Albanian Investment Development Agency (AIDA), which offers support and incentives for foreign investors interested in starting businesses in Albania.
The Albanian government has also introduced a range of policies and initiatives to support start-ups, including tax incentives for investors and start-ups, funding programs, and the establishment of a start-up fund.

Despite these developments, Albania's start-up ecosystem still faces several challenges, including limited access to funding, a lack of infrastructure and resources, and a shortage of skilled talent. However, there is a growing interest in entrepreneurship and innovation among young Albanians, and the potential for growth and success in the start-up ecosystem remains high.
Albania’s start-ups are still at a nascent stage, however continuous access to stable funding from venture capital funds, crowdfunding initiatives, and/or angel investor networks that support start-ups could help scale up micro, small, and medium-sized enterprises.

The EU IPARD III programme. The EU programme 2021-2027 seeks to support sustainable food systems by increasing the agri-food sector’s competitiveness and progressively aligning it with the EU acquis. In addition, it aims to improve the efficiency and sustainability of on-farm production to meet the demand for safe, nutritious and sustainable food and animal welfare. The initiative’s other key tenets include facilitating business development and employment in rural areas and elevating farmers’ position in the value chain. It also hopes to attract more farmers to the sector and improve community development on a local level. The funds will be divided up into tranches that will be disbursed over the years of the programme. The most significant sum, some €31.4 million, is set aside for investments in farmers’ physical assets, with a further €30 million for investment in assets for the processing and marketing of agri-products. Some €2.1 million will be used to increase organic farming. Other significant investments include €21.3 million for farm diversification and business development and €12 million for rural public infrastructure. https://www.euractiv.com/section/agriculture-food/news/eu-to-fund-albanian-agriculture-organic-farming-rural-development/

Social agriculture development fund in Albania. The Cooperazione per lo Sviluppo (COSV) in Albania, as the lead partner of the EU-funded project TOKA JONE, is launching the Social Agriculture Development Fund (SADF) sub-granting scheme to promote the sustainable reuse of confiscated assets to benefit vulnerable groups at risk of exclusion. The main aim of the CfP will be to develop innovative social agriculture initiatives re-using confiscated assets as a means to promote socio-economic development, and use of agricultural land through community–based social farming services. The SADF sub-granting scheme relies on a holistic approach combining smart, flexible and action-oriented regulating solutions embracing technology and community collaboration. It aims to achieve the following objectives: Overall Objective: To promote sustainable re-use of confiscated assets to benefit vulnerable groups at risk of exclusion. Specific Goal: To develop innovative social agriculture initiatives re-using confiscated assets as a means to promote socio-economic development, use of agricultural land through community –based social farming service (including therapy and rehabilitation, social connection and inclusion, and social services, sense of legality and rule of law). https://www2.fundsforngos.org/latest-funds-for-ngos/social-agriculture-development-fund-in-albania/

NOA SH.A. promoter of agricultural support. NOA has a clear and practical mission, which is the economic empowerment of family and business, as an important factor for the development of the Albanian economy in urban and rural areas. The institution is positioned close to the clients, extending with 26 branches in 14 districts of the country, and geographically covering 95% of the Albanian territory. The attention of the institution towards the development of agriculture is evident when it is seen that the financing of agricultural activities occupies a share of 25% of the total economic activities financed by the company, having about 2,700 active clients and covering about 60% of rural areas with service. NOA is the second largest operator in the microcredit sector providing financial services by supporting entrepreneurs from all sectors including manufacturing, agriculture, livestock, trade and services, developing a quality and diversified loan portfolio. For many years, micro-credits will be an important factor of economic development in the country and the financing of small entrepreneurs and farmers, a factor that is in line with the strategies and 5-year development plan in NOA. https://noafin.al/eng/blog/100/the-potential-of-albanian-agriculture-and-financing-opportunities

The European Bank for Reconstruction and Development (EBRD), ProCredit Bank Albania, the European Union (EU) and the government of Albania are stepping up their support for companies in the country's agribusiness and tourism sectors under the Albania Agribusiness and Tourism Support Facility (AATSF). The EBRD has committed to a risk-sharing facility of up to €20 million to ProCredit Bank Albania, which will provide loans to eligible firms in the agribusiness sector. The new package of support for the Albanian agribusiness sector was signed during EBRD President Odile Renaud-Basso's first visit to Albania. The AATSF is a framework aimed at improving access to finance for small and medium-sized enterprises (SMEs) in partnership with a number of commercial banks in Albania. The framework includes a 10% investment grant for sub-borrowers in the

agribusiness sector, funded by the government of Albania and the EU. Borrowers will receive the grant retroactively once their investments have been completed and verified. The facility will also benefit from a government-backed, first-loss risk-cover mechanism. ProCredit Bank Albania signed its first agreement with the EBRD, for €30 million, under the Albania Agribusiness Support Facility (AASF), as it was known then, in July 2016. A leader in financing the agribusiness sector, with the EBRD's support, it will now be able to lend an additional €20 million under the blended finance facility, for a total of €50 million. Up to €180 million has been allocated to date under the AATSF for specialised credit lines and risk-sharing facilities through local partner banks. Since its launch in 2016, more than €70 million in loans have been committed, benefiting more than 6,100 local agribusiness SMEs. https://www.ebrd.com/news/2022/ebrd-eu-and-government-boost-funding-for-albanian-agribusiness-tourism-smes-.html

5.4 Kosovo

Kosovo has been making efforts to promote sustainable waste management practices, and the bio-waste sector has been receiving increasing attention from the government and private sector actors. There are several mechanisms in place that support the development of businesses in the bio-waste and organic waste management sector in Kosovo, providing funding, incentives, and support to startups and small businesses.

1. Public sector start-up funding support: The Government of Kosovo provides financial support to startups and small businesses through various schemes such as the Kosovo Credit Guarantee Fund (KCGF), the Kosovo Innovation Fund (KIF), and the Kosovo Investment and Enterprise Support Agency (KIESA). These programs offer financing to startups and small businesses with favorable terms, including low-interest rates, long repayment periods, and flexible collateral requirements.
2. In addition, the Ministry of Environment,Spatial Planning and Infrastructure of Kosovo has launched awareness-raising campaigns to promote the benefits of composting and other forms of bio-waste management.
3. Private sector accelerators: There are several private sector accelerators in Kosovo that offer support to startups and entrepreneurs in the bio-waste and organic waste management sector. These accelerators provide access to mentoring, networking, funding, and other resources to help startups grow and succeed. Some of the well-known accelerators in Kosovo include Innovation Centre Kosovo, VentureUP, ICT Hub, UNDP Boost, Bonevet etj.

In Kosovo there are programs available to entrepreneurs in the bio-waste and organic waste management sector. These include training and capacity-building programs, research and development grants, and incubation programs.

Ministry of Agriculture, Forestry and Rural Development:

- The Agribusiness Support Fund, which provides grants and loans to small and medium-sized agribusinesses in Kosovo.
- The Agriculture and Rural Development Programme, which supports sustainable agriculture and rural development in Kosovo.

United Nations Development Programme (UNDP):

- The Green Business Innovation Programme, which supports the development of green businesses in Kosovo, including those related to waste management and recycling.
- The Rural Development Programme, which supports the development of sustainable agriculture and rural communities in Kosovo.

European Union (EU):

- The Environment and Climate Action Programme, which supports environmental protection and climate change mitigation in Kosovo, including waste management and recycling initiatives.
- The Kosovo Energy Efficiency and Renewable Energy Project, which supports energy efficiency and renewable energy initiatives, including waste-to-energy projects.
- The Kosovo Private Sector Development and Competitiveness Project, which provides funding and technical assistance to support the development of small and medium-sized enterprises (SMEs), including those in the waste management and recycling sector.

6. Section 6: Which ongoing or recent projects can BECBA synergize with?

This chapter examines various projects in Kosovo, Albania, Greece, and Austria that share synergies with the BECBA project, which focuses on the circular economy and bio-waste management. Specifically, we look at youth entrepreneurship programs, circular economy projects, and organizations/companies that contribute to the transition to a circular economy and bio-waste management. By listing these projects, we aim to identify best practices and lessons learned for the BECBA project and find potential collaboration partners.

6.1 Austria

There are plenty of projects active in Austria that BECBA can synergize with. In the below lists relevant projects are listed.

Find the following 4 lists:

1. **Youth Entrepreneurship Programs in Austria** that focus specifically on **agro-entrepreneurship, agricultural waste-management, or similar**.
2. **Other Youth Entrepreneurship programs** in Austria
3. Circular Economy **projects** in Austria that focus on agriculture, agricultural waste-management, agro-entrepreneurship or similar.

4. Other Austrian **organizations**/companies that contribute to the transition to a circular economy and focus on bio-waste management.

1. Austrian Youth Entrepreneurship Programs in Austria that focus specifically on agro-entrepreneurship, agricultural waste-management, or similar

Bio Innovation Challenge by Agro Innovation Lab from RWA Raiffeisen Ware Austria - This program focuses on promoting innovative ideas and startups in the agro-entrepreneurship field. It is open to entrepreneurs and startups from Austria and other European countries. https://www.agroinnovationlab.com/bic/

Acceleration & Market Entry Program by Agro Innovation Lab from RWA Raffeisen Ware Austria - As a later stage accelerator powered by RWA Raiffeisen Ware Austria AG, one of Europe's biggest players in agriculture, this program offers tailored solutions and precisely the resources participants need to boost their business. With each startup participating in the program, a joint innovation project is designed over five months, including a monthly intensive Acceleration Week, which will be tailored to their individual business requirements. https://www.agroinnovationlab.com/programs-initiatives/#acceleration

Greenstart - This is a pre-acceleration program for early-stage startups with sustainable solutions in various fields, including agriculture and food. It provides mentorship, training, and access to funding opportunities. https://www.greenstart.at/

Evergreen Innovation Camp Hackathon - At the Evergreen Innovation Camp Hackathon participants have the unique opportunity to develop a solution for an exciting real-life challenge from the forestry and timber industry in 48 hours together with their team of students and young professionals from different fields of study. https://www.evergreen-innovationcamp.io/

Future Agro Challenge (for instance Zagreb, Croatia) - Selected agripreneurs will gain access to world class mentors, investors, potential clients, and new market opportunities at the FAC Global Championships, a highlight event at the **Global Agripreneurs Summit**. https://facagro.com/

Different types of entrepreneurship programs by EIT Food – such as EWA, empowering women in Agrifood, Challenge Labs, and Test Farms to get matched to a farmer and test your solution in the field, TeamUp, Supernovas, etc - https://www.eitfood.eu/

European Startup Village Forum - The European Startup Village Forum facilitates the exchange of knowledge and expertise on how to **promote startup-driven innovation in rural areas.** https://startup-forum.rural-vision.europa.eu/?lng=en

Green Tech Cluster by Green Tech Valley – Green Tech Startups Austria 2023 network - https://www.greentech.at/tools/green-tech-startups-austria/

AIT Austrian Institute of Technology GmbH – Research spin-off program - https://www.ait.ac.at/en/about-the-ait/translate-to-english-entrepreneurship-at-ait

2. Other Austrian Youth Entrepreneurship programs in Austria

Jung Enterprise Austria (Die Junge Wirtschaft) – Member-based platform for young entrepreneurs in Austria. "As a representative of the interests of young Austrian entrepreneurs, we are committed to ensuring that young self-employed people and managers have the best conditions for their work." This program is part of the Austrian Federal Economic Chamber. Interesting seminars, events for young entrepreneurs in Austria. https://www.jungewirtschaft.at/oesterreich/wer-wir-sind/jw/ueber-uns.html

Entrepreneurship Avenue - Entrepreneurship Avenue is Europe's largest startup event series by students for students. Their mission is to inspire, encourage and support young people to immerse themselves in the entrepreneurship ecosystem. The event series connects students of all fields of study and universities with each other as well as with well-known founders, investors and mentors. In several workshops, the participants receive valuable insights into entrepreneurial life and can experience first-hand what working on a business idea looks like. https://ecn.ac.at/get-active/entrepreneurship-avenue

INiTS Accelerator - This program supports technology-oriented start-ups in Austria by providing funding, coaching, and networking opportunities. It targets entrepreneurs who have already founded a company and are looking to grow and scale (made possible by Wien Wirtschaftsagentur/Vienna Business Agency). https://www.inits.at/

WU Gründungszentrum - This program is part of the Vienna University of Economics and Business and supports students, graduates, and researchers who are interested in entrepreneurship. They provide coaching, funding, and networking opportunities. **https://www.wu.ac.at/gruenden/ueber-uns/**

Startup Salzburg - This program is focused on supporting young entrepreneurs in the Salzburg region of Austria. It provides coaching, mentorship, funding, and networking opportunities to help entrepreneurs turn their ideas into successful businesses. **https://www.startup-salzburg.at/**

Impact Hub Vienna – Impact Hub Vienna offers multiple accelerator programs such as Re:Wien, Grow, and Better Mobility. https://vienna.impacthub.net/startup-accelerator-programs/

FH Campus Wien Startup Service - This program is part of the University of Applied Sciences Campus Wien and is focused on supporting students and graduates who are interested in entrepreneurship. It provides coaching, mentorship, funding, and networking opportunities to help entrepreneurs turn their ideas into successful businesses - https://www.fh-campuswien.ac.at/studium-weiterbildung/fuer-studierende/start-up-service.html

Youth Entrepreneurship Week (in German: Entrepreneurship Woche) by NGO AustrianStartups - The "Youth Entrepreneurship Week" is a program focused on promoting entrepreneurship among **highschool students**. While I don't have much information about this program, it is likely similar to the Entrepreneurship Week in that it includes a range of events, workshops, and networking opportunities to support and inspire young entrepreneurs in Austria via their schools. https://www.entrepreneurshipwoche.at/

Entrepreneurial Leadership Program by NGO AustrianStartups - The "Entrepreneurial Leadership Program" is open to aspiring entrepreneurs of **all ages** and provides mentorship, coaching, and resources to help participants develop their entrepreneurial skills and build their ventures - https://austrianstartups.com/elp/

Pioneers – Pioneers helps by matching startups to pre-seed investments, offering a co-founder track to jointly bring your idea to the market, consulting in business model, business case, or growth topics. Not only do we have our own Pioneers Ventures fund, but as a member of the startup300 family, we're part of a broader investment group including capital300 and CONDA. https://pioneers.io/corporate-services/startup-services/ventures/

Vienna Start-up Package 2023 by Vienna Business Agency: As part of the Vienna Startup Package, selected international startups are invited to Vienna who are motivated to expand into the DACH region and immerse themselves in the local startup ecosystem. The intensive, four-week program supports the start-ups in understanding the Austrian market, identifying new business opportunities and connecting them with relevant stakeholders in Vienna. https://wirtschaftsagentur.at/startup-city-vienna/vienna-startup-package/

Gründungsgarage - This program is run by the University of Graz and supports students and graduates who are interested in entrepreneurship. It provides coaching, mentorship, funding, and networking opportunities to help entrepreneurs turn their ideas into successful businesses. https://gruendungsgarage.uni-graz.at/de/

The Global Incubator Network Austria (GIN) - is the connecting link between **Austrian** and **international startups, investors, incubators** and **accelerators** with a focus on selected hotspots in Asia (**Hong Kong, Israel, Japan, Mainland China, Singapore and South**

