Kosovo is developing a circular economy to manage bio-waste, a significant challenge in waste management. Initiatives such as vermicomposting and waste separation plants are underway, and the government and private sector provide funding and incentives to start-ups. This presents opportunities for innovative solutions and improvements in agriculture productivity, resource efficiency, and competitiveness.

Baseline research on state-of-the-art, local good practices and opportunities

Bio-Waste

Pristina, 27/03/2023

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1. Applicable legislation in the Republic of Kosovo on waste treatment

Waste management and treatment in the Republic of Kosovo is regulated by legal and by-laws (Administrative Instructions) approved by the Assembly of the Republic of Kosovo, namely the Ministry of Environment, Spatial Planning and Infrastructure.

Law 04/L-060 of June 29, 2012 on Waste and supplemented by Law 08/L071 on Waste. This law defines the measures for the protection of the environment and human health can reduce the generation of waste, the negative impacts of the generation and management of waste, reduce the overall effects of resources, which are improving the efficiency of such a system, which are growing for a circular economy and to guarantee competitiveness.

Based on that law, biodegradable waste, also known as organic waste, is defined as any waste that is capable of being broken down by microorganisms such as bacteria and fungi. Bio-waste is a similar term that refers to biodegradable waste derived from organic sources such as food, garden waste, and animal waste.
Biomass refers to organic matter that can be used as a fuel source, such as wood chips or agricultural residues. Biogas is a renewable energy source that is produced through the anaerobic digestion of organic matter such as bio-waste and biomass.

Biodegradation is the process by which organic matter is broken down by microorganisms into simpler compounds. Biological treatment refers to the use of microorganisms to treat waste, including biodegradable waste, in order to reduce its volume and environmental impact.

Under the Law on Waste, biodegradable waste must be collected separately from other types of waste and treated in a manner that is environmentally sound. 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 for waste management.

In terms of institutional framework, the Ministry of Environment and Spatial Planning is responsible for overseeing the implementation of the Law on Waste and developing policies related to waste management. Local municipalities are responsible for implementing waste management plans at the local level, including the collection and treatment of biodegradable waste.
Overall, Kosovo has a legal and regulatory framework in place for the management of 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.

In addition to the aforementioned law, the handling and management of specific waste is regulated by Administrative Instructions approved by the Ministry of Environment, Spatial Planning and Infrastructure, please find some of the administrative instructions's:

Table 1. List of administrative instruction's

ADMINISTRATIVE INSTRUCTION	DESCRIPTION
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	Determination of technical requirements and other requirements for plastic bags
MEPS NO. 22/2015	Management of waste containing asbestos
NO. 06/2008	Administration of hazardous waste
MEPS NO. 14/2017	Waste containing solid organic pollutants
MEPS NO. 02/2017	List of hazardous waste categories by origin
MEPS NO. 10/2015	Treatment of waste from medicinal products
MEPS NO. 07/2015	Management of waste from construction and demolition activities

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.

Bio-waste:
The administrative instruction defines bio-waste as waste that is biodegradable or compostable in nature, such as food waste, garden waste, and other similar biodegradable waste.

Biodegradable waste management:
The administrative instruction provides guidance for the management of biodegradable waste and sets out requirements for waste management facilities, including the use of appropriate technology and procedures for the handling, storage, and disposal of biodegradable waste.

Composting:
The administrative instruction sets out requirements for the use of composting as a treatment method for biodegradable waste. It provides guidelines for the design, construction, and operation of composting facilities, as well as requirements for the quality of compost produced.

Type of treatment:

The administrative instruction 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.

Transport:
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.

Administrative Instruction No. 20/2014 for Waste Management in the Republic of Kosovo contains a total of 26 articles, covering a range of topics related to waste management, including the classification of waste, waste collection, transportation, storage, treatment, etc.

The draft Waste Management Strategy 2019-2028 for Kosovo aims to establish an institutional framework for the management of all types of waste, including bio-waste, and to promote sustainable waste management practices in the country.

