



**ASSESSMENT OF ENERGY CONSUMPTION BY AGRICULTURAL AND
FOOD SECTOR SMALL BUSINESSES IN RURAL AREAS OF GEORGIA**

Tbilisi, Georgia

Acknowledgments

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LIST OF ABBREVIATIONS

ARD	Austrian Development Agency
CAP	Climate Action Plan
CSA	Climate Smart Agriculture
CNFA	Cultivating New Frontiers in Agriculture
CO ₂	Carbon dioxide
CPF	Country Programming Framework
EBRD	European Bank for Reconstruction and Development
ENPARD	European Neighborhood Programme for Agriculture and Rural Development
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GAPs	Good Agriculture Practices
GDA	Global Development Alliance
GDP	Gross Domestic Product
GEOSTAT	National Statistics Office of Georgia
GEL	Georgian lari (Georgian national currency)
GIZ	German Development Agency
GJ	Giga Joule
GHG	Greenhouse gases
ha	Hectare
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
KfW	German Federal Government Development Bank
LEDS	Low Emissions Development Strategy
LEPL	Legal Entity Under Public Law
MEPA	Ministry of Environment Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development
MSME	Micro, small, and medium enterprise
NDC	Nationally Determined Contribution
NECP	National Energy and Climate Plan
NNLE	Non-entrepreneurial Non-commercial Legal Entity
RDA	Rural Development Agency
RECP	Resource Efficiency and Cleaner Production
t	Ton
toe	Tonne of oil equivalent
WAE	Windbreak and Agroforestry Ecosystem
WEG	World Experience for Georgia
UN Women	United Nations Entity for Gender Equality and the Empowerment of Women
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNSDCF	UN Sustainable Development Cooperation Framework for Georgia
USAID	United States Agency for International Development

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EXECUTIVE SUMMARY

Georgia is planning to seek food security self-reliance through domestic production. This strategy requires a clear understanding of agricultural production and its potential for growth in the short-term. Unfortunately, information currently available to policy makers is unreliable for this purpose and needs to be improved.

Significant energy price increases are having a negative impact on production capabilities and costs for producers, especially from rural areas. They, consequently, may result in the weakening of the competitiveness of these producers and increasing their vulnerability. Reducing energy consumption can be achieved by improving the efficiency of food production. Food producers and processors can ensure food safety while being energy-wise and reducing their carbon footprint.

UNECE is implementing project “Strengthening Georgia’s food and energy resilience,” which aims to enhance capacity of small business to introduce energy efficiency measures in rural areas and improve knowledge of national stakeholders on energy efficient solutions for small businesses in rural areas.

For the assessment of energy consumption by agricultural and food sector small businesses in rural areas of Georgia, the study examined such background information as percentage of population living in rural areas and their engagement in agricultural production either as family holdings (1,366.4 thousand) or working in agricultural enterprises (14.4 thousand).

According to the Geostat publication “*Agriculture of Georgia 2021*,” about 60 per cent of agricultural holdings are producing primarily for own consumption and selling less than 10 per cent of production. Only about 6 per cent of agricultural holdings are producing primarily for sale. It is notable that 20 per cent of households/family holdings can’t provide their families with all the necessary foodstuff and receive social allowance. In 2021, rural absolute poverty in the country reached 21.3 per cent.

Agricultural sector’s contribution to GDP is only 7 per cent. Manufacturing sector which comprises 11.7 per cent includes “production of food, beverages and tobacco”. Georgia’s self-sufficiency ratio for such important product as wheat is very low, being only 22 per cent. Georgia imports about more than 40 per cent of vegetables, more than 50 per cent of meat, pork, poultry meat.

Weak economic performance and its low productivity can be attributed to:

- Fragmentation of agricultural land and property rights leading to inefficient management of land resources;
- The fact that 87 per cent of households own less than 1 hectare of arable land, only 0.1 per cent own more than 50 hectares.
- Agricultural value chain (weak linkages, consulting and extension services, education, enforcement of standards).

In 2020, energy consumption of the “agriculture, forestry and fishery” was 24,900 toe, or 0.6 per cent of total energy consumed in Georgia.

Energy used for production of food, beverages and tobacco makes 8 per cent of energy used by industrial sector. Adding estimations on energy consumed by family holdings (household) for plant growing, cattle breeding and poultry raising the estimated energy consumed by agricultural sector and food production in 2020 was 128,932 toe or **2.9 per cent of total energy consumption**.

Energy intensity level of primary energy (MJ/USD 2017 PPP GDP) for Georgia in 2019 was 3.83 MJ per 2017 USD PPP lower than the world energy intensity which stood for 4.7 MJ per 2017 USD PPP. At the same time, energy intensity of the Georgian industry and agriculture is higher than in some European countries.

In 2020, oil and natural gas accounted for 29.3 per cent and 38.5 per cent, respectively, of total energy consumption in Georgia. Both of these sources are imported, so it is crucial to conserve energy in the agriculture and food industries, given current volatile state of energy markets and price increases.

With high prices on fossil fuels, it will be extremely difficult to increase food production by as much as necessary to meet anticipated food demand by 2050 (FAO anticipates a 60 per cent increase in food consumption over 2006–2007 levels).

Climate change may have a significant impact on agri-food systems since it can lead to severe droughts, floods, changes in water availability, and changes in soil quality. These adjustments may have an impact on rising energy demand. According to 2021-2023 Action Plan of Georgia's 2030 Climate Strategy, by 2030 emissions in the Georgian agricultural sector are expected to increase by about 40 per cent.