Korea). GIN is a program initiated by the **Federal Ministry of Austria for Labour and Economy**, managed by the public funding agencies Austria Wirtschaftsservice GmbH (aws) and Österreichische Forschungs- förderungsgesellschaft (FFG), and financed by the Austrian Federal Ministry for Labour and Economy (BMAW). https://www.gin-austria.com/

The I.E.C.T. Community - Members of the I.E.C.T. community are start-ups, investors, mentors, established companies and institutions. We promote lively, lasting cooperation through tailor-made events, programmes and packages. https://www.iect.at/

3. **Circular Economy projects in Austria that focus on agriculture, agricultural waste-management, agro-entrepreneurship or similar.**

Bioeconomy Austria Project- Over 180 organisations are already part of the growing network. 10 partner organisations are building a national bioeconomy cluster by 2024. https://www.bioeconomy-austria.at/en/das-netzwerk/

FOEBE - FOSTERING ENTREPRENEURSHIP FOR THE BIOECONOMY- FOEBE project is funded by the Erasmus+ programme. It aims at equipping bioeconomy students with sustainable entrepreneurship skills to speed up the European expansion of the bioeconomy sector. https://european-bioeconomy-university.eu/education/foebe-fostering-entrepreneurship-for-the-bioeconomy/

BioCyclic Vegan Agriculture - This project focuses on a circular and vegan organic agriculture system. It aims to develop and promote veganic farming practices that focus on closed nutrient cycles, biodiversity, and soil health. Two Austrian Farmers/Producers are part of the network: Strassner Family Farms, Estyria Naturprodukte GmbH
https://biocyclic-vegan.org/
https://biozyklisch-vegan.org/strassner-family-farms/
https://www.estyria.com/

Biotransform EU Projekt - BIOTRANSFORM provides European policymakers with an adequate assessment and policy development framework, knowledge base and expert support ecosystem to accelerate the transition from linear fossil-based systems to circular bio based systems. It is therefore operating at the interface between the circular economy and the bioeconomy transitions. https://www.biotransform-project.eu/

Kompost & Biogas Österreich - This is an association of composting and biogas companies in Austria. It promotes the use of organic waste as a resource for energy and soil fertility, and supports the development of circular economy models for the management of organic waste. https://www.kompost-biogas.info/

The Organic Farming Association Austria - This association promotes sustainable and organic farming practices in Austria. It supports the development of circular agriculture models based on regenerative soil management, biodiversity conservation, and the use of renewable resources. https://www.bio-austria.at/

Essenswert, research project BOKU (University of Natural Resources and Life Sciences) - Project "Essenswert" attempts to identify and measure avoidable food waste streams on farms. Data on these numbers are lacking in Austria and the project aims to fill the gap.
https://forschung.boku.ac.at/fis/suchen.projekt_uebersicht?sprache_in=en&menue_id_in=300&id_in=15168

Project Rund Geht´s - The project is focused on providing "good practice" examples of recycling initiatives that demonstrate the possibilities of turning waste into valuable resources. By highlighting these examples, "Rund Geht's" aims to encourage individuals and communities to take an active role in promoting sustainability and reducing waste. rundgehts.at

Circular Futures - Multi-stakeholder platform, think tank, incubator and catalyst of projects and initiatives for the transformation to a circular economy in Austria and Europe. https://www.circularfutures.at/bibliothek/fact-sheets/

FiBL - Research Institute for Organic Farming in Austria - https://www.fibl.org/en/locations/austria

Innovate - We empower small and medium-sized enterprises in the agriculture, timber, forestry and energy industries to realize their full digital potential. https://www.dih-innovate.at/ueber-uns/

4. Other organizations in Austria relevant to BECBA project

Other Austrian organizations/companies that contribute to the transition to a circular economy:

Austrian Federal Ministry of Agriculture, Regions and Tourism: The ministry is responsible for promoting sustainable agriculture and forestry, as well as **rural development** and tourism. It also works towards developing policies that support the circular economy, including bio-waste management.

Website: https://www.bmlrt.gv.at/en.html

ARGE Kompost und Biogas Österreich: This is an association of companies involved in the production and use of compost and biogas in Austria. The association works towards promoting the sustainable use of resources and the development of a circular economy.

Website: https://www.kompost-biogas.info/

Oekoregion Kaindorf: This is a public-private partnership that promotes sustainable development in the Kaindorf region of Austria. The partnership focuses on various areas, including waste management and the promotion of a circular economy.

Website: https://www.oekoregion-kaindorf.at/

BOKU University of Natural Resources and Life Sciences: This university in Vienna is focused on research and education related to natural resources and the environment. It has a department dedicated to waste management and bio-waste utilization.

Website: https://boku.ac.at/en/

Climate Lab – A large network based in Vienna, to connect corporates, NGO's and start-ups on the way to become climate neutral. https://climatelab.at/en/home/

respACT – Austria's Business Council for Sustainable development - CSR platform - https://www.respact.at/

Circular economy forum Austria – supporting Austrian businesses on the way to circularity. https://www.circulareconomyforum.at/

Biogest: This is a private company that provides solutions for biogas and biomethane production. Its systems can be used for the digestion of bio-waste and other organic materials.

Website: https://www.biogest.at/en/

Komptech: This is a private company that provides technology for the treatment and recycling of waste. It offers solutions for the processing of bio-waste, including composting and anaerobic digestion.

Website: https://www.komptech.com/en/

6.2 Greece

Circular economy projects

Since 1992, the LIFE Programme (the EU's funding instrument for the environment and climate action) has funded 169 projects in Greece on the topic of Circular economy and quality of life. The total investment for these projects was 250 M euros, with the EU contribution reaching 121 M euros.

Some ongoings projects under the LIFE programme are:

- Integrated approach for exposure and health effects monitoring of engineered nanomaterials in workplaces and urban areas (Project Number: LIFE17 ENV/GR/000285)
- Nano-CATalysts for HEAVY Duty Applications (Project Number: LIFE17 ENV/GR/000352)
- Pollutant Photo-NF remediation of Agro-Water (Project Number: LIFE17 ENV/GR/000387)
- Demonstration of an advanced technique for eliminating coal mine wastewater (brines) combined with resource recovery (Project Number: LIFE18 ENV/GR/000019)
- PRevent Of Waste crIme by Intelligence Based InspecTions (Project Number: LIFE18 GIE/GR/000899)

According to recent research done on the **'New plan of Greece – road map for circular economy'**, there are 11 innovative Greek initiatives that can lead the way to more ideas and practices contributing to the circular transformation of the country‘s economy.

To mention a few:

1) The 'Research Infrastructure for Waste Valorization and Sustainable Management of Resources - INVALOR' has been created to promote the concept of the circular economy.
2) The Materials Reuse Center 'We Can' in Kastoria is a facility of the Integrated Waste Management System (IWMS) that aims at preventing the production of waste and its reuse. It is a place where there will be participation and interaction of citizens in order to prevent waste production through the exchange of objects and to give these objects a second chance to be reused.
3) Boroume ('We Can') is a non-profit organisation whose mission is to reduce food waste and to fight malnutrition in Greece. Through their 'Saving & Offering Food' program, they save food on a daily basis from many sources and they offer it to charities that help people who are facing food insecurity. Their actions help the most vulnerable in the society as well as the environment by reducing organic food waste.
4) The Cluster of Bioeconomy and Environment of Western Macedonia (CLuBE) is a platform for cooperation of the three pillars of the regional economy: the public sector, research and entrepreneurship. The Cluster seeks to develop synergies between local and regional players and businesses in bioenergy and the environment, aiming at introducing and developing innovation in the sector and increasing its added value.
5) The 'REPLACE -REgional PoLicy Actions for Circular Economy' project aims at improving management, implementation and monitoring of regional policy instruments targeted at facilitating the transition towards a CE, while boosting sustainable development. The main operative target refers to the development and application of policies and actions focusing on identification, valorisation, assessment

and financing of circular value chains, resulting in new local and interregional projects.

6) PHOTOREC - Integrated Management of Photovoltaic Panels for Maximum Materials Recovery: The main expected outcome from the implementation of the PHOTOMEGA project (PH0T0REC) is an integrated PV management system for maximum recovery and utilisation of materials/metals at the waste electrical and electronic equipment (WEEE) sector.

Last but not least, the EIT Climate KIC Greece Hub is a connector between policymakers, innovators and the society, seeking the transformation of the society. This process is ensured through implementation research, participatory workshops, educational training, capacity building, local actions and innovation support and communities of practice. Through its network, EIT Climate-KIC Greece Hub can offer seminars and training to stakeholders at the municipality level, as well as the co-responsible public authorities (Ministries of Environment and Agriculture or Port authorities), at the business sector (entrepreneurs, farmers, ship-owners, investors and bankers) about the meaning and importance of implementing the Systems Innovation Approach and more importantly why it is relevant for protecting the economy while at the same time integrating the new technologies into the market.

In particular, the EIT Climate KIC Hub aims at bringing to surface the potential of Greece for innovative solutions in CleanTech, WaterTech, Circular Economy & innovative financing innovative financing schemes.

Projects to foster entrepreneurship in Greece

Start Up Bio: This Erasmus+ project (Project Number: 2019-1-IT01-KA202-007492) aims at supporting and facilitating transition and innovation processes of rural enterprises, accompanying them to the conversion from a traditional production to an organic production. It offers high quality training opportunities, promoting ICT-based learning (self-tutorial and e-learning paths).

The project seeks that new well-trained farmers could be the agents for change management processes in the agricultural sector, actively participating as ambassadors in dissemination of a culture of organic production and sustainable development. The Academy of Entrepreneurship was the Greek partner in this project.

SOSUSK – Social and Sustainable skills for young NEET population: This Erasmus+ project (Project Number: 2021-1-EL02-KA220-YOU-000029015) is meant to face the pivotal challenge of mobilising a transnational population of European young Neither in Employment or in Education or Training (NEETs), providing them with social and green entrepreneurship skills and competences. The purpose is to ease their match with sustainable opportunities for employment or self-employment. The Academy of Entrepreneurship is the

Greek partner and the coordinator in this project.

GreenY - Promoting Youth-led Women Entrepreneurship for the development of Inclusive Green Economy: This Erasmus+ project (Project Number: 618886-EPP-1-2020-1-EL-EPPKA2-CBY-ACPALA) aims at fostering cooperation between countries in Europe, Latin America, and Asia by training women youth workers and young people belonging to vulnerable contexts with key competencies and practical skills that promote their entrepreneurial spirit and increase their employment opportunities within the various sectors related to the green economy model. The development of these capacities will allow them to be empowered in the face of the challenges of the global context and can be considered as active agents of change within the framework of emerging sustainable development models. The Academy of Entrepreneurship is one of the Greek partners and the coordinator in this project.

6.3 Albania

The EQGj project in Albania aims to promote the circular and green economy as a new model of sustainable development in the municipalities of Patos and Roskovec, Fier district. The project intends to encourage businesses, local and central governments to apply EQGj and create non-fiscal facilities related to businesses that apply EQGj. The project's objective is to increase understanding and practical approaches to models of the circular and green economy for citizens and businesses while identifying businesses in the district of Fier with potential orientation towards a green and circular economy.

The project intends to achieve its objectives through three main initiatives. The first initiative is to encourage and promote businesses to apply the principles of a circular economy and identify at least five business cases that can apply these principles. The second initiative aims to distribute knowledge about the circular and green economy to local governments and young people in schools. The third initiative is to create a set of concrete recommendations for incentives from the local government for businesses that apply the principles of the circular economy and inform at least 500 individuals, businesses, and local governments about the benefits of the circular and green economy.

The expected results of the project include increasing knowledge about EQGj among local government, local businesses, and young people, promoting ideas for EQGj, organizing a promotional fair to increase knowledge and promotion of facilities among citizens, releasing a media statement and promotional video, and publishing the final report. The main beneficiaries of the project are county businesses, local government, and county youth. Overall, the project aims to promote the circular and green economy as a means of promoting an active society and economic development in the municipalities of Patos and Roskovec (Leviz Albania, n.d.).

6.4 Kosovo

Relevant start-ups:
AgroVictus: mushroom producers that upcycle organic matter into delicious mushrooms. https://www.facebook.com/AgroVictusFarming/

GoBeyond: Gobeyond is an early stage start-up that converts organic side and waste-streams into high-quality protein for animal feed and natural fertilizer using the power of insects. The project intends to contribute to re-think food & waste systems and to develop effective alternatives to managing waste. https://www.gobeyondnow.eu/

Botanic: Botanic is a start-up working to introduce regenerative agriculture practices in Kosovo with a focus on the food processing sector. It seeks to provide healthy and safe products by reducing the carbon footprint in agriculture and food consumption. http://wearebotanic.com/

Greenergy: Greenergy is a start-up that produces affordable, organic-certified, and sustainable-produced spices, using agricultural waste and circular economy. https://www.instagram.com/greenergykosovo/

Eco Solution Research: Eco Solution Research is a start-up that produces organic fertilizers and biogas from food waste picked up from restaurants. https://pozi.io/startups/eco-solution-research

BIO 365 Kosovo: Bio 365 Kosovo produces essential oils from medicinal plants. Taking into consideration that the process of production of essential oils generates a large amount of waste or biomass, Bio 365 Kosovo aims to produce bio-pellets out of this waste. Bio-pellets can be an energy source in the distillation and drying facility. The remaining ash after burning can also be used as organic fertilizer. https://www.facebook.com/bio365kosovo/

Besides these projects the following initiated food waste challenge aimed at similar objectives as BECBA project:
UNDP Kosovo, in partnership with Norwegian Institute for Bioeconomic Research (NIBIO), Gastronomy Association of Kosovo, and Innovation Center in Kosovo (ICK), piloted the first food waste challenge in Kosovo to address the problem of food waste in the country. The challenge involved 18 gastronomic businesses and successfully collected direct data to identify previously unnoticed patterns in food management. Some businesses designed new solutions to reduce food waste and financial losses. The challenge also showed that many businesses successfully reduced their waste in 21 days. By the third week, Restaurant Renaissance reduced the amount of waste per guest by 92 grams less. Some restaurants fed stray dogs and cats or their own animals, while others rethought their menu and portion sizes.

Circular economy projects in Kosovo

1. The "Clean and Healthy Environment" program: This is a project funded by the European Union that aims to improve waste management practices in Kosovo, including bio-waste management. The program includes activities such as raising public awareness, developing waste management infrastructure, and promoting sustainable waste management practices. https://www.eea.europa.eu/publications/municipal-waste-management-in-western

2. The "Kosovo Recycles" campaign: This is a public awareness campaign launched by the Ministry of Environment and Spatial Planning in Kosovo, which aims to promote recycling and sustainable waste management practices, including bio-waste management. https://boostimpact.org/innovations/kosovo-glass-recycling/

3. The "Green Waste Management" project: This is a project implemented by the Kosovo Environmental Protection Agency that aims to promote the sustainable management of organic waste, including composting and biogas production.

4. The "Waste to Value" project: This is a project implemented by the United Nations Development Programme in Kosovo that aims to promote sustainable waste management practices, including the management of bio-waste. The project includes activities such as developing composting facilities, promoting public awareness, and providing technical assistance to local municipalities.