Institutional framework for bio-waste management: The institutional framework for waste management in Kosovo includes the Ministry of Environment and Spatial Planning, which is responsible for developing policies related to waste management, and the Environmental Protection Agency (KEPA), which is responsible for overseeing the implementation of waste management policies and regulations.

Goals and strategies: The Waste Management Strategy sets several goals and strategies for the management of bio-waste in Kosovo. These include:

- 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.

Companies who collect waste: The Waste Management Strategy aims to increase the number of waste management companies in Kosovo and to promote competition in the waste management sector. The management of waste is the responsibility of municipalities according to the Law on Local Self-Government. They have the authority to create structures and mechanisms for better waste management and allocate funds for this purpose. Private companies can also participate in waste management, but public enterprises still dominate in this sector. These enterprises are created based on the Law on Private Enterprises and their main activity is waste collection and transportation to sanitary landfills, in accordance with the Law on Commercial Companies.

Table 2. Regional waste companies in Kosovo

REGIONAL WASTE COMPANIES	LOCATION
PASTRIMI	Pristina
AMBIENTI	Peja
PASTËRTIA	Ferizaj
ECO-REGION	Prizren
EKOHIGJIENA	Gjilan
UNITY	Mitrovica
ÇABRATI	Gjakovë

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.), 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.

2. Bio-waste Management in Kosovo: Progress and Challenges

Kosovo, as a developing country, faces many challenges in terms of waste management. One of the key issues is the management of bio-waste, which is a significant portion of the waste generated in the country. In this report, we will review the current state of bio-waste management practices and initiatives in Kosovo

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 mention:

According to the Kosovo Municipal Waste Fact Sheet 2021, only 5% of the total municipal waste generated in Kosovo is bio-waste. This indicates that bio-waste management is still a relatively underdeveloped area in the country. However, some progress has been made in recent years. For example, the city of Pristina has recently initiated a pilot project for 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.

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.
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.

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.

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.

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.

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.

Additionally, to rural communities, 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.

3. Circular Economy Initiatives for Bio-Waste Management in Kosovo

Which circular economy activities exist, dealing with bio-waste in Kosovo? Recovery of products from bio-waste, recovery of nutrients, composting, recovering bio-based materials or chemicals from waste/residues.
During the last years, Kosovo has begun to focus on developing a circular economy, which includes managing bio-waste. Below are some of the activities, initiatives and pilot-projects dealing with bio-waste:

The construction of the Composting Plant in Mramor, Pristina. Composting Scheme for Gërmia Park and Pristina Public Green Areas is a pilot project, the first of its kind in Kosovo, which aims to create the infrastructure for organic waste management for the Municipality of Prishtina through composting, as an environmentally-friendly process. The operating capacity of the Composting Plant foresees the processing of about 3,000 cubic meters of organic waste annually, with the potential to expand the capacity in the future. The benefits of the composting scheme include: cost reduction for public services, environmental protection and production of high quality organic fertilizer from resources destined for landfill. However this project has not yet started to be implemented.

Let’s Talk About Food Waste is a pilot project that aims to contribute to environmental protection and policy-making in Kosovo by initiating a public dialogue on Food Waste and by piloting innovative solutions for Food Waste reduction in Kosovo. This project is implemented by Fondacioni Jeshil as part of Consortium of Human Rightivism project, financed by the Swedish International Development Agency and managed by Community Development Fund. This project aims to establish a system for collecting and processing organic waste into high-quality fertilizers. Biotech Team (Endrit Ameti, Erjon Ameti, Vegim Ymeri & Argjent Veliu) has been selected for a trip to World Urban Forum 11 in Katowice, Poland, and a training of their choice by BONEVET for their business model of creating biogas through agricultural and food waste.

In addition, Kosovo has recognized the potential of biogas production from organic waste, and there have been initiatives aimed at promoting the use of biogas as an alternative energy source.