Of these emissions, 36.8 per cent are attributable to intestinal fermentation, 47 per cent are attributable to agricultural soils (direct and indirect emissions), and 14.7 per cent are attributable to manure management. Pasture, synthetic fertilizers (direct emissions from agricultural soils), and nitrogen leakage and runoff are the main sources of emissions from agricultural soils (indirect emissions from agricultural soils).

The Government of Georgia adopted Climate Strategy and Action Plan on 8 April 2021. Goal 5 of the Climate Action Plan aims at the support the low carbon development of the agriculture sector through encouraging climate-smart agriculture technologies and services and corresponds to the Sustainable Development Goals 2, 6, 12, 15. Foreseen actions include:

- Sustainable management of soil and pastures and support to the introduction of sustainable domestic animal feeding practices;
- Development of climate-smart approaches in the agriculture sector.

Although energy consumption in examined sectors is relatively low, there is still room for improvement in terms of energy efficiency. The most promising areas for this are:

- Fruit and vegetable processing, which uses contemporary, energy-efficient technological units and automated processes;
- New technologies for livestock breeding and meat processing. Improving energy efficiency within the agricultural sector helps reducing energy demand and its associated costs, reducing reliance on fossil fuels thus contributing towards GHG emission reduction.

Energy efficiency can be implemented in different agricultural sub-sectors as well as in various ways by substitution of used technology with more energy-efficient one; introduction of energy saving technologies in lighting, air-conditioning, heating; behavior change, such as composting instead of largely relying on inorganic fertilizers, use residues generated from crop production and livestock as a source of bioenergy.

As revealed by the energy audits performed in small size food sector enterprises, there is a significant potential to decrease energy usage by introducing energy-efficient measures related to electricity supply and consumption, steam generation and distribution, pumping and lighting systems, industrial refrigeration and cooling and furnaces, kilns and ovens. These measures could be recommended for application in the sector enabling the companies to decrease energy consumption.

Replacing the outdated and inefficient technology with new, environmentally friendly, and energy-efficient machinery that uses less energy will enable local businesses to better compete on both domestic and international markets. The institutional side of modernization involves altering behavior and management strategies to emphasize the advantages of energy efficiency.

Generally, there is lack of energy efficiency education and information programmes as well as technical expertise, lack of trained personnel especially in regions for installation, operation and maintenance of renewable energy and energy efficiency technologies, limited capacity of local research institutions, lack of strategies and policies for the implementation of energy efficient projects. Georgian businesses are largely motivated by productivity and have minimal understanding of or awareness of energy-saving strategies.

IFIs are encouraging EE and RES development through their credit lines, but the efforts are still insufficient, constrained, and connected to the specific projects. For example, EBRD offers local banks affordable credit lines, including subsidized loans and free technical assistance during the project development stage, to boost energy efficiency and the development of renewable energy sources. KfW also has a similar programme.

Commercial banks lack experience in financing energy efficiency and renewable energy projects and are unaware of the possible economic and environmental benefits of these projects. There is lack of fiscal and tax incentives, as well as lack of innovative financial instruments, especially for small businesses.

I. BACKGROUND AND KEY FIGURES

1.1. GENERAL CONTEXT AND ECONOMIC INDICATORS

Georgia is a small country, with a total area of 69,700 km². Georgia is largely mountainous with Greater Caucasus mountains in the north and Lesser Caucasus mountains in the south. The Kolkhida Lowland opens to the Black Sea to the west; the Mtkvari River basin in the east. The diverse terrain provides a number of micro-climates and rainfall patterns, the basis for the production of a wide variety of agricultural products.

43.4 per cent of the total area of the country (30,300 km²) is occupied by agricultural land (2005). Annual crops occupy 207.1 thousand hectares (2018), and the perennial crops occupy 109.6 thousand hectares of land (Agricultural Census of Georgia 2014). Besides, 44.8 per cent of the country's territory is covered by forest fund (2017).

An estimated 40.2 per cent (1,487.5 thousand) of the Georgian population live in rural areas, most of this population is categorized as "self-employed", usually meaning that they are small-scale subsistence farmers.

Fig.1 Urban and Rural Population of Georgia

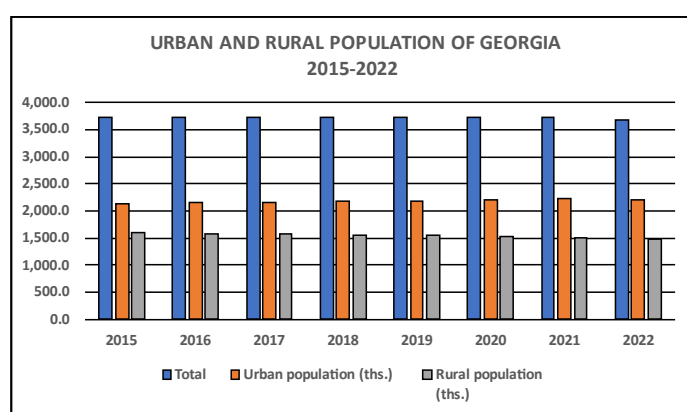


Table 1. Urban and Rural Population in Georgia

Year	Total	Urban population (thousand)	Rural population (thousand)	Rural population as % of total population
2015	3,721.9	2,135.6	1,586.3	42.6
2016	3,728.6	2,151.5	1,577.1	42.3
2017	3,726.4	2,161.9	1,564.5	42.0
2018	3,729.6	2,174.8	1,554.8	41.7
2019	3,723.5	2,184.3	1,539.1	41.3
2020	3,716.9	2,194.5	1,522.4	41.0
2021	3,728.6	2,215.6	1,512.9	40.6
2022	3,688.6	2,201.2	1,487.5	40.3

Source: Geostat

1.2. SMALL BUSINESS IN AGRICULTURE AND FOOD SECTOR IN GEORGIA

The Law of Georgia "On entrepreneurs" defines the following types of organizational-legal forms of enterprise:

- Limited Liability Company;
- Joint-stock Company;
- Joint Liability Company;
- Limited Partnership;
- Cooperative;
- Individual Entrepreneur (physical person).