5. “Composting Scheme for Germia Park and Other Pristina Public Green Areas”. The aim of the project is to establish a composting scheme for the organic waste generated in Germia Park and other public green areas in Pristina, the capital city of Kosovo. https://fondacionijeshil.org/pristina-will-have-a-composting-scheme/

6. “Compost Valorisation via Worm Farming in Lipjan”. The aim of the project is to establish a worm farming system for the valorisation of compost in the municipality of Lipjan. https://fondacionijeshil.org/portfolio/model-3-compost-valorisation-via-worm-farming-in-lipjan/

7. “Let's Talk About Food Waste”. The aim of the project is to raise awareness about food waste and promote sustainable food consumption practices among the general public. https://fondacionijeshil.org/portfolio/lets-talk-about-food-waste/

8. “Composting Scheme for Rural Neighborhood”. The aim of the project is to establish a composting scheme in a rural neighborhood in Kosovo, with the goal of promoting

sustainable waste management practices and reducing the amount of organic waste that is sent to landfills. https://fondacionijeshil.org/portfolio/model-2-composting-scheme-for-rural-neighbourhood/

9. "Linear Economy". The aim of the project is to raise awareness and understanding causes and consequences of linear waste disposal and circular waste economy.

Other organizations in Kosovo relevant to BECBA project:

Other local NGOs:

- Climate Awareness Association that deal with rising awareness on Circular Waste and Climate Change
- Fondacioni Jeshil that as involved in best practices for waste reduction and management
- PEN Organisation that are focused on education of youth

7. Primary research

- **Qualitative interviews**

5 qualitative interviews were performed by alchemia-nova.
Interview partners:

1. A researcher at the BOKU university concerning their research project "Essenswert" about avoidable food waste caused by farmers in Austria and the data gap concerning these numbers the project aims to solve.
2. Johannes Kisser, technical director of alchemia-nova, institute for circular economy and nature-based solutions, based in Vienna, about his expertise concerning (circular) waste management and waste valorisation.
3. Armin Winter, about EU project BIOTRANSFORM, synergies with BECBA, system transformation in rural areas.
4. Helen Dolinšek, about systemic transformation, the start-up ecosystem in Austria and project DIRECT HUBS and CIRCULARITY HUBS, showcasing entrepreneurial activities and enabling circularity in urban areas.
5. Nektaria Efthymiou-Charalampopoulou, environmental lawyer, about EU laws and directives concerning bio-waste, defining bio-waste and Austrian law.

After recording the 30-45 minutes semi-structured interviews have been transcribed with the help of Otter.ai, an artificial intelligence tool. The texts have been analyzed and important insights have been mentioned in the report. The interviews were performed with an explorative approach, attempting to identify relevant topics and points of attention to support

the desk research.

- **Quantitative survey**

Descriptive Statistics

A sample of 71 farmers from Austria (21), Greece (10), Albania (20) and Kosovo (20) were surveyed.

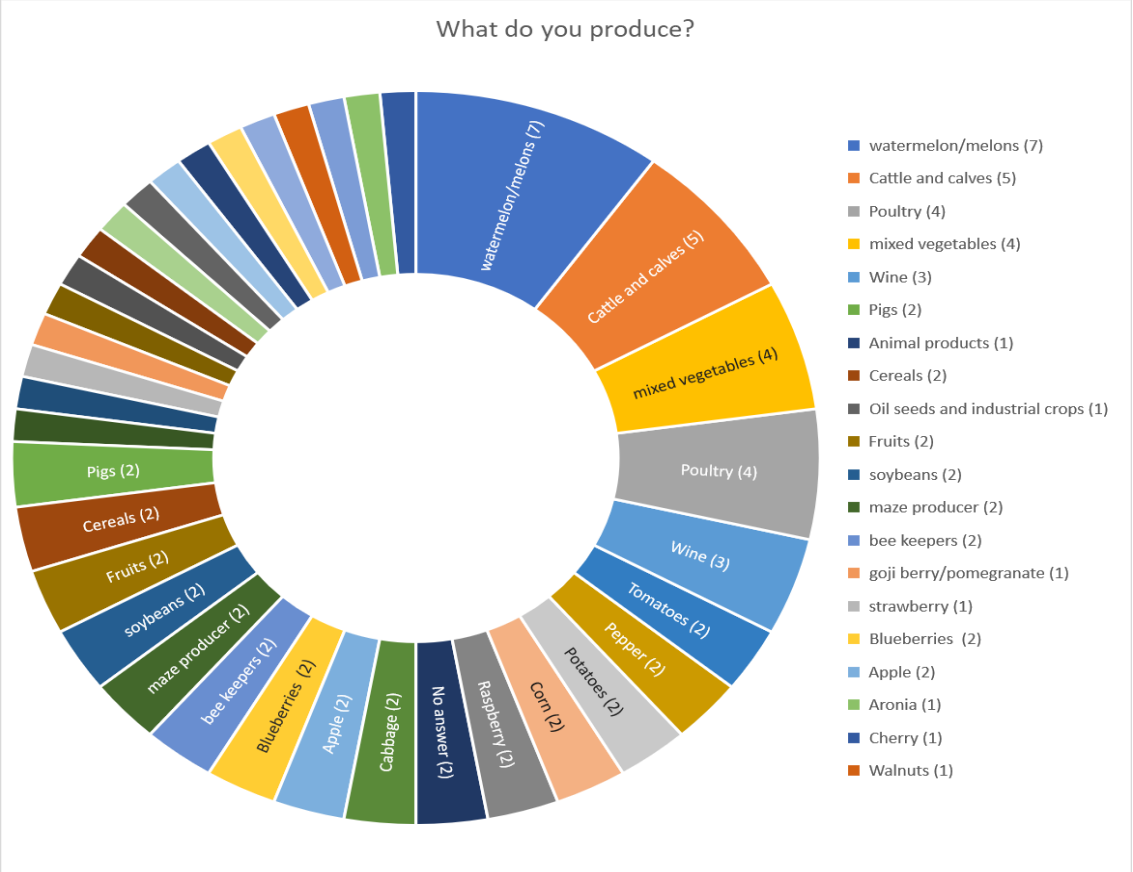


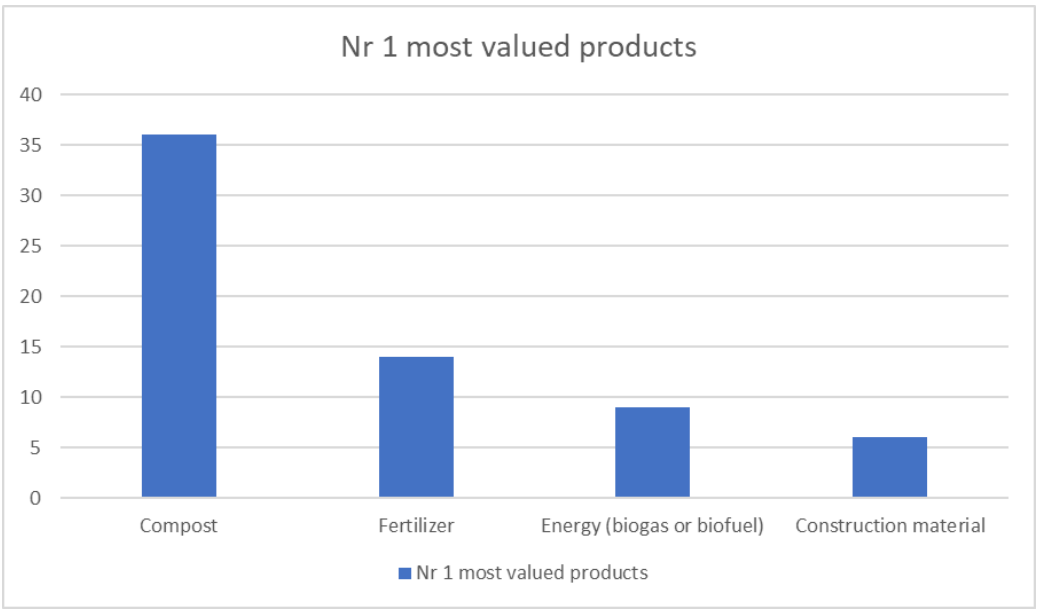
Figure 19: Farmers sample

Q2: Are you interested in commercial products that could be produced from your agricultural waste?

89% of the questioned farmers indicated they were interested in commercial products produced from their agricultural waste.

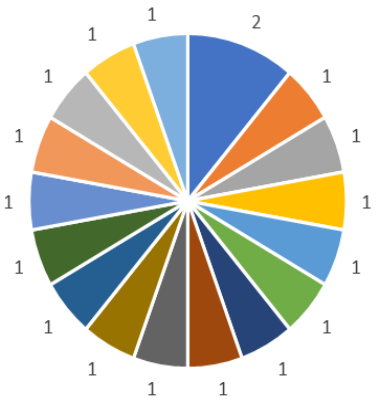
Which products produced from agricultural waste are valued most by farmers?

From the 65 farmers that indicated a number 1 most valued product produced from agricultural waste, 36 valued compost as most important, 14 valued fertilizer as most important, 9 valued energy (biogas or biofuel) as most important and 6 valued construction material as most valued product.



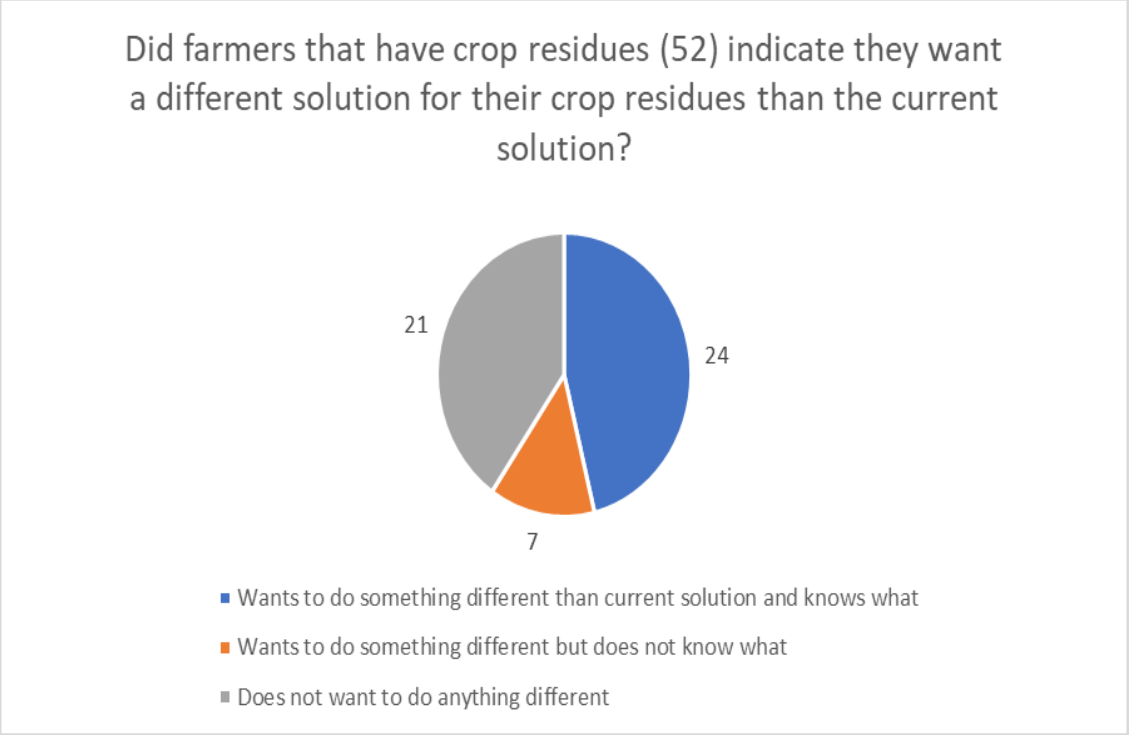
What do farmers that have crop residues currently do with their residues of crops?

What do you currently do with the residues of crops?



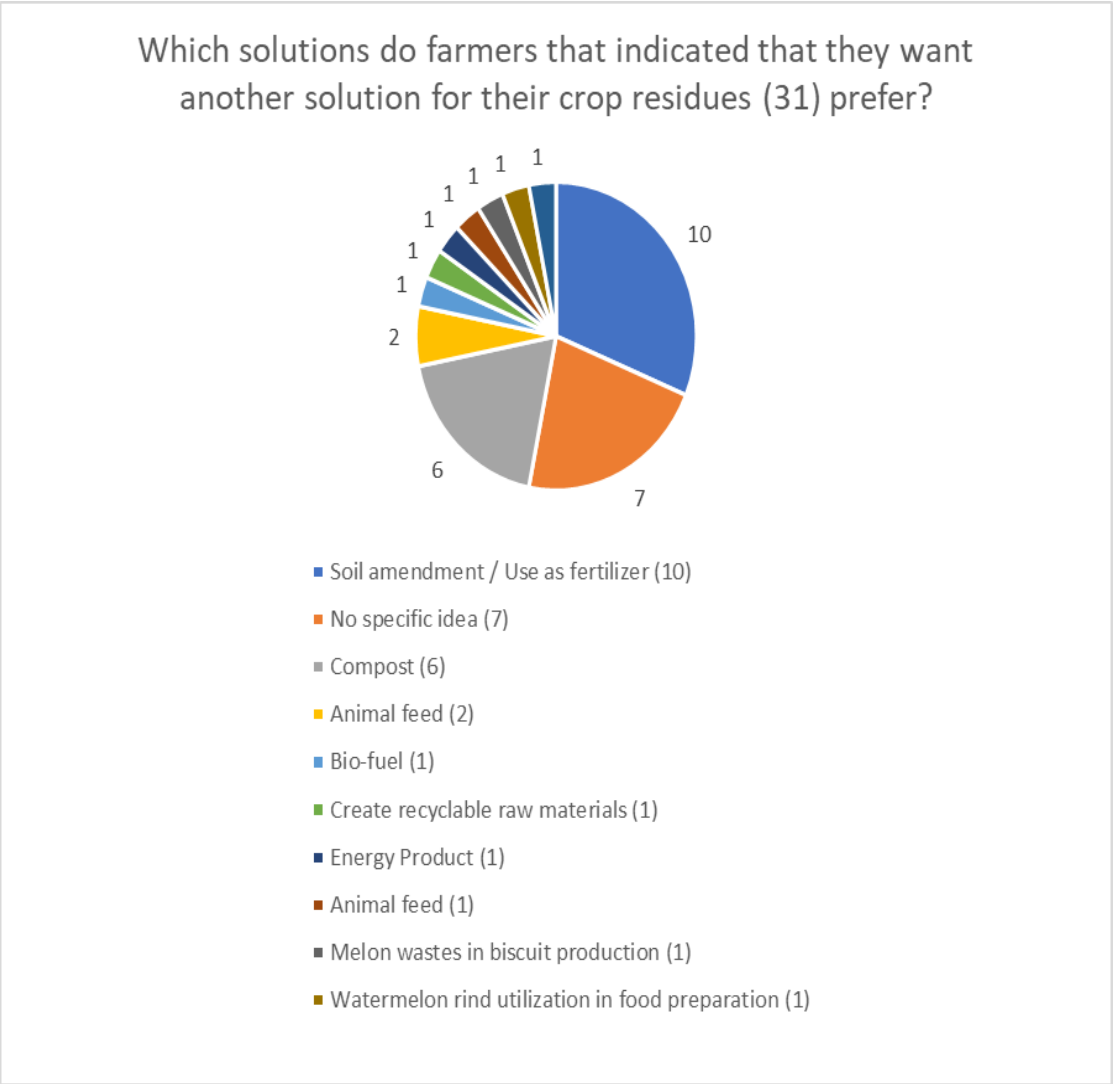
- farm biogas (2)
- animal feed that is not used by the cattle is sold or donated to other farmers or businesses.
- Whey is a by-product of cheese and yogurt production and it is a valuable source of protein and other nutrients. We sell our whey to companies specializing in processing and producing protein powder or animal feed.
- compost waste materials such as straw, chaff, and other plant debris to create a nutrient-rich soil amendment
- generate energy through anaerobic digestion
- sell waste materials, such as pressed cake or meal, as animal feed.
- compost their waste materials, including fruit waste, pruning debris, and other organic matter, to create a nutrient-rich soil amendment
- Lees aresediment that accumulates at the bottom of wine barrels during agings. They consist of dead yeast cells, grape skins, and other organic matter. We use lees to produce wine vinegar
- After the harvest, the skins and pomace remaining after pressing the grapes is composted and this is returned to the vineyards instead of using chemical fertilizers.
- From a packaging point of view, 86% of the material used in the outer packing cases, comes from recycled cardboard and no metal pigments are used in the ink for the labels.
- Soy hulls are the outer layer of soybeans and are a byproduct of the soybean processing industry. We use soy hulls as animal feed, as they are a good source of fiber and energy for livestock such as cattle, sheep, and pigs.
- We use it in the production of biofuels
- all the biomass is fed to cattle, straw is used as bedding and is returned to the meadows and fields with the manure.
- all the biomass is fed to cattle, straw is used as bedding and is returned to the meadows and fields with the manure.
- Beeswax generated by honeybees is used for various purposes, such as making candles, cosmetics, and skincare products.
- Propolis is a resinous substance bees produce with antimicrobial and antioxidant properties. We collect propolis from beehives and sell it to processors or use it to make our own products.
- Fruit waste includes damaged or unsellable fruits, as well as parts of the fruit that are not used in processing, such as peels and seeds. We compost fruit waste to create a nutrient-rich soil amendment, use it for animal feed, or use it to produce biogas

Did farmers that have crop residues (52) indicate they want a different solution for their crop residues?