For example, in 2019, the Ministry of Environment and Spatial Planning of Kosovo signed a Memorandum of Understanding with the European Bank for Reconstruction and Development (EBRD) to develop a legal and regulatory framework for renewable energy, including biogas.
Moreover, the German Development Cooperation (GIZ) has been working in Kosovo to support the development of biogas production from organic waste. In 2017, GIZ launched a project called "Promotion of Biogas in Kosovo," which aimed to increase the use of biogas as a renewable energy source and improve waste management. The project included activities such as the construction of biogas plants, the training of local stakeholders, and the development of a legal and regulatory framework for biogas.

Further, there were also some initiatives working to promote composting in the municipality of Prishtina that involved setting up community composting sites in public spaces and providing training to local residents on how to compost organic waste. The resulting compost was used to improve soil quality in parks and gardens in the municipality.

In addition, the Swedish International Development Cooperation Agency (SIDA) has supported a project on sustainable waste management in Kosovo. As part of this project, local NGOs have been working to establish small-scale composting schemes in several municipalities across the country, including Gjakova and Mitrovica. These schemes involve the collection of organic waste from households and businesses, which is then composted and used to produce organic fertilizers.

Overall, while there is not any concrete and viable company/corporate that deals with bio-waste and bio-based materials, there have been some initiatives and business ideas focused on promoting organic waste management production.

Syri i Vizionit (regjioni Perëndim), EC Ma Ndryshe (regjioni Jug), CEDE - Center for Education and Development of Environment (regjioni Lindje) dhe Green Art Center (regjioni Qendër).

4. Agricultural Overview of Kosovo: Production, Land, Data

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 categories of use, 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.