Enterprises are grouped by size as follows: large, medium and small.

Small and medium enterprises are the entities of any organizational-legal form which do not exceed the following limits for number of employees and annual turnover respectively:

- For small enterprises - 50 employees and 12 MIn. GEL;
- For medium enterprises - 249 employees or 60 MIn. GEL.
- Large enterprise is an enterprise, in which number of employees exceeds 249 persons or annual turnover exceeds 60 MIn. GEL.

Above-mentioned gradation of enterprises is in action since 2017.

As of September 2022, 2,741 legal entities are functioning in Georgia in “Agriculture, forestry and fishing” sector¹. Majority of these enterprises (2,684) are the small ones. In manufacturing sector, which includes food processing industry, the number of legal entities amounts to 16,175, from which 15,731 are small enterprises.

In 2021, the production value of the industry amounted to 18,133.6 mln. GEL (including Tbilisi- 6,348.9 mln. GEL) from which share of small enterprises was 3,226 mln. GEL. The production value of manufactured food products was 2,784.7 mln. GEL

From total number of 135,883 persons employed in industry throughout Georgia (Tbilisi- 59,964 persons) 24,689 persons were employed in manufacturing of food products.

In 2021, the average monthly remuneration of employed persons in industry was 1,323.5 GEL, while in manufacturing of food products the remuneration was lower 900 GEL on average.

According to Geostat, in 2020 from total number of employed-12,286 were employed in agriculture, forestry and fishing² and 44.1 per cent were employed by small businesses.

Georgia does not have a formal definition of farmer or smallholder. Geostat (National Statistics Office of Georgia) does have a definition of agricultural holding, which is divided into family holding and agricultural enterprise.

A family holding is defined as an agricultural holding operated by a household, including holdings operated by several households without any formal agreement among them (Geostat, 2017a). A household is considered to be an agricultural household when one of the members of the household is a holder (regardless of which source is the largest source of income of a household or if no income is derived from agricultural production) (Geostat, 2014). Agricultural enterprise is a holding operated by legal entity: limited liability company, general partnership, limited partnership, joint stock company, cooperative, etc.

According to the census results, as of 1 October 2014, there are 642.2 thousand holdings in the country: of which 640 thousand households and 2.2 thousand legal entities. According to Geostat Statistical Publication “Agriculture of Georgia-2021”,³ the total number of people in agricultural holdings is 1,366.4 thousand men from which only 14.4 thousand work in agricultural enterprises. From the total number of workers in family holdings 999.8 thousand are family members and 352.1 are external workers (hired workers neighbor, relative, etc.). Thus, from total rural population of 1,487.5 thousand persons about 90 per cent are engaged in agricultural production as family holdings.

Table 2. Average Number of Workers in Agricultural Holdings (thousand man)

Agricultural holdings			Family holdings			Agricultural Enterprises		
Female	Male	Total	Female	Male	Total	Female	Male	Total
638.9	727.4	1 366.4	633.1	718.8	1 351.9	5.8	8.6	14.4

Source: Agriculture of Georgia 2021.Geostat

The average household owns 1.14 hectares of land (Geostat, 2021). Only 4.8 per cent of households own two to five hectares of land, and 1.5 per cent own more than five hectares. With such an ownership structure,

¹ <https://www.geostat.ge/en/modules/categories/65/by-kind-of-economic-activity>

² “Agriculture” is defined in accordance with the European classification NACE Rev. 2, which Geostat is using. NACE Rev. 2 Section A – agriculture, forestry and fishery industry: this section [A] includes utilization of plant and animal natural resources, which includes crop growing, animal rear and breeding, timber production and propagation of various plants, breeding of animals and fish, and producing animal products in agriculture enterprises or natural environment.

³ <https://www.geostat.ge/ka/single-archive/3371#>

commercial farming remains underdeveloped. Small land holding hinders the development of large-scale agricultural production, and it is the main driver of poverty for the people employed in agriculture as well as the low level of labor productivity.

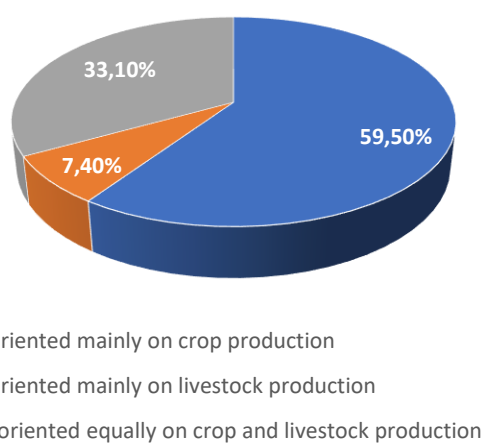
Agriculture consists of two main sub-sectors: plant growing and animal husbandry. In Georgia, animal husbandry has a larger share than plant growing. However, the share of livestock has declined in recent years.