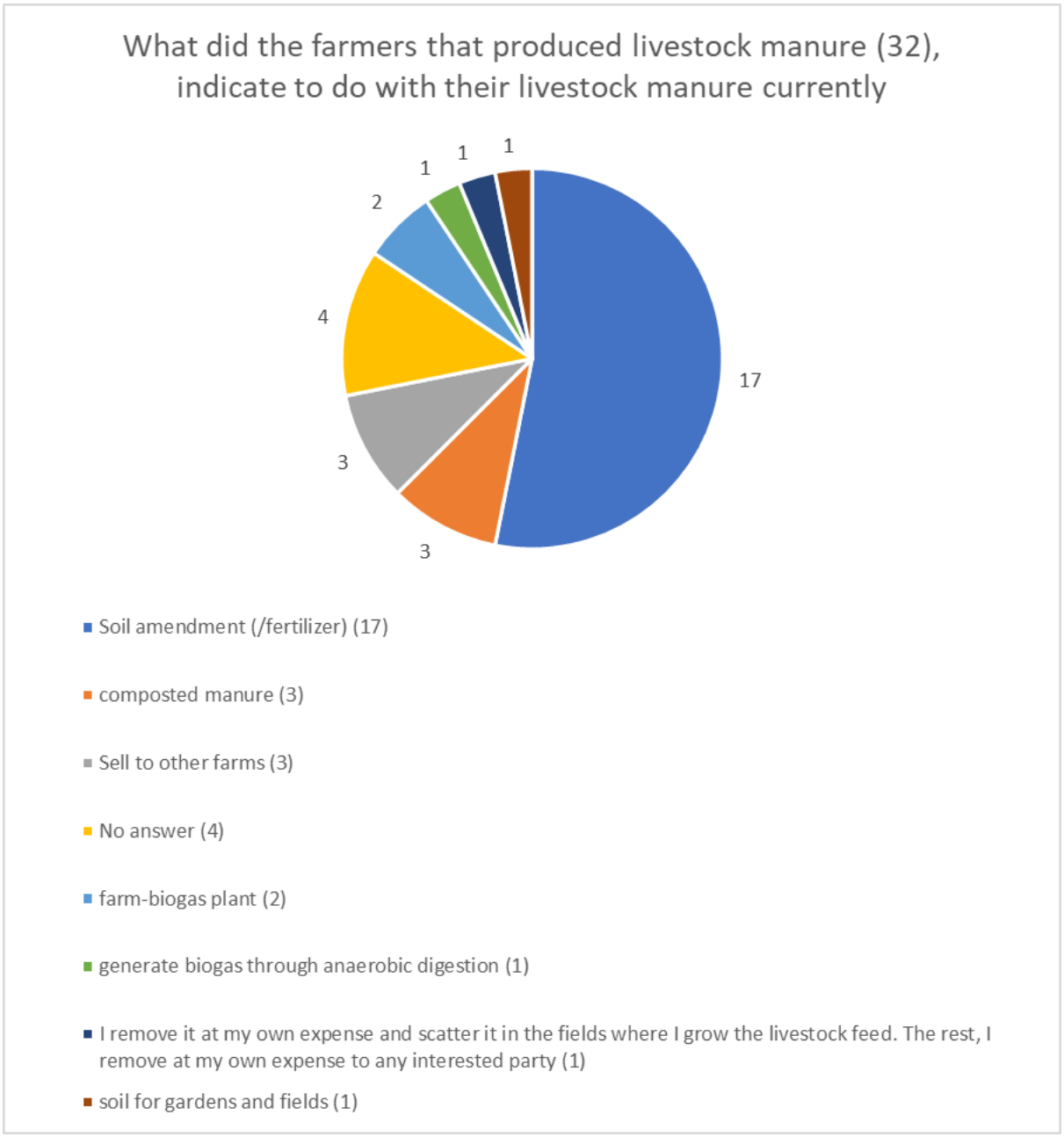
31 out of 52 farmers with crop residues indicated they wanted another solution. 24 of those mentioned which solution they would prefer. 7 indicated not to know which other solution they wanted because of "no specific idea", "not knowing the options" or just "not knowing".

Which solutions do farmers that indicated they want another solution for their crop residues (31) prefer?

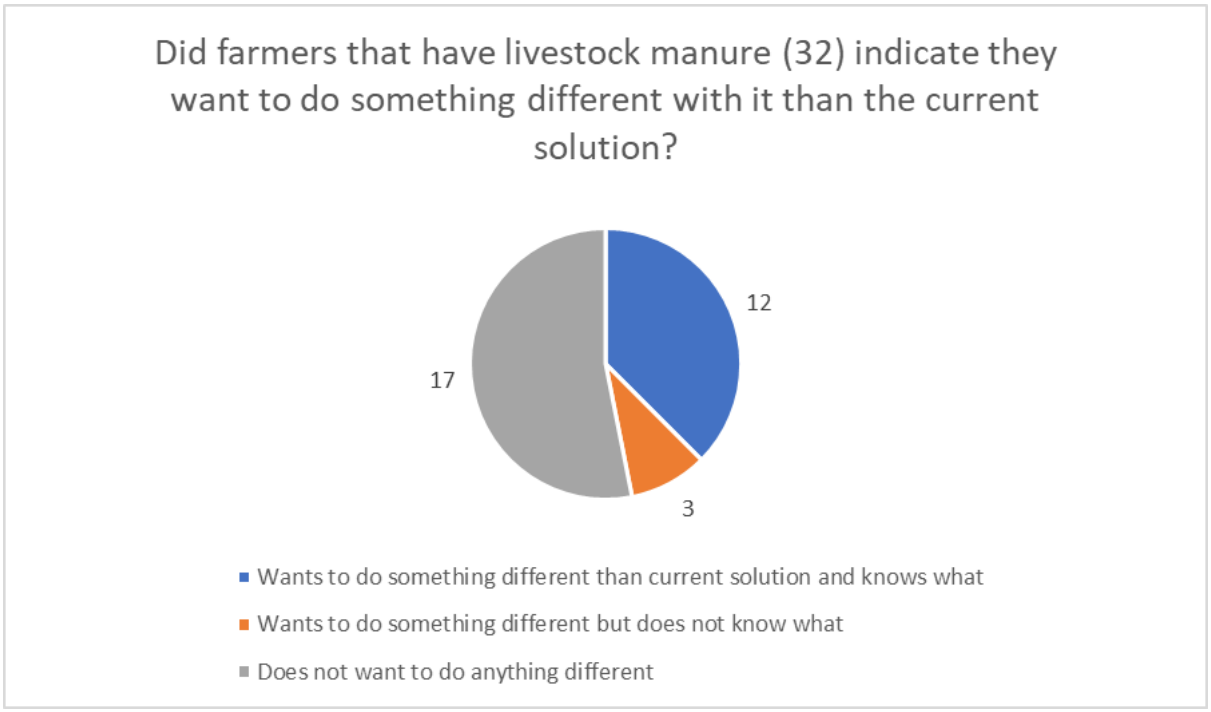


What do the farmers currently do with their livestock manure?

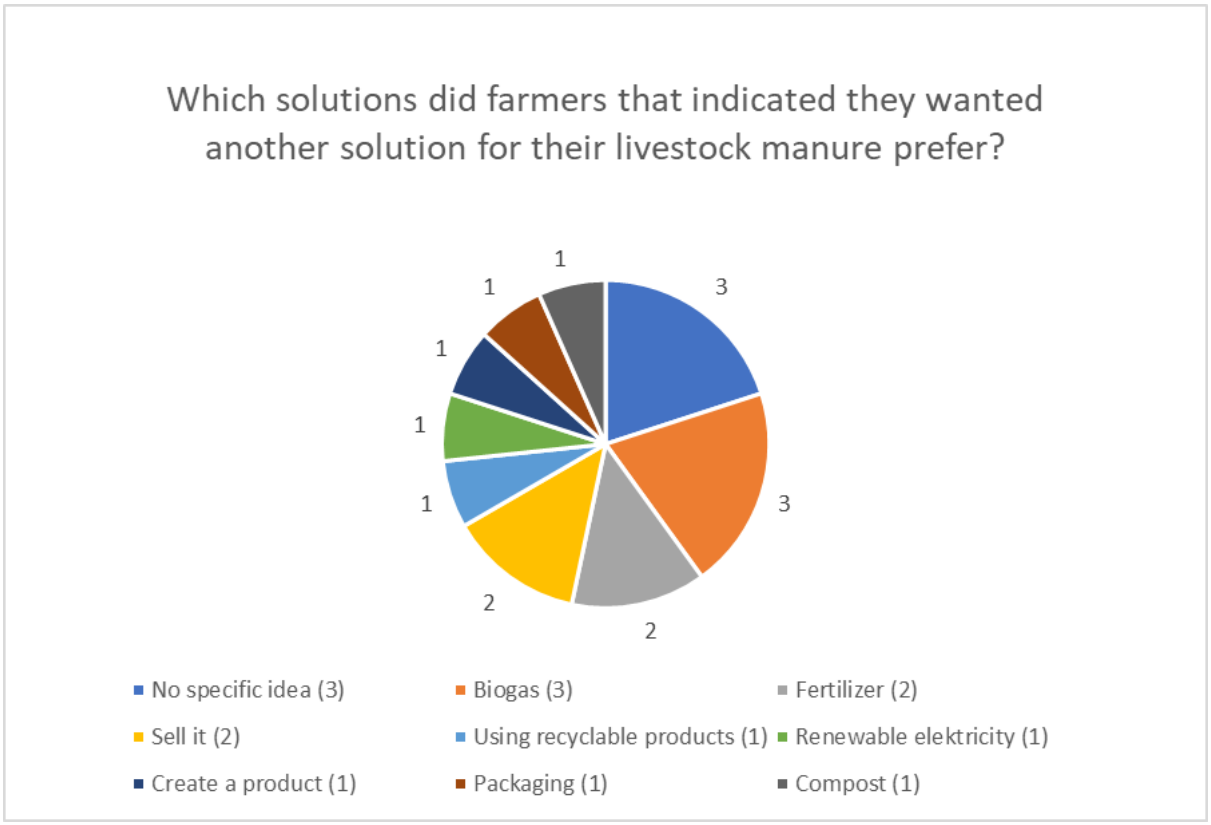
39 out of 71 (55%) indicated not to have livestock manure or too little to do something with it. By the 32 farmers (45%) that do produce livestock manure the following solutions were described:



How many farmers that indicated to have livestock manure (32) wanted to do something different than that they are currently doing with their livestock manure?



For the farmers that indicated they wanted another solution for their livestock manure (15 farmers), which solutions were they interested in?



8. References

8.1 Austria reference list

Abfallwirtschaft im Betrieb - Allgemeine Informationen zum Abfallwirtschaftsgesetz 2002. (2013). *In-house waste management—General information on the Waste Management Act 2002*. https://www.wko.at/site/mehrsprachige_info/In-house_waste_management.html#

Ag News. (2020). *AgroPages-Soybeans from Austria – a niche product becoming one of the major crops-Agricultural news*. https://news.agropages.com/News/NewsDetail---34913.htm

Amlinger, F., & Peyr, S. (2009). *The State of the Art of Composting A guide to good practice*. lebensministerium.at. https://www.bmk.gv.at/dam/jcr:69c43c71-1844-4c52-8d0c-20e0d9ced59f/Richtlinie_Kompost_en.pdf

Anderl, Friedrich, Gangl, & Haider. (2021). *Austria's National Inventory Report 2021*. https://www.umweltbundesamt.at/

Angel Investing Report 2020. (2020). Austrian Angel Investor Association.Puchner, & Gloser. (2021). Austrian locational advantages for start-ups. *AAIA*. https://www.aaia.at/en/aaia_blog/austrian-locational-advantages-for-start-ups/

Biodegradable waste. (n.d.). Retrieved March 22, 2023, from https://environment.ec.europa.eu/topics/waste-and-recycling/biodegradable-waste_en

Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance), CONSIL, EP, 150 OJ L (2018). http://data.europa.eu/eli/dir/2018/851/oj/eng

European Commission. (2015). *National factsheet—Austria Assessment of separate collection schemes in the 28 capitals of the EU*. https://www.municipalwasteeurope.eu/sites/default/files/AT%20National%20factsheet.pdf

Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, & Innovation and Technology. (2021). *Austria on the path to a sustainable and circular society*. https://www.bmk.gv.at/themen/klima_umwelt/abfall/Kreislaufwirtschaft/strategie.html

Federal Waste Management Plan. (2017). Retrieved March 15, 2023, from https://www.bmk.gv.at/en/topics/climate-environment/waste-resource-management/waste-management/fed-waste-mgt-plan.html

FMRA. (2022). *Facts and Figures 2022*. Federal Ministry Republic of Austria Agriculture,

Forestry, Regions and Water Management. https://info.bml.gv.at/dam/jcr:4395efec-0a8c-493e-8911-b8a9db92f883/Facts%20and%20Figues%202022%20(barrierefrei).pdf

Green Agenda. (2021). Composting in municipalities across the country: Better in the soil than in the landfill. *Green Agenda*. https://greenagenda.gr/%ce%ba%ce%bf%ce%bc%cf%80%ce%bf%cf%83%cf%84%ce%bf%cf%80%ce%bf%ce%af%ce%b7%cf%83%ce%b7-%cf%83%ce%b5-%ce%b4%ce%ae%ce%bc%ce%bf%cf%85%cf%82-%cf%84%ce%b7%cf%82-%cf%87%cf%8e%cf%81%ce%b1%cf%82-%ce%ba%ce%b1/

Jünemann, Wirtz, & Förster. (2023). *ECSPR - Guide to the European Crowdfunding Regulation*. Bird & Bird. https://www.twobirds.com/-/media/new-website-content/pdfs/2022/articles/ecspr-guide-to-the-european-crowdfunding-regulation.pdf

Kreislaufwirtschafts-Strategie. (n.d.). Retrieved April 5, 2023, from https://www.bmk.gv.at/themen/klima_umwelt/abfall/Kreislaufwirtschaft/strategie.html

Miza. (2022, October 17). The best European examples for collecting bio-waste | Blog MiZA. *Mission Zero Academy*. https://www.missionzeroacademy.eu/waste-management/the-best-european-examples-for-collecting-bio-waste/

Paleari, S. (2016). *Municipal waste management: Country profile Austria* (p. 22). https://www.eionet.europa.eu/etcs/etc-ce/products/country-profiles-on-the-management-of-municipal-waste-1/austria_msw_2016.pdf

Review of Crowdfunding Regulation 2017—Interpretations of existing regulation concerning crowdfunding in Europe, North America and Israel. (2017). European Crowdfunding Network (ECN).