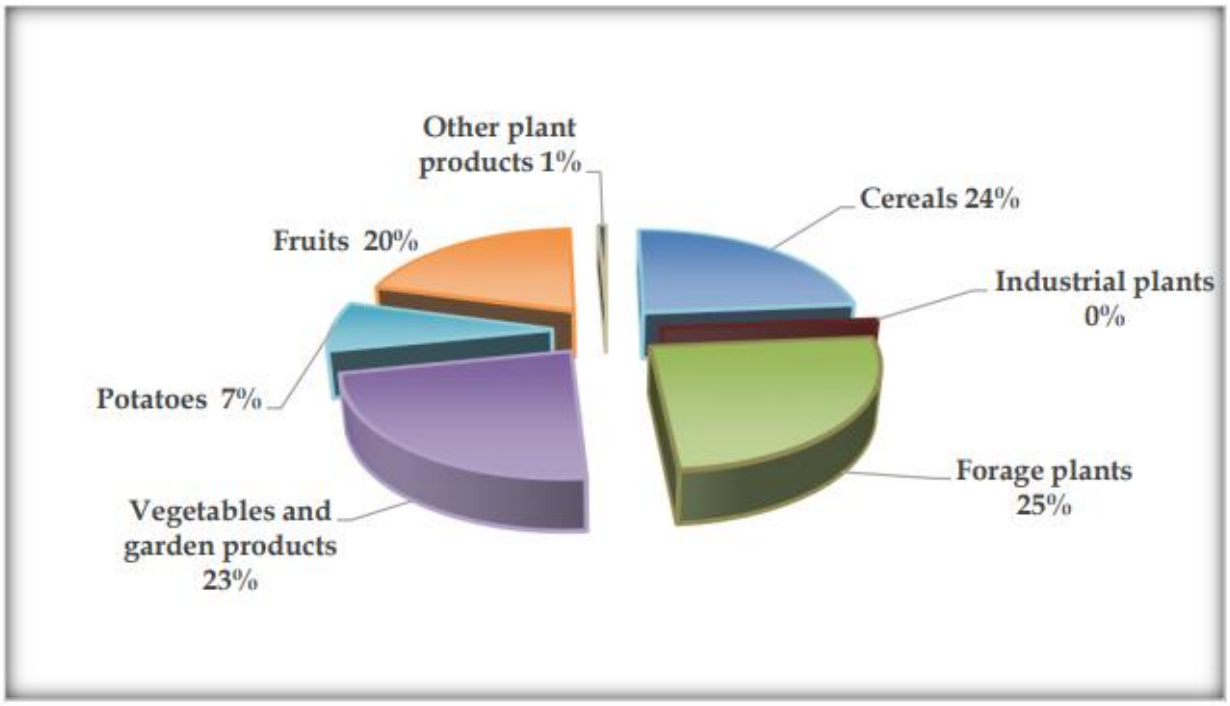


Figure 1. Share of agricultural crops in total production, 2021

The following 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 ha, which was similar to the area of 2020. More than half of the agricultural land in the given area is made up of meadows and pastures, covering an area of 217,107 hectares. This category did not show any significant changes in 2021. 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.

Table 3. Agricultural land use by categories, ha

	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**

Cereal Production

In 2021, a total of 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 the majority of 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. On average, each person in Kosovo consumed 207 kg of wheat and wheat-containing products in 2021.

Table 4.Cereal area, production and yield, 2017-2021

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*

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. However, there was a decrease in vegetable production by 2.7% compared to 2020. The highest production was seen in crops like potato, pumpkin, stella blue squash, pepper, cabbage, and watermelon, while other crops such as tomato, onion, cucumber, bean, and melon produced below 20,000 tons.

Table 5. Vegetable area, 2017 – 2021

Crop	2017	2018	2019	2020	2021	Difference 2021/2020 in %
Area		ha				
Vegetables	19,643	17,886	18,911	19,243	19,399	0.8
Potatoes	4,290	3,606	3,688	3,771	3,854	2.2
Tomatoes	862	757	794	815	800	-1.8
Eggplant	8	6	8	7	8	11.7
Pepper	3,035	3,038	3,108	3,134	3,146	0.4
Pumpkin	2,270	2,255	2,502	2,577	2,612	1.4
Stella blue squash	684	810	898	913	918	0.5
Cucumber	305	273	304	313	305	-2.7
Watermelon	1,201	1,182	1,216	1,303	1,309	0.4
Melon	388	298	313	318	321	0.9
Cabbage	917	832	906	918	923	0.5
Cauliflower	47	46	53	50	52	3.8
Spinach	161	160	197	150	154	2.8
Lettuce	92	78	88	79	82	3.7
Beet	-	9	9	7	7	2.1
Radish	-	5	5	5	5	2.7
Parsley	10	11	11	11	12	8.9
Leek	73	72	75	76	78	2.7
Onions	1,465	1,185	1,354	1,367	1,369	0.1
Garlic	138	146	234	264	263	-0.6
Beans	3,406	2,845	2,888	2,904	2,914	0.3
Peas	99	55	67	68	69	1.6
Other legumes	54	69	42	43	46	5.4
Carrots	107	112	121	126	129	2.6
Other vegetables	32	37	29	22	23	5.3

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 onion which has 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.

Table 6. Area, production and yield of second crops after the first harvest

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

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.

Table 7. Area and production of fruits, 2017 – 2021

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

Grape Production

In 2021, the cultivation areas of vineyards experienced a modest increase of 1%, or 34 hectares. Specifically, the areas dedicated to table grapes increased by 2.9%, while those used for wine grapes saw a more modest rise of 0.3%. Unfortunately, the year was marked by challenges such as diseases and hail, which had a negative impact on both production and yield. Although

production increased slightly by 0.7%, yield decreased by 0.2% compared to the previous year. The production value of this crop in 2021 was €3.9 mil., which is close to the year 2020. The trade balance in 2021 continues to be negative with a value of €1.4 million.

Table 8. Grape's area, production and yield, 2017-2021

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

Organic Farming

There is no direct information of hectares planted with organic farming since most of the organic production in Kosovo are based on wild collection and very small portion in cultivation. This table present the number of applicants for subsidies that are provided by the state.