Table 3. Output of Agriculture (Current Prices, mln. GEL)

	2014	2015	2016	2017	2018	2019	2020	2021*
Output of agriculture, total	3 817.6	3 884.3	3 882.7	3 724.5	4 552.8	4 834.6	5 492.6	5 697.9
Plant growing	1 717.1	1 642.5	1 590.4	1 456.8	2 067.7	2 159.5	2 578.5	2 507.1
Animal husbandry	1 886.4	1 981.3	2 002.2	2 015.5	2 197.9	2 411.1	2 584.9	2 830.7
Agricultural services	214.0	260.5	290.1	252.2	287.1	263.9	329.2	360.1
<i>* Preliminary data.</i>								

Though animal husbandry has a larger share in total output of agriculture, the majority of agricultural holdings are engaged in crop production.

Fig.2 Distribution of Agricultural Holdings by Agricultural Orientation, 2021, %



As could be viewed from below table more than 90 per cent of wheat, barley, maize, beans potato and vegetables are produced by family holdings.

Table 4. Plant Growing-Share of Family Holdings and Agricultural Enterprises in Total Production (%)

	2018		2019		2020		2021	
	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises
Wheat	88.8	11.2	85.1	14.9	92.3	7.7	93.4	6.6
Barley	94.7	5.3	94.4	5.6	95.7	4.3	91.5	8.5
Maize	92.5	7.5	92.5	7.5	95.8	4.2	94	5.7
Haricot beans	98.5	0.2	99.8	1.5	98.9	1.1	99.9	0.1
Potato	99.6	0.4	98.4	1.6	97.9	2.1	98.5	1.5
Vegetables	91.6	8.4	90.6	9.4	90.4	9.6	90.6	9.4

As for the animal production, only about 40 per cent of meat is produced by family holdings while share of agricultural enterprises in meat production is more than 60 per cent. Similarly, more than 70 per cent of eggs and poultry meat is also produced by agricultural enterprises.

	2018		2019		2020		2021	
	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises	Family holdings	Agricultural enterprises
Meat, total*	43.6	56.4	43.4	56.6	37.7	62.3	36.6	63.4
Beef	96	4	73.2	3.9	92.9	7.1	89.4	10.6
Pork	75.1	24.9	90.4	26.8	64.1	35.9	56.3	43.7
Sheep & goat meat	99.9	0.1	99.9	0.1	99.9	0.1	99.9	0.1
Poultry meat	29.1	70.9	29.5	70.5	25.4	74.6	26.1	73.9
Milk	97.9	2.1	97.1	2.9	95.9	4.1	95.7	4.3
Egg	30.1	69.9	31.5	68.5	27.3	72.7	29.9	70.1
Honey	94.1	5.9	93.9	6.1	88.3	11.7	95	5

**In calculation of shares live animals sold for slaughtering by agricultural holdings is not taken into account.*

It is notable (see Table 6) that about 60 per cent of agricultural holdings are producing primarily for own consumption and selling less than 10 per cent of production and just only about 6 per cent of agricultural holdings are producing primarily for sale.

Holdings producing primarily for sale (selling 90% or more)	5.90%
Holdings producing mainly for sale (selling more than 50% and up to 90%)	14.60%
Holdings producing mainly for own consumption (selling more than 10% and up to 50%)	18.80%
Holdings producing primarily for own consumption (selling 10% or less)	57.90%
Holdings with no agricultural production	2.80%

Source: Agriculture of Georgia 2021.Geostat

In 2020, the average annual income of small agricultural holdings was 1,508 GEL while medium and large holdings annual income amounted to 13,151 GEL.⁴

According to Geostat, in 2021 - 18.5 per cent of the cash income of rural households was generated from the selling agricultural production (Distribution of Average Monthly Incomes per Household by Urban and Rural Areas). This was less than the income received from hired employment (32 per cent, but most people are hired in agribusiness) and less than the income received as pensions, scholarships, and assistance (29 per cent). As for non-cash income, 15 per cent of total income gained by rural population in 2021 was non-cash income. Besides the pension and social packages, the Georgian Government provides a subsistence allowance to the poorest of the population.

Geostat defines the subsistence minimum according to the minimum grocery basket defined and established in accordance with the order of the of the Minister of Labour, Health and Social Affairs of Georgia. The minimum grocery basket is a defined normative basket of foodstuffs, which contains the amount of physiologically necessary foods for the normal life and employable working-age man, the minimum amount of its constituent elements (proteins, fats and carbohydrates) and calories. The minimum grocery basket includes such products

⁴ Agriculture of Georgia 2021.Geostat (Table 1.47)

as: wheat bread and flour, corn flour, cereals, meat and meat products, poultry, eggs, fish, dairy products and vegetables, in total 35 food products.

At the end of 2021, the monthly subsistence minimum for average consumer was 198 GEL and as of August 2022 reached 218.6 GEL.

As reported by the Social Service Agency, the number of socially vulnerable people (recipients of subsistence minimum) in the country reached a historic high at the end of 2021. The number of cash social assistance recipients was growing monthly during the pandemic. In 2020-2021, the number of cash assistance recipients increased by 215,794 (54,797 families) in total. The fact that there was a record high number of applications from people to register as social assistance recipients indicates that the population's social well-being worsened drastically during the pandemic (2020-2021). As of August 2022, **185,520⁵ households** are recipients of social allowance from which **123,833 households** are from rural areas or about 20 per cent of households or family holdings can't provide their families with all the necessary foodstuff and are in need of state assistance.