Schneider, & Lebersorger. (2016). *Situation on Food Waste in Austria*. Reduce Food Waste in Europe. http://www.reducefoodwaste.eu/situation-on-food-waste-in-austria.html

Severin, Krell, & Michalikova. (2021). *The bio-waste management challenge*. https://www.interregeurope.eu/sites/default/files/2022-04/Bio-waste%20challenge.pdf

Statista. (2022). *Austria—GDP distribution across economic sectors 2021*. Statista. https://www.statista.com/statistics/375659/austria-gdp-distribution-across-economic-sectors/

Sunil. (2022). *Small but mighty: How Austria's startup ecosystem is growing*. Sifted. https://sifted.eu/articles/austrias-startup-ecosystem-brnd/

Taste of Austria. (n.d.). *Facts on Agriculture*. Taste of Austria. Retrieved April 17, 2023, from https://www.tasteofaustria.org/facts-on-agriculture

Walla, C., & Schneeberger, W. (2005). Farm biogas plants in Austria – An economic analysis. *Jahrbuch Der Österreichischen Gesellschaft Für Agrarökonomie, Vol. 13, pp. 107–120*. www.boku.ac.at/oega

What Happens to Collected Waste? (n.d.). Retrieved April 5, 2023, from https://www.bmk.gv.at/en/topics/climate-environment/waste-resource-management/waste-management/collect-waste-properly/collected-waste.html

8.2 Greece reference list

Alpha Bank Economic Research team. (2021). *Circular economy and applications in various sectors*. Alpha Bank. https://www.alpha.gr/-/media/alphagr/files/group/agores/sectors-in-focus/circular_economy_sectors_in_focus_december2021.pdf

Albanidis Pavlos. (2018). *Energy recovery from agricultural and industrial Waste*. Technological Educational Institution of Crete. https://apothesis.lib.hmu.gr/bitstream/handle/20.500.12688/8803/AlmpanidisPavlos2018.pdf?sequence=1

Art Haddaway. (2015). *Nutrient Recovery Technology transforms world's largest wastewater treatment plant.* Waterworld. https://www.waterworld.com/wastewater/article/16193822/nutrient-recovery-technology-transforms-worlds-largest-wastewater-treatment-plant

Arkolaki, N., & Arkolaki, N. (2019, November 11). *Municipality of Arta: Applications for the free distribution of composting bins have started* - Aftodioikisi.gr. https://www.aftodioikisi.gr/ota/dimoi/d-artaion-xekinisan-oi-aitiseis-gia-dorean-dianomi-kadon-kompostopoiisis/

Argyris Demertzis. (2022). *Circular economy: 10+1 Greek flagship business initiatives*. Ecopress. https://ecopress.gr/64553-2/

Dafni Sotirchou. (2021). *Waste management in Greece under the current legislative framework.* KARAGEORGIOU & ASSOCIATES LAW FIRM. https://kalaw.gr/waste-management-in-greece-under-the-current-legislative-framework/

Ecorec team. (n.d.). *What is composting*. Ecological Recycling Society. http://www.ecorec.gr/ecorec/index.php?option=com_content&view=category&id=64&Itemid=537&lang=en

Ecological Recycling Company team. (n.d.) *What is composting.* Ecological Recycling Company. http://www.ecorec.gr/ecorec/index.php?option=com_content&view=category&id=64&Itemid=537&lang=en

Ellaktor Group team. (n.d.). *Integrated Waste Management Project in the Region of Western Macedonia / HELECTOR*. ELLAKTOR GROUP. https://ellaktor.com/en/activity/oloklиromeno-systima-diacheirisis-aporrimmaton-perifereias-dytikis-makedonias-ilektor/

Eurostat Statistics Explained team. (2014). *Glossary: Recovery of waste.* Eurostat https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Recovery_of_waste#:~:text=Recovery%20of%20waste%20means%20any,or%20in%20the%20wider%20economy

European Commission. (2011). *Roadmap for Greece Support to Member States in improving waste management based on assessment of Member States' performance*.

European Commission team. (n.d.). *Agriculture and rural development*. European Commission.https://agriculture.ec.europa.eu/common-agricultural-policy/rural-development_en

European Environment Agency. https://www.eea.europa.eu/el/articles/apo-ti-diacheirisi-apobliton-pros

Flash team. (2019, April 20). *The Greek municipalities that recycle*. www.flash.gr. https://www.flash.gr/environment/1558264/oi-ellinikoi-dimoi-poy-kanoyn-anakyklwsi

Giannis Zisopoulos (n.d.). *The good example of Kozani (Greece) on bio-waste management*.

Hans Bruyninckx. (2016). *Moving beyond waste management towards a green economy.*

Hellenic Statistical Authority. (2022). *PRESS RELEASE - WASTE STATISTICS: 2020*. Hellenic Statistical Authority. https://www.statistics.gr/en/statistics?p_p_id=documents_WAR_publicationsportlet_INSTANCE_qDQ8fBKKo4lN&p_p_lifecycle=2&p_p_state=normal&p_p_mode=view&p_p_cacheability=cacheLevelPage&p_p_col_id=column-2&p_p_col_count=4&p_p_col_pos=1&_documents_WAR_publicationsportlet_INSTANCE_qDQ8fBKKo4lN_javax.faces.resource=document&_documents_WAR_publicationsportlet_INSTANCE_qDQ8fBKKo4lN_ln=downloadResources&_documents_WAR_publicationsportlet_INSTANCE_qDQ8fBKKo4lN_documentID=486566&_documents_WAR_publicationsportlet_INSTANCE_qDQ8fBKKo4lN_locale=en

Hellenic Statistical Authority. (2022). *Results Collection for Agriculture - Livestock, ELSTAT 2021 (reference year: 2020)*. Hellenic Statistical Authority. https://elstat-outsourcers.statistics.gr/apografi_georgias_21_FINAL_web.pdf

Hitachi Zosen INOVA team. (2021, July 29). *Epirus, GRC - Anaerobic Digestion*. Hitachi Zosen INOVA. https://www.hz-inova.com/projects/epirus-grc/

IEA Bioenergy team. (2019). *Workshop report: Nutrient recovery from waste*. IEA Bioenergy. https://www.ieabioenergy.com/blog/publications/workshop-report-nutrient-recovery-from-waste/

Kalawgr. (2021, June 25). *Waste management in Greece under the current legislative framework | Karageorgiou & Associates*. Karageorgiou & Associates. https://kalaw.gr/waste-management-in-greece-under-the-current-legislative-framework/

Ministry of the Environment and Energy. (2020, November 12). *Legislation.* Ministry of the Environment and Energy. https://ypen.gov.gr/diacheirisi-apovliton/sterea-apovlita/nomothesia/

Ministry of the Environment and Energy. (n.d.). *Legal Framework for the management of Solid Waste.* Ministry of the Environment and Energy. https://ypen.gov.gr/wp-content/uploads/legacy/Files/Perivallon/Diaxeirisi%20Apovlitwn/Nomothesia/Nomothetikoplasio.pdf

Ministry of Environment and Energy team. (2021). *Circular Economy, Greece's New Action Plan.* Ministry of Environment and Energy. https://ypen.gov.gr/wp-content/uploads/2021/03/NEO_SXEDIO_DRASIS_KUKLIKH_OIKONOMIA.pdf

Municipality of Karditsa. (2018, January 19). *Home Composting - Municipality of Karditsa*. https://dimoskarditsas.gov.gr/perivallon/ikiaki-kobostopiisi/

Moutafis I. Evaggelos. (2018). *Organic Waste Management With Composting And Suitable Selection Building Materials.* Aristotle University Of Thessaloniki http://ikee.lib.auth.gr/record/297593/files/GRI-2018-21426.pdf

News European Parliament team. (2015, February 12). *Circular economy: definition, importance and benefits.* News European Parliament. https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits

Νόμος 4042/2012—ΦΕΚ 24/Α/13-2-2012 (Κωδικοποιημένος). (2012, February 13). E-Nomothesia.Gr | Τράπεζα Πληροφοριών Νομοθεσίας. https://www.e-nomothesia.gr/kat-periballon/apobleta/n-4042-2012.html

Nomothetikoplasio.pdf. (n.d.). Retrieved April 26, 2023, from https://ypen.gov.gr/wp-content/uploads/legacy/Files/Perivallon/Diaxeirisi%20Apovlitwn/Nomothesia/Nomothetikoplasio.pdf

Paschalis Mentizis. (2021). *Composting in municipalities across the country: Better in the soil than in the landfill*. Green Agenda. https://greenagenda.gr/%CE%BA%CE%BF%CE%BC%CF%80%CE%BF%CF%83%CF%84%CE%BF%CF%80%CE%BF%CE%AF%CE%B7%CF%83%CE%B7-%CF%83%CE%B5

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Paschalis Mentizis. (2018). *Life F4F : Animal feed production from hotel food waste.* Greenagenda. https://greenagenda.gr/life-f4f-%CF%80%CE%B1%CF%81%CE%B1%CE%B3%CF%89%CE%B3%CE%AE-%CE%B6%CF%89%CE%BF%CF%84%CF%81%CE%BF%CF%86%CF%8E%CE%BD-%CE%B1%CF%80%CF%8C-%CE%B1%CF%80%CF%8C%CE%B2%CE%BB%CE%B7%CF%84%CE%B1-%CF%84%CF%81%CE%BF/

Psomopoulos, C. S., Kiskira, K., Kalkanis, K., Leligou, H. C., & Themelis, N. J. (2022). The role of energy recovery from wastes in the decarbonization efforts of the EU power sector. *IET Renewable Power Generation*, *16*(1), 48–64. https://doi.org/10.1049/rpg2.12315

RESEL consortium. (n.d.). *From UCO to Biodiesel*. Renewable and Sustainable Energy Local Planning Toolbox. https://reselplan-toolbox.eu/case-studies/from-uco-to-biodiesel.html

Symbiotic Networks of Bio-Waste Sustainable Management. https://symbiosisproject.eu/the-good-example-of-kozani-greece-on-bio-waste-management/

Shelia Hu. (2020, July 20). *Composting 101*. NRDC. https://www.nrdc.orgstories/composting-101

Terna. (2021). *Circular economy in practice.* Terna Energy Group. https://www.terna-energy.com/restories-en/circular-economy-in-practice/

US EPA. (2022, November 22). *Composting At Home*. US EPA. https://www.epa.gov/recycle/composting-home#:~:text=for%20Home%20Composting-,What%20is%20Composting%3F,crumbly%2C%20earthy%2Dsmelling%20material

US EPA. (2023, February 9). *How Does Anaerobic Digestion Work?*. US EPA. https://www.epa.gov/agstar/how-does-anaerobic-digestion-work#:~:text=Anaerobic%20digestion%20is%20a%20process,in%20the%20absence%20of%20oxygen

Waste management in Greece under the current legislative framework. (2021, June 25). *Karageorgiou & Associates*. https://kalaw.gr/waste-management-in-greece-under-the-current-legislative-framework/

ΥΠΕΝ Αρχική -. (n.d.). Retrieved April 26, 2023, from https://ypen.gov.gr/

8.3 Albania reference list

EEA Report. (2020). *Bio-waste in Europe — turning challenges into opportunities.* https://www.eea.europa.eu/publications/bio-waste-in-europe

European Environment Agency. (2021). *Municipal waste management.* https://www.eea.europa.eu/themes/waste/waste-management

German Financial Cooperation. (2018). *Strategic Environmental Assessment for Preparation of the "Sectoral Study for Investment Demand in Integrated Solid Waste Management (ISWM) in Albania".* Strategic Environmental Assessment for Preparation of the "Sectoral Study for Investment Demand in Integrated Solid Waste Management (ISWM) in Albania". https://infrastruktura.gov.al/wp-content/uploads/2018/09/ISWM-Albania-Final-Sector-Study-Report-20180808-1.pdf

INSTAT. (2021). https://www.instat.gov.al/media/10184/agriculture-statistics-2021.pdf

Invest-in-albania.org. (2016). *Project.* https://invest-in-albania.org/

JICA. (2016). *THE PROJECT FOR THE SUPPORT OF WASTE MINIMIZATION AND 3R PROMOTION IN REPUBLIC OF Newsletter No. 3 November 2016 ALBANIA.*

IIA. (2019, May 29). *Invest in Agriculture in Albania • IIA*. IIA. https://invest-in-albania.org/industries/agriculture/

INCA. (2023). *INCA: Natural Casings*. http://inca-al.com/page-about-company

Instat. (2021). *Agriculture Statistics, 2021*. https://www.instat.gov.al/en/themes/agriculture-and-fishery/agriculture/publication/2022/agriculture-statistics-2021/

Leviz Albania. (n.d.). *EQGj @Albania – Circular and green economy, opportunities for promoting an active society and economic development in the municipalities of Patos and Roskovec.* https://www.levizalbania.al/sq/nisma-te-mbeshtetura/thirrja-per-aplikime-7/forumi-shqiptar-social-ekonomik-aset

National Environment Agency. (2021). *Report on Environmental Situation. National Waste Management Plan.* (2020-2035).

https://cdn.climatepolicyradar.org/navigator/ALB/2020/national-integrated-waste-management-plan-2020-2035_d7d15655dd8876e417a33825baa083d5.pdf

UNECE. (2018). *Environmental Performance Reviews Albania.* https://unece.org/environment-policy/publications/3rd-environmental-performance-review-albania

World Bank. (2021). *Strengthening the Sustainability of Albania's Growth Model.*

8.4 Kosovo reference list

Analysis of the Gap in the Waste Sector (MENAXHIMI I MBETURINAVE NË KOSOVË: SFIDAT DHE MUNDËSITË). (n.d.). HELVETAS Swiss Intercooperation Kosovo.