Table 9. Number of applicants for subsidies per organic

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

Forage crops and green cereals

In 2021, there was a small 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 that was grown as a second crop. The reason for the decrease in production was due to a decrease in yield. The biggest decrease in yield was for grass, hay, clover, and other crops, ranging from 1.7% to 6.1%.

Table 10. Area, production, yield of forage crops and cereals harvested green, 2017-2021

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

Livestock Product

In the given data, depicting the sale of diverse livestock categories including cattle, pigs, sheep, goats, poultry, and other animals along with 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. With regard to livestock products, the production of eggs saw a surge in 2021 as compared to the preceding year, while the production of milk recorded a decrease. No significant alteration was observed for other livestock products.

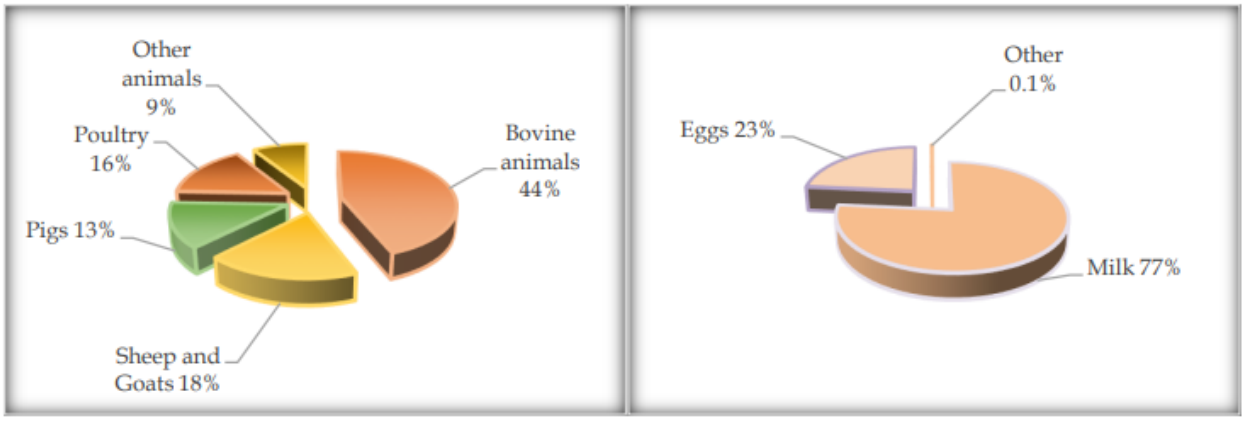
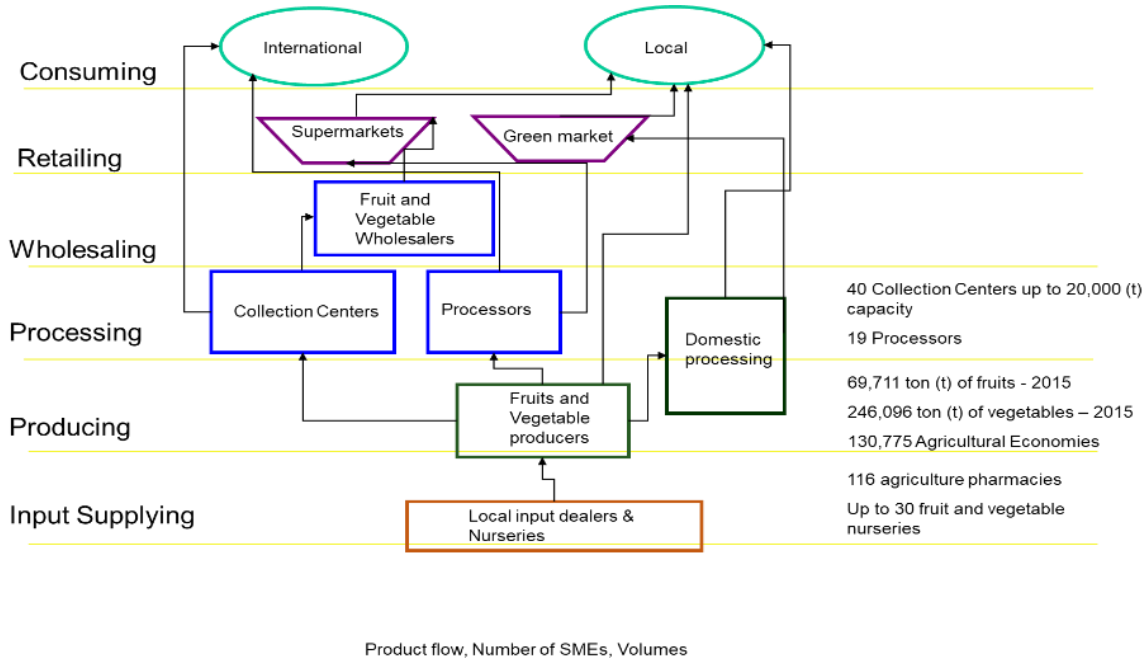