According to Geostat,⁶ in 2021 the share of the Georgian population under national relative poverty line was 18.9 per cent. Rural relative poverty was 24.7 per cent, while urban relative poverty was 15 per cent (relative poverty shows the share of population under 60 per cent of the median consumption). Regarding absolute poverty, the 2021 absolute poverty rate for Georgia was 17.5 per cent while rural absolute poverty was 21.3 per cent and urban 15 per cent.

As mentioned above, though that more than 40 per cent of Georgia's working population is employed in the agricultural sector, the sector's contribution to the GDP comprises only 7 per cent. As could be seen from the below tables on balances for major crops, meat and dairy products, Georgia's self-sufficiency ratio for such important product as wheat is very low being only 22 per cent. Georgia imports about more than 40 per cent of vegetables, more than 50 per cent of meat, pork, poultry meat.

Table 7. Balances for Major Crops in Georgia (2021)				
	Wheat	Maize	Potato	Vegetables
	(thousand tons)			
Domestic production	136	233	235	149
Import	482	83	19	108
Seed	14	3	30	1
Feed	18	141	3	2
Food	624	152	195	205
Waste	12	9	3	7
Export	5	2	50	14
Stock variation	-60	8	-28	29
Self-sufficiency ratio, %	22%	74%	115%	61%

⁵ http://ssa.gov.ge/index.php?lang_id=&sec_id=1594

⁶ <https://www.geostat.ge/en/modules/categories/192/living-conditions>

Table 8 Balances for Meat and Dairy Products in Georgia (2021)

	Meat	Beef	Pork	Sheep & goat meet	Poultry meat	Milk products	Eggs
	(thousand tons)						
Domestic production	72.6	20.5	21.8	4.4	25.5	588	655
Import	84.8	6.5	24.5	0.2	53.6	155	17
Feed						12	39*
Food	140	24.5	41.7	4.1	69.3	707	614
Waste	1	0.1	0.4	0.1	0.4	9	13
Export	16.4	2.3	4.3	0.4	9.4	14	5
Stock variation	-0.1	0	-0.1	0	0	1	1
Self-sufficiency ratio, %	51%	83%	52%	105%	37%	81%	98%

*for hatching

Source: *Agriculture of Georgia 2021*. Geostat

“The sector’s weak economic performance and its low productivity can be attributed to a number of specific root causes. These include the fragmentation of agricultural land and property rights issues that lead to inefficient management of land resources. Of additional concern are issues related to the agricultural value chain, such as weak linkages, consulting and extension services, education, enforcement of standards, etc...It is also worth noting that investments are an important factor in the introduction of modern technologies and hence productivity growth. The investment in the sector is too small a part of total investment to talk about mechanization and its advantages”⁷.

One of the causes of low productivity is the fragmentation of land. Studies show⁷, that farm size is positively correlated with income and productivity. Consequently, productivity growth is hardly conceivable given the current distribution of land in Georgia.

According to the 2014 Census alone (National Statistics Office of Georgia, Agricultural Census 2014), 87 per cent of households own less than 1 hectare of arable land, and only 0.1 per cent own more than 50 hectares. Also, on average a single farm (family farm or agricultural enterprise) owns 1.37 hectares of agricultural land, of which 0.71 hectares is arable land and 0.4 hectares are perennial. These statistics clearly indicate a high degree of land fragmentation.

In conclusion, problems with land registration and management, low productivity of practically all crops, and rising investment and mechanization continue to be the major challenges in the sector. Additionally, the households often do not have a predisposition to view agriculture as a business. As a result, the primary function of this sector today is that of the so-called subsistence economy, which is very different from what was anticipated of it. Therefore, it is challenging to attain economies of scale and boost the efficiency/productivity required to provide competitive products on the market under these circumstances.

⁷ “Analysis of the Agricultural Sector in Georgia: Value Chain and Export Potential” PMC Research Center, 2019

II. ASSESSMENT OF ENERGY CONSUMPTION BY AGRICULTURAL AND FOOD SECTOR SMALL BUSINESSES IN RURAL AREAS OF GEORGIA

2.1. METHODOLOGY USED FOR THE ASSESSMENT

The methodology for this assessment included:

Desk review and analysis of existing documents were conducted. Relevant reports from the United Nations organizations and agencies as well as local organizations were analysed, and quantitative data was requested where possible. Statistical data was obtained from the National Statistics Office of Georgia (Geostat) and further analysed.

In 2014, Geostat conducted a General Population and Agricultural Census, and the census results are used in the secondary data analysis. Also, some data from ongoing Geostat surveys (statistical survey of agricultural holdings, integrated household survey and business statistics survey) were also used during the preparation of the document.

The Consultant could not obtain from Geostat the necessary energy consumption data for calculation of benchmarks for various essential food products as Geostat has only aggregated energy consumption for the whole sector. Based on the annual trends and world energy intensity figures, energy intensity has been calculated for sectors of Georgian economy, including industry and agriculture.

For comparison reasons, the consultant calculated energy intensity factor by economic sectors in the EU countries and Georgia.