Composting scheme for rural neighbourhood – Fondacioni Jeshil. (n.d.). Retrieved April 29, 2023, from https://fondacionijeshil.org/portfolio/model-2-composting-scheme-for-rural-neighbourhood/

Connective Cities. (2021). *Waste Management in Vushtrri, Kosovo—An effective system even during the Pandemic*. https://www.connective-cities.net/en/news/waste-management-in-vushtrri-kosovo

European Environment Agency—Kosovo country profile. (2021). European Environment Agency. https://www.eea.europa.eu/themes/waste/waste-prevention/countries/kosovo-waste-prevention-country-profile-2021/view

Expansion of the Project for Separation of Organic Waste. (2019). Republika e Kosoves Fushë Kosovë. https://kk.rks-gov.net/fushekosove/news/zgjerohet-projekti-per-ndarjen-e-mbeturinave-organike/

Fondacioni Jeshil Provides Innovative Solution to Reduce Food Waste in Kosovo. (2021). *Fondacioni Jeshil*. https://fondacionijeshil.org/fondacioni-jeshil-mundeson-zgjidhjen-inovative-per-reduktimin-e-humbjes-se-ushqimit-ne-kosove/

Kosovo Green Report 2022. (2022). Ministry of Agriculture, Forestry and Rural Development, Prishtina. https://www.mbpzhr-ks.net/repository/docs/Kosovo__Green_Report_2022.pdf

Kosovo—Municipal waste factsheet 2021 Municipal waste management in Western Balkan countries—Country profile. (2021). European Environment Agency.

https://www.eea.europa.eu/themes/waste/waste-management/municipal-waste-management-country/kosovo-municipal-waste-factsheet-2021/view

Kosovo Integrated Waste Management Strategy (2019- 2028) and Action Plan (2019- 2021). (2019). http://kepweb.org/wp-content/uploads/2020/04/F_KEP_D0.00.20-Draft_Waste_Management_Strategy-2019-2028.pdf

LAW Nr. 02/L-123 FOR COMMERCIAL COMPANIES . (n.d.). Retrieved April 26, 2023, from https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2585

LAW NR. 03/L-087 PUBLIC ENTERPRICES. (n.d.). Retrieved April 26, 2023, from https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2547

LIGJI NR. 04/L-060 PËR MBETURINA - SHTOJCA. (n.d.). Retrieved April 26, 2023, from https://gzk.rks-gov.net/ActDetail.aspx?ActID=2829

Madhi, & Trupia. (2022). *Kosovo's waste (mis)management: From failures to alternatives*. | Heinrich Böll Stiftung | Belgrade - Serbia, Montenegro, Kosovo. https://rs.boell.org/en/2022/08/03/kosovos-waste-mismanagement-failures-alternatives

(Next Task for Kosovo's Gastronomy: Reducing Food Waste) Detyra e Radhës për Gastronominë e Kosovës: Reduktimi i Mbeturinave Ushqimore | Kombet e Bashkuara në Kosovë. (2021). https://kosovoteam.un.org/sq/140268-detyra-e-radh%C3%ABs-p%C3%ABr-gastronomin%C3%AB-e-kosov%C3%ABs-reduktimi-i-mbeturinave-ushqimore, https://kosovoteam.un.org/sq/140268-detyra-e-radh%C3%ABs-p%C3%ABr-gastronomin%C3%AB-e-kosov%C3%ABs-reduktimi-i-mbeturinave-ushqimore

Pilot Project for Recycling Organic Waste Begins (2020). Republika e Kosoves Fushë Kosovë. https://kk.rks-gov.net/gjakove/news/fillon-se-realizuari-projekti-pilot-per-riciklimin-e-mbeturinave-organike/

Ramadani, D. (2018). Kosovo Builds Factory for Processing Organic Animal Waste (Kosova bëhet me fabrikë për përpunimin e mbetjeve organike të kafshëve). *Raporto Korrupsionin! KALLXO.Com*. https://kallxo.com/shkurt/kosova-behet-me-fabrike-per-perpunimin-e-mbetjeve-organike-te-kafsheve/

Support Waste Management in Kosovo. (2016). EuropeAid/133800/C/SER/XK.

Tahiri, F., Mrasori, Z., Orana, I., Balaj, I., & Lajqi Makolli, V. (2012). Economic and environmental interest of organic waste treatment in kosovo. *Journal of Environmental Protection and Ecology*, *13*.

ADMINISTRATIVE INSTRUCTION Nr. 16/2010 FOR ADMINISTRATION OF BIODEGRATABLE WASTE (n.d.). Retrieved April 26, 2023, from https://gzk.rks-gov.net/ActDetail.aspx?ActID=7901

Waste Enterprises: Kosovo Trust Agency: KTA. (n.d.). Retrieved April 26, 2023, from http://kta-kosovo.org/html/index.php?module=htmlpages&func=display&pid=119

9. Annexure 1

Figure 1: The legal framework governing waste management in Greece

- **Law 2939/2001** (Government Gazette 179/A/06.08.2001) 'Packaging and alternative management of packaging of other products – Establishment of a National Organisation for the Alternative Management of Packaging and Other Products (E.O.E.D.SA.P.) and other provisions', as amended by Law 3854/10 (Government Gazette 94/A/23.06.2010) 'Amendment of the legislation on the alternative management of packaging and other products and the National Organisation for the Alternative Management of Packaging and Other Products (E.O.E.D.S.A.P.) and other provisions'
- **Law 4042/2012** (Government Gazette 24/A/13.02.2012) 'Criminal Protection of the environment – Harmonisation with Directive 2008/99/EC – Framework for the production and management of waste – Harmonisation with Directive 2008/98/EC – Regulation of issues of the Ministry of Environment, Energy and Climate Change' which incorporates into national law the Framework Directive 2008/98/EU on waste
- **Law 4014/11** (Government Gazette 209/A/21.09.2011) 'Environmental licensing of projects and activities, regulation of arbitrary in connection with the creation of an environmental balance and other provisions of competence of the Ministry of Environment' as amended and in force

- **Law 4685/2020** provides for the National Waste Management Plan (NWMP), which is approved by the Ministerial Council, following a proposal by the Minister of Environment and Energy. The new NWMP applies for the implementation period 2020-2030 and has been drafted in line with the provisions of art. 22 and 35 of Law 4042/2012, as amended by art. 83 of Law 4685/2020.

Source:(*ΥΠΕΝ Αρχική* -, n.d.)

Figure 2: Key European Union Directives on waste management

- **JMD 29407/3508/2002** (Government Gazette 1572 B) 'Measures and conditions for the landfill of waste', to transpose Directive 1999/31/EC.
- **JMD 22912/1117/2005** (Government Gazette 759 B) 'Measures and conditions for the prevention and reduction of environmental pollution from the incineration of waste, to incorporate Directive 2000/76/EC.
- **JMD with No.50910/2727/2003** 'Measures and Conditions for the Management of Solid Waste. National and Regional Management Planning', as amended by Law 4042/2012.
- **JMD 13588/725/2006** 'Measures, conditions and restrictions for the management of hazardous waste in compliance with the provisions of Council Directive 91/689/EEC 'on hazardous waste' of 12 December 1991', as amended by Law 4042/2012
- **JMD with No. J.M.D.146163//2012** 'Measures and conditions for the Management of Waste of Sanitary Units 1991', issued by delegation of article 38, par. 7 of Law 4042/2012.

Source: (*Nomothetikoplasio.Pdf*, n.d.)

Figure 3: Companies in the private business sector that, in compliance with the regulation system, cover important aspects of waste – and bio-waste – management´

- Diadyma S.A. is a waste management company in Western Macedonia that provides knowledge on reusing techniques, mapping of recycling centres in the area, recycling of oil and educational programs. It numbers more than 10 different facilities in the area (including IWMS) and almost 250 employees. The statistics provided for the year 2021 are impressive, since 67% of the municipal solid waste was utiliased, 16,330 tons of recyclable materials were recovered, and more that 14 tons of compost were produced. The company's plans for the next period includes the conversion of the Integrated Waste Management Central facilities (IWMCF) into a Circular Economy Park, in order to achieve the objectives of the National Waste Management Plan.
- Dedisa S.A. is a company based in Crete that focuses on the sustainable management of municipal solid waste. Main goal of the company is to minimize waste generation, promote reusing of materials, sort waste at the source, raise awareness and inform citizens on environmental issues.

- Biosolids S.A. is a company based in Thessaloniki that aims at providing an environmentally sustainable model of composting and organic recycling. It has managed to recycle more than 20 tons of bio-waste per year, selling them as compost-soil improvers, fertilisers and substrates.

Figure 4: The new NWMP targets for Municipal Solid Waste in Albania

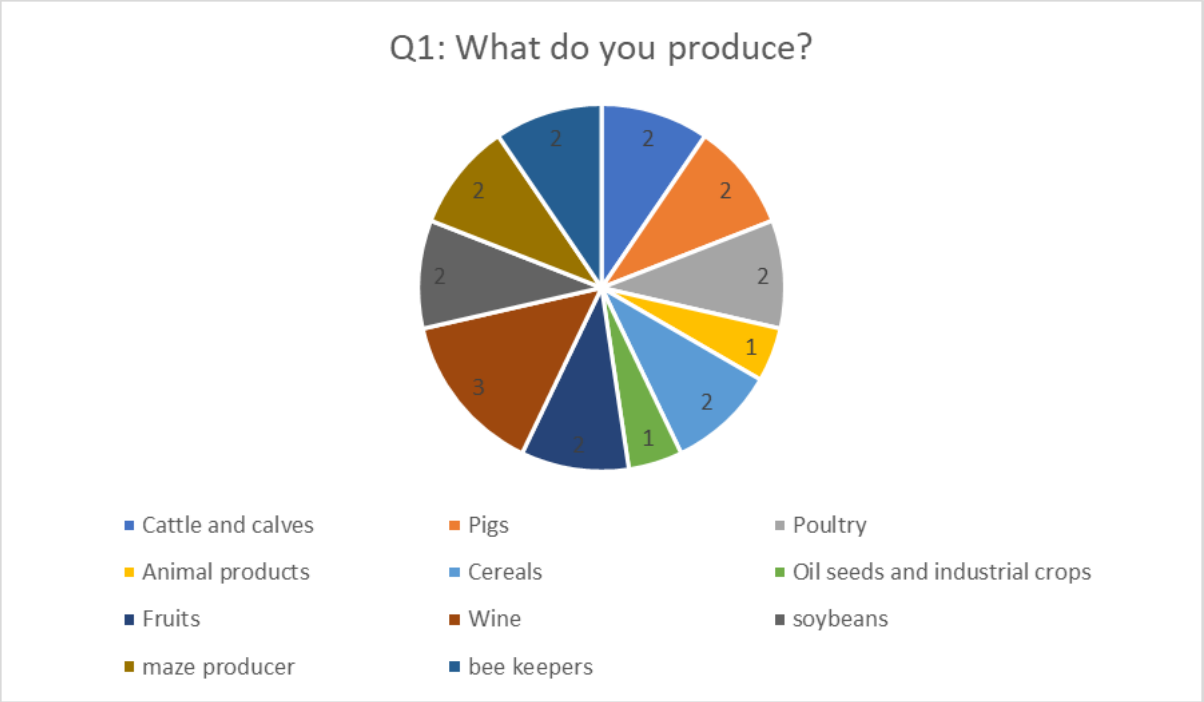
2025 Targets	2030 Targets	2035 Targets
Collection coverage: at least 80 % of the population and 90 % of waste generated.	Collection coverage: 90 % of the population and 95 % of waste generated.	Collection coverage: 95 % of the population.
Separate collection: at least 20 % of MSW.	Separate collection: 30 % of MSW.	Separate collection: 40 % of MSW.
Landfilling rate: maximum of 50 % of generated municipal waste.	Landfilling rate: maximum of 30 % of generated municipal waste.	Landfilling rate: maximum of 10 % of generated municipal waste.
Biodegradable waste: reduction of landfilling of biodegradable waste to 75 % of the biodegradable MSW generated in 2016.	Biodegradable waste: reduction of landfilling of biodegradable waste to 55 % of the biodegradable MSW generated in 2016.	Biodegradable waste: reduction of landfilling of biodegradable waste to 35 % of the biodegradable MSW generated in 2016.
Packaging: 10 % recovery of total packaging materials and specific targets of 10 % for each of paper and cardboard, metals, plastics, glass and wood.	Packaging: 40 % recovery of packaging generated at households and similar sources and 30 % recovery of total packaging with material-specific targets for paper and cardboard (30 %), metals (30 %), plastics (12 %), glass (30 %) and wood (10 %).	Packaging: 70 % recovery of packaging generated at households and similar sources and 60 % recovery of total packaging with material-specific targets for paper and cardboard (60 %), metals (50 %), plastics (22.5 %), glass (60 %) and wood (15 %).

Source: (Country Fact Sheet: Municipal Waste Management: Albania, 2021)

10.Annexure 2: Primary research reports

10.1 Austria

Q1 What do you produce



You can also find information concerning the online questionnaire at: BECBA_questionnaire (Responses)_EN

Co-funded by the European Union

Interview #	Produce	Are you interested in commercial products that could be produced from your agricultural waste?	What do you currently do with the residues of crops? (e.g., non-edible plant parts of food crops, residues of crops)	What would you like to do with your crop residues?	What do you currently do with livestock manure?	What would you like to do with livestock manure?
1	Cattle and calves	yes	farm biogas	satisfied with current solution	farm-biogas plant	satisfied with the current solution
2	Cattle and calves	yes	farm biogas	satisfied with current solution	farm biogas plant	satisfied with the current solution
3	Pigs	yes	animal feed that is not used by the cattle is sold or donated to other farmers or businesses.	satisfied with current solution		satisfied with the current solution
4	Pigs	yes		satisfied with the current solution	manure and bedding material, are composted to create a nutrient-rich soil amendment.	satisfied with the current solution
5	Poultry	yes		satisfied with the current solution		satisfied with the current solution

	Poultry			satisfied with the current solution	generate biogas through anaerobic digestion	satisfied with the current solution
6	Animal products	yes	Whey is a by-product of cheese and yogurt production and it is a valuable source of protein and other nutrients. We sell our whey to companies specializing in processing and producing protein powder or animal feed.	satisfied with the current solution		satisfied with the current solution
7	Cereals	yes	compost waste materials such as straw, chaff, and other plant debris to create a nutrient-rich soil amendment	satisfied with the current solution		satisfied with the current solution
8	Cereals	yes	generate energy through anaerobic digestion	satisfied with the current solution		satisfied with the current solution
9	Oil seeds and industrial crops	yes	sell waste materials, such as pressed cake or meal, as animal feed.	satisfied with the current solution		satisfied with the current solution
10	Fruits	yes	compost their waste materials, including fruit waste, pruning debris, and other organic matter, to create a nutrient-rich soil amendment	satisfied with the current solution		satisfied with the current solution