Figure 2. Livestock share

Value Chain

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



Product flow, Number of SMEs, Volumes

**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.*

5. Kosovo Advances Sustainable Waste Management through Vermicomposting and Bio Waste Initiatives

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 m^3 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, the Green Art Center-Prishtina (GAC) is 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 fur Internationale Zusammenarbeit (GIZ) GmbH and the non-governmental organization in Kosovo Green Art Center - Prishtina (GAC), is 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.

6. Empowerment of Bio-Waste Sector Through Funding and Incentives for Sustainable Waste Management

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 and Spatial Planning 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.

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.

As BECBA aims to enhance youth employability and tackle bio-waste mismanagement in rural areas by engaging young people in agro-entrepreneurship and circular economy actions. There are some initiatives that may fit the objective of project:

AgroVictus: mushrooms producers, that upcycle organic matter into delicious mushrooms.

Gobeyond: Gobeyond 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.

Botanic: Botanic is 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.

Greenergy: Greenergy produces affordable, organic-certified, and sustainable-produced spices, using agricultural waste and circular economy.

Eco Solution Research: Eco Solution Research produces organic fertilizers and biogas.

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.

PNC: PNC aims to reduce material waste in the wood manufacturing industry in Kosovo through software optimization. Through software solutions and further digitalization of material optimization, various types of businesses in Kosovo in the wood industry will have the chance to lower their material waste while increasing their production.

Other support programs: In addition to the above support mechanisms, there are other 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.

Other local NGO's:

- Climate Awareness Association that deal with rising awarenes 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

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.

ANNEX 1.

Table 1. Questionare table from 20 farmers

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

References:

NO.	TITLE OF ARTICLE
1	Analysis of the Gap in the Waste Sector
2	Municipal Waste Management in Western Balkan Countries: Current State and Prospects
3	Kosovo Municipal Waste Factsheet 2021
4	Waste Management in Vushtrri, Kosovo
5	Support Waste Management in Kosovo
6	Kosovo's Waste Mismanagement: Failures & Alternatives
7	Economic and Environmental Interest of Organic Waste Treatment in Kosovo
8	Kosovo Waste Prevention Country Profile 2021
9	Waste Management Strategy 2019-2028
10	Model 2: Composting Scheme for Rural Neighborhood
11	Model 3: Compost Valorisation via Worm Farming in Lipjan
12	Let's Talk About Food Waste
13	Composting Scheme for Germia Park and Other Pristina Public Green Areas
14	Fondacioni Jeshil Provides Innovative Solution to Reduce Food Waste in Kosovo
15	Expansion of the Project for Separation of Organic Waste
16	Pilot Project for Recycling Organic Waste Begins
17	Kosovo Builds Factory for Processing Organic Animal Waste
18	Next Task for Kosovo's Gastronomy: Reducing Food Waste
19	Boosting Innovation in Kosovo's Waste Sector
20	Green Report 2023