The consultant had several meetings with experts from the United Nations Industrial Development Organization (UNIDO) Resource Efficient and Cleaner Production (RECP) who have expertise in conducting energy audits of industrial enterprises, including small food manufacturing businesses. The recommendations for energy efficiency measures that are appropriate to small food manufacturing firms in Georgia were defined and implemented with the help of the Georgian RECP experts.

In cases when data clarification was needed, additional meetings were held, or phone calls were made to representatives of various organizations.

2.2. GEORGIA'S GROSS DOMESTIC PRODUCT AND SHARE OF THE AGRICULTURAL AND FOOD SECTOR

Despite having wide state support and funding from the European Neighborhood Programme for Agriculture and Rural Development (ENPARD) and the higher rate of labour force participating in agriculture, the share of Georgian agriculture makes up 7 per cent of the national GDP.

The share of agriculture, forestry and fishing in total GDP declined significantly (from 25 per cent in 1999 to about 10.3 per cent in 2011 and 7 per cent in 2021).

Fig.3 Agriculture, Forestry and Fishing Share in GDP 2010-2021 (%)

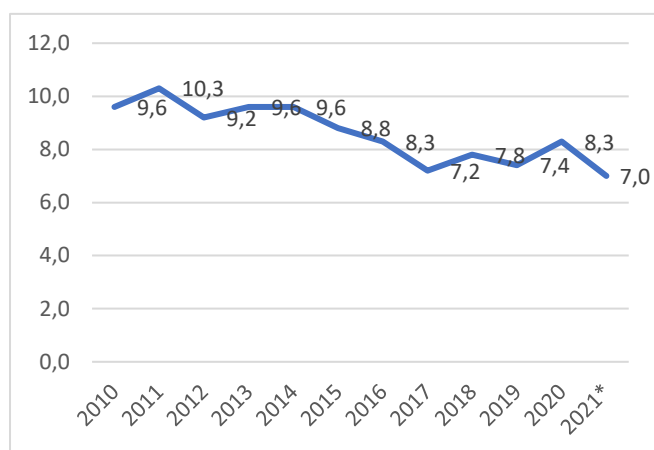
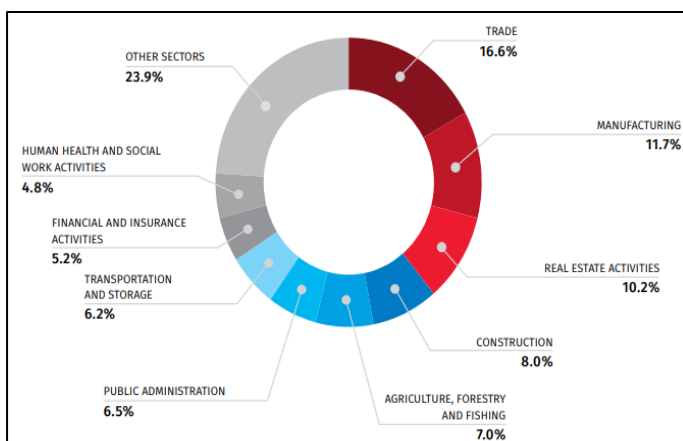


Fig. 4 GDP Structure, 2021⁸



The largest shares of GDP by activity are held by wholesale and retail trade; repair of motor vehicles and motorcycles (16.6 per cent) and manufacturing (11.7 per cent), followed by real estate activities (10.2 per cent), construction (8.0 per cent), agriculture, forestry and fishing (7.0 per cent), public administration and defense; compulsory social security (6.5 per cent), transportation and storage (6.2 per cent), financial and insurance activities (5.2 per cent), human health and social work activities (4.8 per cent).

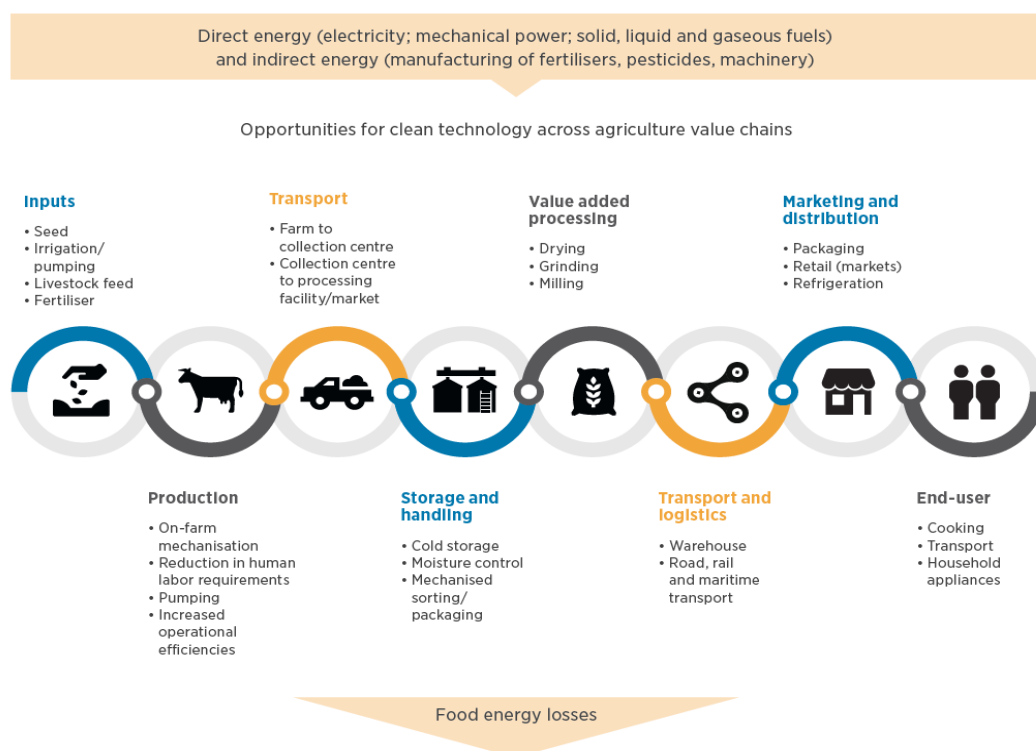
2.3. ENERGY CONSUMPTION BY AGRICULTURE AND FOOD SECTOR IN GEORGIA