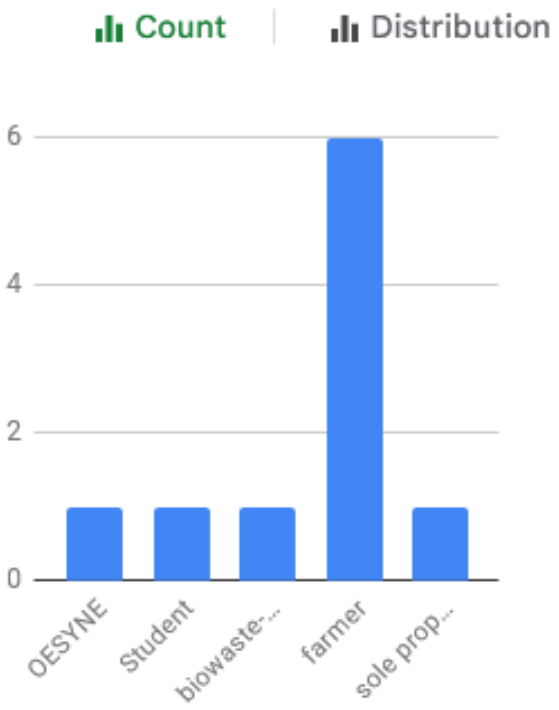
11	Wine	yes	Lees aresediment that accumulates at the bottom of wine barrels during agings. They consist of dead yeast cells, grape skins, and other organic matter. We use lees to produce wine vinegar	satisfied with the current solution		satisfied with the current solution
12	Wine	yes	After the harvest, the skins and pomace remaining after pressing the grapes is composted and this is returned to the vineyards instead of using chemical fertilizers.	satisfied with the current solution		satisfied with the current solution
13	Wine	yes	From a packaging point of view, 86% of the material used in the outer packing cases, comes from recycled cardboard and no metal pigments are used in the ink for the labels.	satisfied with the current solution		satisfied with the current solution
14	soybeans	yes	Soy hulls are the outer layer of soybeans and are a byproduct of the soybean processing industry. We use soy hulls as animal feed, as they are a good source of fiber and energy for livestock such as cattle, sheep, and pigs.	satisfied with the current solution		satisfied with the current solution

15	soybeans	yes	We use it in the production of biofuels	satisfied with the current solution		satisfied with the current solution
16	maze producer	yes	all the biomass is fed to cattle, straw is used as bedding and is returned to the meadows and fields with the manure.	satisfied with the current solution		satisfied with the current solution
17	maze producer	yes	all the biomass is fed to cattle, straw is used as bedding and is returned to the meadows and fields with the manure.	satisfied with the current solution		satisfied with the current solution
18	bee keepers	yes	Beeswax generated by honeybees is used for various purposes, such as making candles, cosmetics, and skincare products.	satisfied with the current solution		satisfied with the current solution
19	bee keepers		Propolis is a resinous substance bees produce with antimicrobial and antioxidant properties. We collect propolis from beehives and sell it to processors or use it to make our own products.	satisfied with the current solution		satisfied with the current solution

20	Fruits		Fruit waste includes damaged or unsellable fruits, as well as parts of the fruit that are not used in processing, such as peels and seeds. We compost fruit waste to create a nutrient-rich soil amendment, use it for animal feed, or use it to produce biogas through anaerobic digestion.	satisfied with the current solution		satisfied with the current solution

10.2 Greece

The target group of this online survey was farmers or other bio-waste-producing actors in the value chain who were asked about their current practices. In total, we received 10 responses.

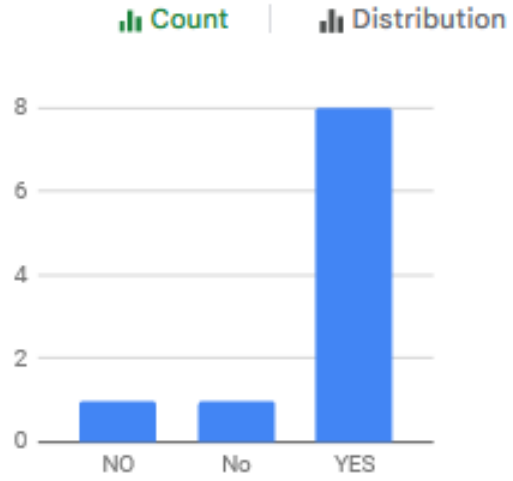


What do you produce?

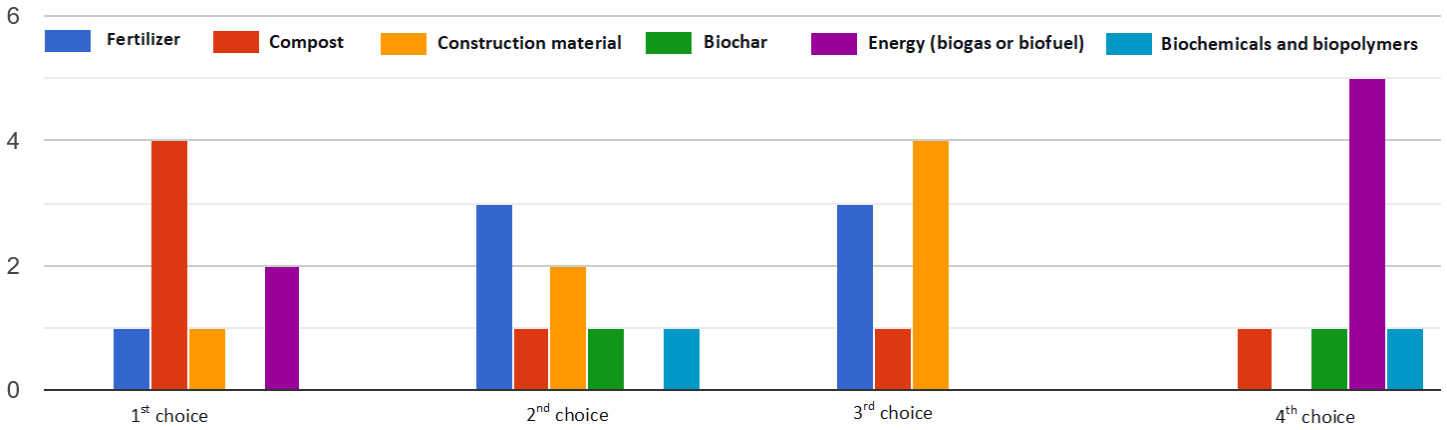
1. Snails fillet in standard packaging waste. I have the shells
2. mushrooms growing on olive branches
3. meat of sheep & goats, and ovine and caprine animals, milk
4. NO

5. bio olive oil
6. Alfalfa, Corn, Sunflower seed, wheat
7. Cotton, Pumpkins, Wheat, Sesame, Hemp
8. olive oil
9. aromatic medicinal plants - essential oils
10. chestnuts

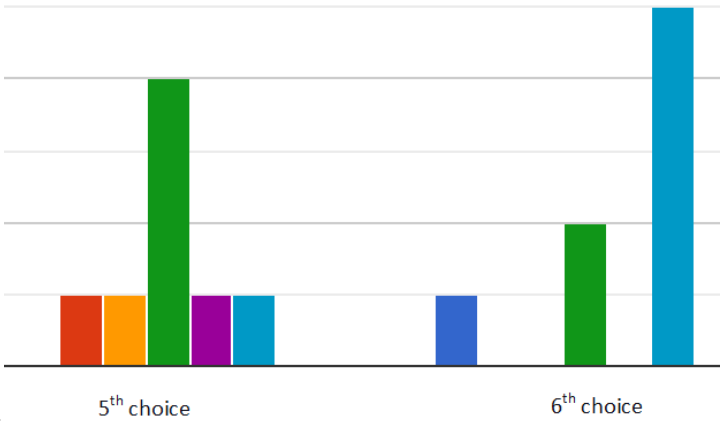
Are you interested in commercial products that could be produced from your agricultural waste?



***(For those who answered positively)* I am interested in the following product groups (ranking):**



What do you currently do with the residues of crops? (e.g., non-edible plant parts of food crops, residues of crops)?



1. Compost
2. mushrooms
3. The crop residues are ploughed and mixed with the soil, after having been sufficiently grazed by the livestock.
4. I don't know
5. Fragmentation of the branches with a shredder
6. absorption into the soil
7. Incorporation as fertiliser for the next crop.
8. The remains of productive trees (olive trees), branches, leaves, weeds, and the remains of other forest trees and shrubs located on the borders of the crops are usually treated with soil stripping, burning or herbicides
9. Mulch
10. They are transported to specialised factories to be converted into other materials, e.g. (energy or for the production of materials)

What would you like to do with your crop residues?

1. Compost, animal feed
2. substrate for mushroom cultivation
3. I don't know what options exist
4. create recyclable raw materials
5. I would like to be able to manage the leaves from the oil press after separation from the fruit so that they can go back to the olive grove and be assimilated into the soil.
6. incorporation into the soil for fertiliser
7. A more sustainable solution. For example, creating compost, biofertiliser, etc...
8. I would like to learn about compost practices and the incorporation of residues into the soil for enrichment or the production of other products from them
9. mulching, soil conditioning
10. leave them in the field to become fertiliser

What do you currently do with livestock manure?

1. Fertilisation
2. I don't have livestock manure

3. I remove it at my own expense and scatter it in the fields where I grow the livestock feed. The rest, I remove at my own expense to any interested party.
4. soil for gardens and fields
5. In specific cases, as fertiliser
6. in the fields as fertiliser
7. I use manure (from poultry) as fertiliser every 3-4 years for soil conditioning.
8. I don't use it
9. We don't have livestock
10. I add it to the field to feed the tree in a quantity that the tree needs

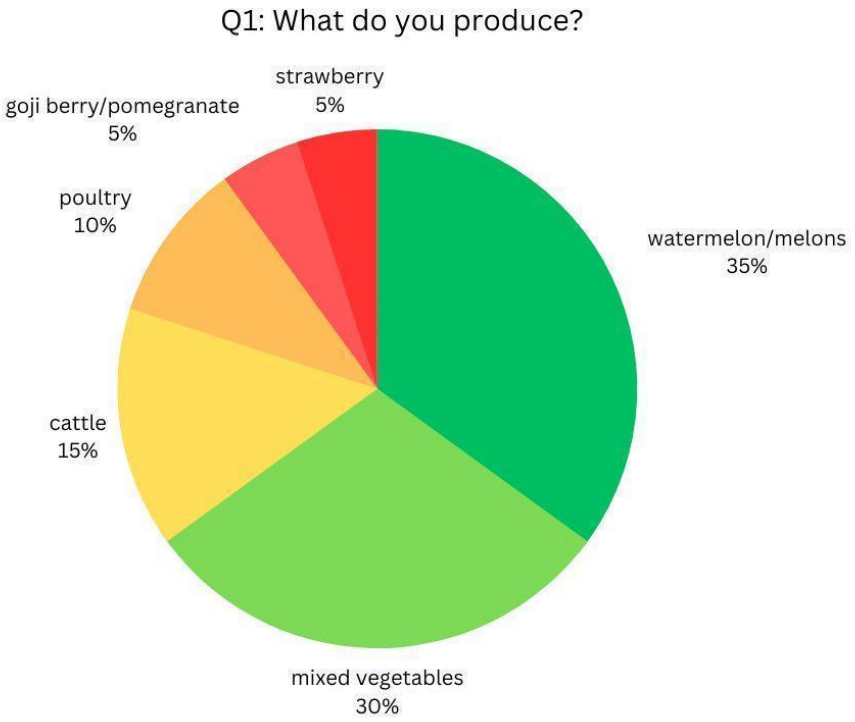
What would you like to do with livestock manure?

1. Compost
2. Fertilizer
3. Use as much as I need and sell the rest for other crop fields or for home use in small packages
4. Using recyclable products
5. Use it as a fertiliser
6. in the fields as fertiliser
7. I would like to be able to create manure naturally from agricultural residues.
8. Compost
9. if we had, soil conditioning
10. leave them in the field to become fertiliser

You can also find information concerning the online questionnaire at: BECBA questionnaire (Responses)_EN

10.3 Albania

QUESTION 1

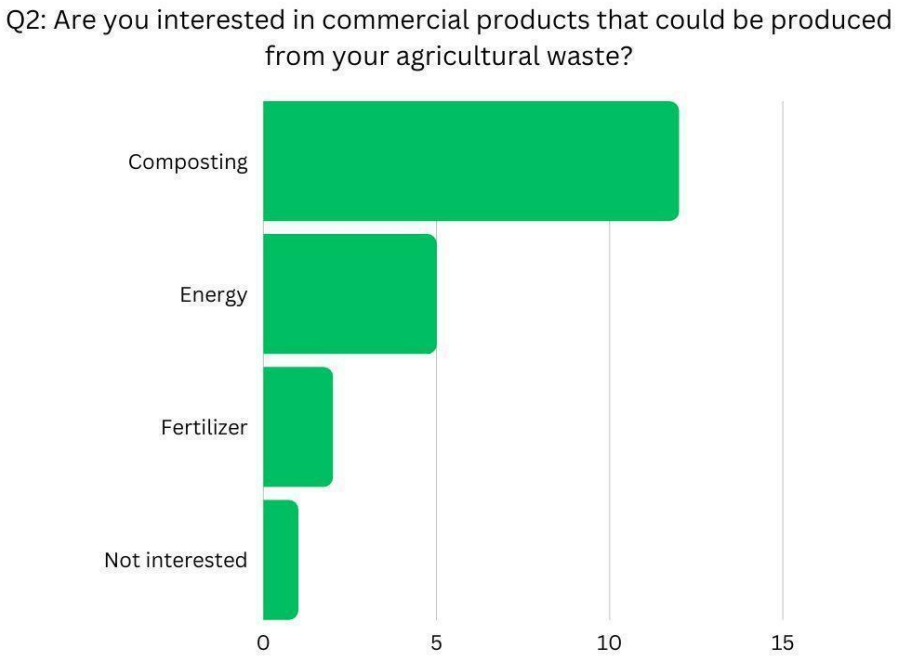


Quantitative findings:

- 7 farmers were involved in watermelon and melon production
- 6 farmers were involved in mixed vegetables production
- 3 farmers were involved in cattle farming
- 2 farmers were involved in poultry farming
- 1 farmer was involved in goji berry and pomegranate production
- 1 farmer was involved in strawberry production

The report findings suggest that the vast majority of farmers are engaged in watermelon and melons production which are the main cultivars the area is known for. 30% of the farmers depended on vegetables production stating potatoes, carrots, field peppers, pumpkins, carrots, beets, cucumbers, tomatoes as some of the varieties in their mixed farms. Animal husbandry was present with cattle farming (cows and sheep) and poultry farming (chickens, turkeys and geese). New initiatives due to grant and partnership investments were established in strawberry and goji berry/pomegranate production resulting compatible to the Divjaka ecosystem and opening new opportunities to the local farmers.

QUESTION 2

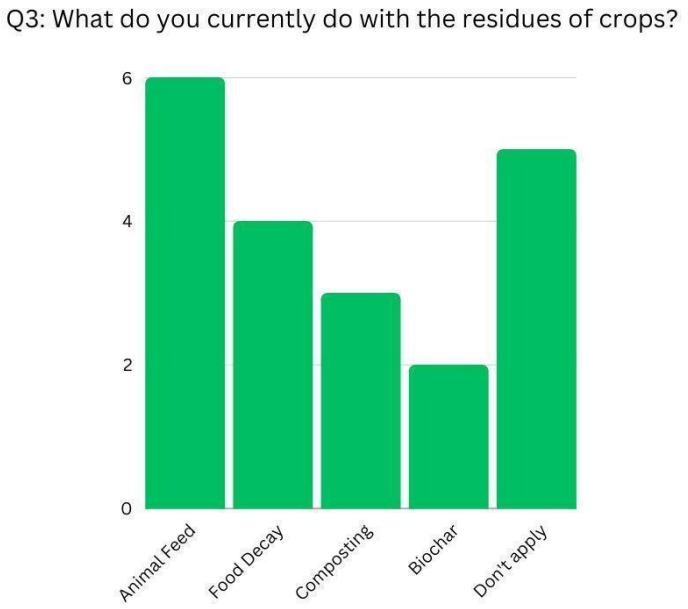


Quantitative findings:

- 12 farmers expressed interest in composting products
- 5 farmers expressed interest in energy related products
- 2 farmers expressed interest in fertilizer products
- 1 farmer expressed no interest in agricultural waste products

The report findings suggest a general interest related to composting products. The majority of the farmers interested in the methodology required further knowledge in improving composting efficiency at scale and how to monetize on the latter. The animal husbandry related farms expressed interest in converting the animal manure in energy products (biogas or biofuel) mainly for heating purposes. The farmers interested in fertilizers were seeking knowledge on organic fertilizers production for on-farm and selling purpose to correspond to the requirements for organic farming certification. The strawberry farmer saw no interest in agricultural waste by-products claiming the waste generated is too small for having interest in it.