“Energy plays a fundamental role in food systems. It is consumed not only in primary production, but also in secondary activities, such as drying, cooling, storage, transport and distribution (Figure 2) (Taghizadeh-Hesary, Rasoulinezhad and Yoshino, 2019). It is needed at all steps along the agri-food chain, both directly (for production, processing and transport) and indirectly (for manufacturing of fertilizers, agro-chemicals and machinery). Agri-food systems are responsible for about 30 per cent of the world’s total energy consumption (FAO, 2011)”⁹.

⁸ <https://www.geostat.ge/media/44017/Gross-Domestic-Product-of-Georgia-in-2021-%28Preliminary%29.pdf>

⁹ “Renewable energy for agri-food systems. Towards the Sustainable Development Goals and the Paris Agreement” IRENA and FAO. 2021. <https://doi.org/10.4060/cb7433en>.

Fig. 5 Energy Flows in Agri-food Systems

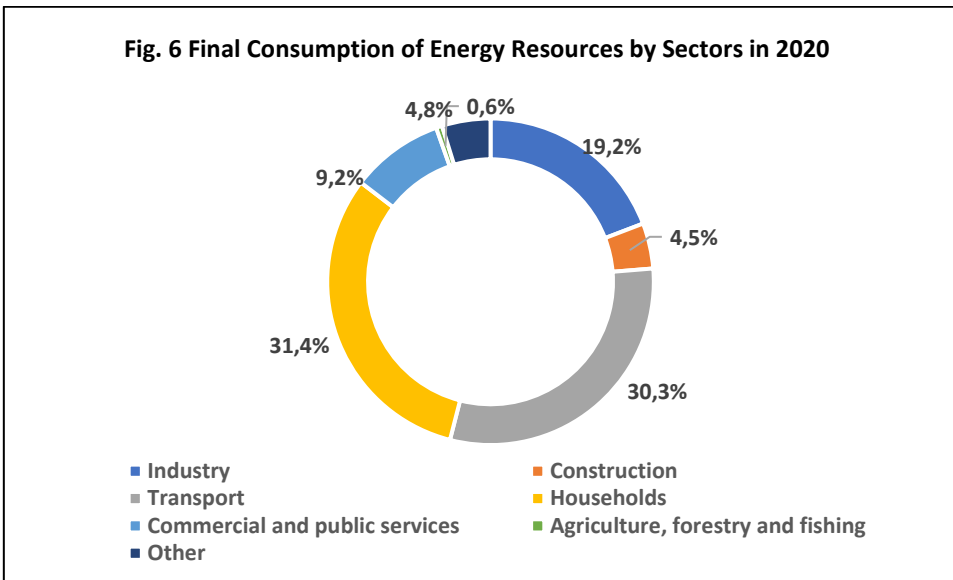


The consumption of energy within the agricultural sector in Georgia is relatively low compared to that of other economic sectors.

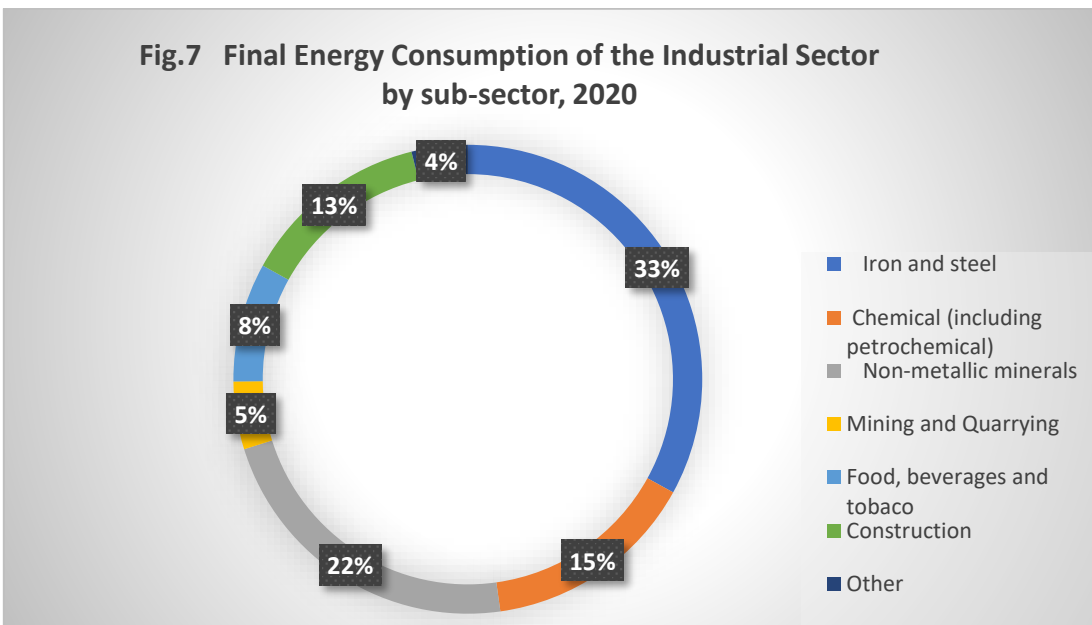
As can be established from below table and figures, an estimated total of 24900 TOE of energy was consumed by the sector in 2020 which is only 0,6 per cent of the total energy consumed in Georgia in 2020 thereby making the agricultural sector the least direct energy consuming sector in the country.