QUESTION 3

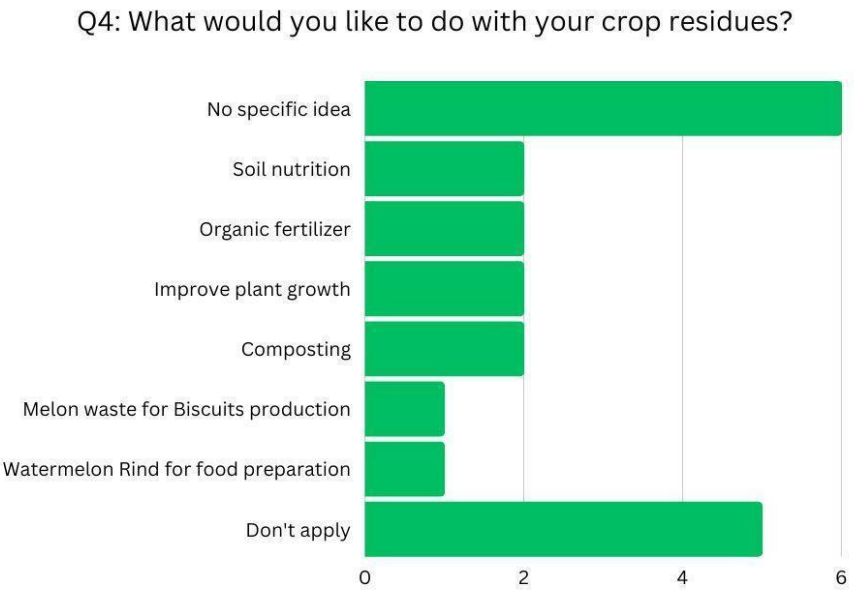


Quantitative findings:

- 6 farmers utilize it for animals feeding
- 4 farmers leave it for decomposition in open fields
- 3 farmers utilize it for composting
- 2 farmers utilize it for biochar production
- 5 farmers don't find the question applicable to them

The report findings suggest a mixture of methods in crop residues management among farmers. The prevalent choice remains animal feeding. These animals eat these crop residues along with green fodder and specially prepared concentrates or compound feeds. Crop residue decomposition follows closely suggesting high dependency on tilling soil for faster decay and soil microbes' activation under moist warm conditions offered by Divjaka climate. Biochar production process can be found mainly among cauliflower and cabbage farmers which cut the residues, turn them to dry waste and burn the mixture to benefit the by-product. The rest of the farmers don't find the question applicable to their activities.

QUESTION 4

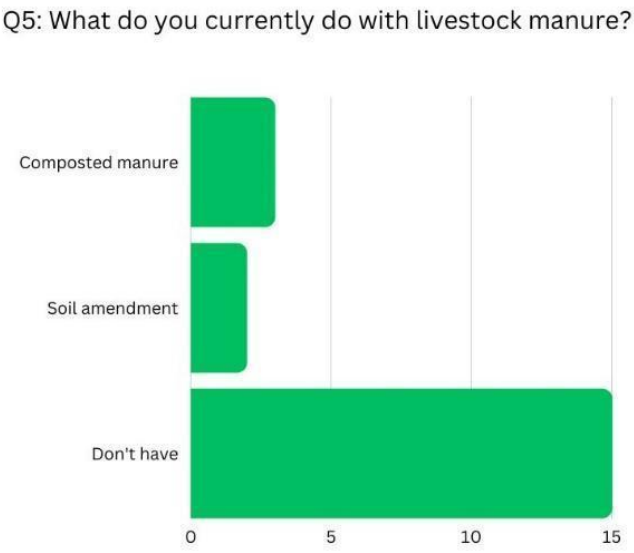


Quantitative findings:

- 6 farmers had no specific idea what to do with the crop residues
- 2 farmers wanted to use the residues for soil nutrition
- 2 farmers wanted to turn them to organic fertilizers
- 2 farmers wanted to utilize them for their plants growth improvement
- 2 farmers for composting of the residues
- 1 farmer wanted to introduce biscuits for visitors from melon residues
- 1 farmers wanted to utilize watermelon rind in various food preparations
- 5 farmers don't find the question applicable to them

The research findings highlight a general lack of ideas when it comes to crop residues utilization. The positive note is that the farmers are open to innovative ideas as long as it's on their benefit. The majority of farmers expressing their opinion opted for residues utilization connected with the soil improvement and plant growth in the process. Composting remains a trending topic despite its large utilization in Divjaka. New ideas have been highlighted connected with watermelon/melon farmers who are trying to insert tourism in their farm activities and utilize the residues for food preparation for visitors. The food varieties brainstormed on the field research included flour-based cookies, fruit butter and cakes. The rest of the farmers don't find the question applicable to their activities.

QUESTION 5

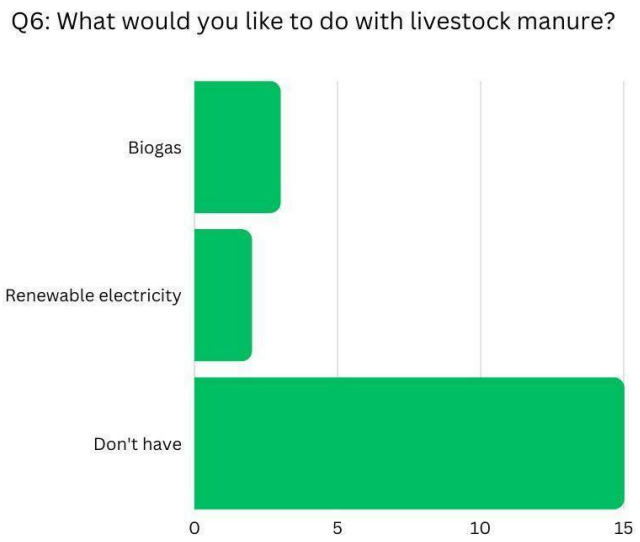


Quantitative findings:

- 3 farmers decompose it to composted manure
- 2 farmers utilize it for soil amendment
- 15 farmers don’t produce livestock manure in their farm

The research findings showcase that livestock manure is currently utilized in 2 main categories: as composted manure, creating a mixture which contains other composted materials like straw or sawdust, targeting mainly vegetable growers looking to reduce potential health and environmental risks of applying raw manure. The second category includes farmers using livestock manure as a soil amendment to improve soil quality. In addition to providing nutrients for plant growth, applying fresh or composted livestock manure to cropland improves soil organic matter and tilth (the physical conditions that make a soil suitable for growing crops). The rest of the farmers don’t produce livestock manure on their farms.

QUESTION 6



Quantitative findings:

- 3 farmers want to produce biogas from livestock manure
- 2 farmers want to produce renewable energy for utilization in their farms
- 15 farmers don't produce livestock manure in their farm

The research findings display a general interest in renewable sources of energy emitted from livestock manure. However small-scale farmers are still trailing behind in adopting this technology because the initial installment cost of a biogas plant is high and they have inadequate numbers of livestock to feed using a biogas plant. On-farm manure-to-energy technologies are expensive and require initial investments in infrastructure as well as on-going maintenance and operation costs. Systems installed to produce heat will require more labor than traditional propane-fueled heating systems. The rest of the farmers don't produce livestock manure on their farms.

CONCLUSIVE TABLE

	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
1	watermelon/melons	Composting	Decay in open field	soil nutrition		
2	mixed vegetables	Composting	Decay in open field	soil nutrition		
3	cattle	Energy			soil amendment	Biogas
4	poultry	Energy			soil amendment	Biogas
5	watermelon/melons	Composting	Animal feed	Melon Wastes in Biscuit Production		
6	mixed vegetables	Fertilizer	compost	organic fertilizer		
7	mixed vegetables	Composting	Biochar	improve plant growth		
8	cattle	Energy			Composted manure	Renewable electricity
9	mixed vegetables	Composting	Animal feed	composting		
10	watermelon/melons	Composting	Decay in open field	no specific idea		
11	watermelon/melons	Composting	Animal feed	no specific idea		
12	watermelon/melons	Composting	Animal feed	Watermelon Rind utilization in food preparation		
13	poultry	Energy			Composted manure	Biogas
14	watermelon/melons	Composting	Animal feed	composting		
15	mixed vegetables	Fertilizer	compost	organic fertilizer		
16	mixed vegetables	Composting	Biochar	improve plant growth		
17	goji berry/pomegranate	Composting	cattle feed	no specific idea		
18	cattle	Energy			Composted manure	Renewable electricity
19	watermelon/melons	Composting	Decay in open field	no specific idea		

20	strawberry	no interest	compost	anything apart from animal feeding		

10.4 Kosovo

Q1. What do you produce?

This survey focuses on the most prominent and economically valuable crops in Kosovo, including blueberries, apples, aronia, cherries, walnuts, raspberries, peppers, tomatoes, cabbage, cucumbers, corn, and potatoes. We have selected a sample of 20 farmers who cultivate these crops in Kosovo.

Q2. Are you interested in commercial products that could be produced from your agricultural waste?

- 15 expressed an interest in using their agricultural waste for composting
- 2 farmers show no interest in using their agricultural waste for commercial products
- 1 for bio-fuel production
- 1 farmer to use it as a feed for animals
- 1 farmer was unsure

Q 3. What do you currently do with the residues of crops? (e.g., non-edible plant parts of food crops, residues of crops)
Following observations were made:

- 2 farmers reported that they grind their crop residues, presumably for use as animal feed or for easier disposal.
- 4 farmers reported that they compost their crop residues, likely to produce fertilizer for future crops or to improve soil quality.
- 6 farmers reported that they let their crop residues decay in the open field, which could potentially lead to soil nutrient depletion and the release of greenhouse gases.
- 2 farmers reported that they use their crop residues for mulching, which can help reduce weed growth and water evaporation in the soil.
- 1 farmer reported that they do nothing with their crop residues, which could potentially lead to waste and environmental problems.
- 1 farmer reported that they did not have any crops to produce residues from.
- 4 farmers reported that they use their crop residues for animal feed, which can provide a source of nutrition for livestock and reduce the amount of feed that needs to be purchased.

Overall, it appears that there is a wide range of practices when it comes to crop residue management among farmers. Some practices, such as composting and using residues for animal feed, can have benefits for both the environment and agricultural production. However, other practices, such as letting residues decay in the open field or doing nothing with them, may have negative consequences. It may be beneficial for farmers to explore more sustainable and efficient ways to manage their crop residues.

Q4. What would you like to do with your crop residues?
Following observation were made:

- 1 farmer would like to use crop residues as wood chips
- 4 farmers have no idea what to do with crop residues
- 4 farmers would like to compost their crop residues
- 2 farmers would like to re-use crop residues, but they did not provide any clear idea
- 3 farmers suggested using crop residues as soil amendment
- 1 farmer would like to use crop residues as fertilizer
- 2 farmers would like to use crop residues as animal feed
- 1 farmer suggested using crop residues for energy production
- 1 farmer would like to use crop residues as bio-fuel

The survey results show that composting is the most popular option for managing crop residues, followed by using them as soil amendment and animal feed. However, there is a need for more awareness and education among farmers regarding sustainable crop residue management. It is also worth exploring other options such as energy production and bio-fuel, which can contribute to a more sustainable and environmentally friendly agricultural system.

Q5. What do you currently do with livestock manure?

Following observation were made:

- 4 farmers reported not having any livestock manure on their farms
- 9 farmers reported using livestock manure as fertilizer for their crops
- 2 farmers reported not having significant amounts of manure to use
- 1 farmer reported not having any application for the manure
- 3 farmers reported selling their livestock manure to other farms
- 1 farmer reported using the manure for composting

The survey findings indicate that livestock manure is a valuable resource for farmers, with the majority of surveyed farmers using it as a fertilizer for their crops. The results also suggest that the availability of livestock manure may be a limiting factor for some farmers, and that livestock farming may be a significant part of financial incomes.

Q6. What would you like to do with livestock manure?

Following observation were made:

- 6 farmers did not have any livestock manure.
- 8 farmers wanted to use it as a fertilizer to improve soil fertility and increase crop yields.
- 4 farmers had no idea how to use it, indicating a need for more education and awareness.
- 1 farmer was interested in creating a product from the manure, but didn't say what kind of product.

Based on the survey results, it can be concluded that there is a need for more education and awareness among farmers regarding sustainable management of crop residues and livestock manure. While some farmers are already using these resources for composting and as animal feed or fertilizer, there is still a significant number of farmers who do not know how to use them effectively or are not using them at all. There is also a potential for exploring new and innovative ways to utilize these resources, such as for energy production or creating other products, which can contribute to a more sustainable and environmentally friendly agricultural system. Overall, promoting sustainable agricultural practices and providing education and support to farmers can help improve their productivity, profitability, and environmental sustainability.

CONCLUSIVE TABLE

No. Farmer	What do you produce	Are you interested in commercial products that could be produced from your agricultural waste?	What do you currently do with the residues of crops? (e.g., non-edible plant parts of food crops, residues of crops)	What would you like to do with your crop residues?	What do you currently do with livestock manure?	What would you like to do with livestock manure?
1	Blueberries	Compost	Grinding	Wood Chips	We don't have	We don't have
2	Blueberries	Compost	4 in composting,	no specific idea	We don't have	We don't have
3	Apple	Compost	Decay in open field	Compost	We don't have	We don't have
4	Aronia	Compost	Decay in open field	re-used it somehow	As fertilizer use	Fertilizer
5	Cherry	Compost	Cuting	Soil amandmend	We don't have	We don't have
6	Walnuts	No	Decay in open field	no specific idea	As fertilizer use	Fertilizer
7	Raspberry	Compost	Mulching	Soil amandmend	We don't have	We don't have
8	Raspberry	Compost	Mulching	Soil amandmend	As fertilizer use	Fertilizer
9	Pepper	Compost	Decay in open field	Compost	As fertilizer use	no specific idea
10	Pepper	Compost	Composting	Using as fertilizer	As fertilizer use	Create a product
11	Apple	no	Nothing	no specific idea	Not much manure	no specific idea
12	Tomatoes	Compost	Decay in open field	Compost	As fertilizer use	no specific idea
13	Tomatoes	Compost	No crops planted	No crops planted	Sell it to other farms	Packaging
14	Cabbage	Feed	Animal feed	Animal feed	Composting	Fertilizer
15	Cababge	Compost	Composting	Compost	We don't have	We don't have
16	Cucumber	Compost	Decay in open field	re-used it somehow	As fertilizer use	Fertilizer
17	Corn	Don't know	Animal feed	Don't know	As fertilizer use	Fertilizer
18	Corn	Compost	Composting	Animal feed	Sell it to other farms	no specific idea
19	Potatoes	Bio-fuel	Animal feed	Energy Product	As fertilizer use	Fertilizer

20	Potatoes	Compost	Animal feed	Bio-fuel	Sell it to other farms	Fertilizer