Table 9. Final Energy Consumption of Energy Resources by Sectors in 2013-2020 (thousand toe)

	UNIT	2013	2014	2015	2016	2017	2018	2019	2020
FINAL CONSUMPTION OF ENERGY RESOURCES	1000 TOE/ %								
	1000 TOE	3 736.4	3 999.3	4 168.8	4 396.1	4 455.2	4 414.1	4 592.0	4 486.9
Industry	1000 TOE	805.5	804.7	843.8	789.5	885.1	925.8	887.5	860.4
	Percentage	21.5	20.1	20.2	18.0	19.9	21.0	19.3	19.2
Construction	1000 TOE	141.0	163.8	159.2	171.5	180.9	185.9	245.5	201.9
	Percentage	3.8	4.1	3.8	3.9	4.1	4.2	5.3	4.5
Transport	1000 TOE	1 127.7	1 266.9	1388.5	1 539.0	1 395.6	1 367.4	1 418.5	1 359.1
	Percentage	30.2	31.7	33.3	35.0	31.3	31.0	30.9	30.3
Households	1000 TOE	1 159.3	1 182.3	1 200.8	1 265.6	1 336.3	1 227.3	1 300.7	1408.2
	Percentage	31.0	29.6	28.8	28.8	30.0	27.8	28.3	31.4
Commercial and public services	1000 TOE	351.1	428.6	402.9	433.3	453.0	514.9	535.5	412.9
	Percentage	9.4	10.7	9.7	9.8	10.1	11.7	11.7	9.2
Agriculture, forestry and fishing	1000 TOE	13.7	12.1	18.7	31.4	32.3	27.6	27.2	24.9
	Percentage	0.4	0.3	0.4	0.7	0.7	0.6	0.6	0.6
Other	1000 TOE	138.0	140.9	154.9	165.7	172.1	165.2	177.1	219.5
	Percentage	3.7	3.5	3.8	3.8	3.9	3.7	3.9	4.8



At the same time, according to the Energy Balance of Georgia-2020,¹⁰ energy used for production of food, beverages and tobacco is included in industry sector and makes 8 per cent of energy used by this sector. As estimated by Geostat, energy consumed for economic activities of family holdings (households) for plant growing and cattle breeding and poultry raising in 2017 amounted to 1392.5 TJ and made about 2.5 per cent of energy consumed by the households that year.¹¹

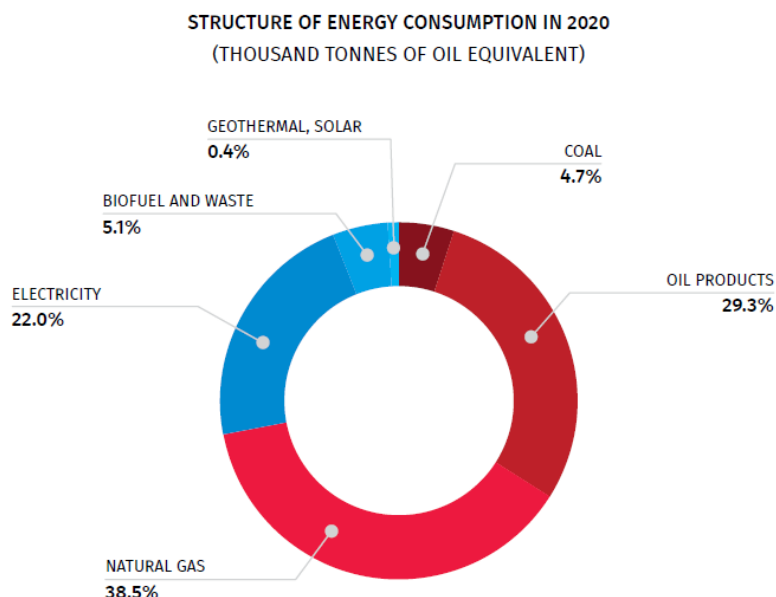


Within the total energy consumption structure 38.5 per cent share comes on natural gas. Oil products (29.3 per cent) and electricity (22.0 per cent) are also characterized with a relatively high share. During the year, 5.1 per cent share of consumed energy comes on the biofuel and waste, while the remaining 5.1 per cent share has coal and geothermal energy.

¹⁰ <https://www.geostat.ge/en/modules/categories/719/energy-balance-of-georgia-2020>

¹¹ "Energy Consumption in Households" 2017. Publication of National Statistics Office of Georgia

Fig.8 Structure of Energy Consumption in 2020 (thousand toe)



According to energy balance for 2020,¹² the total amount of biofuels and waste consumed in 2020 was 227.8 Ktoe, which in physical units was made up of 1211.9 thousand m³ of fuel wood, 9.3 thousand tons of other vegetal materials and residual (pellets, briquettes, etc.), 1,000 tons of biodiesel, 100 tons of charcoal. From this amount “food, beverages and tobacco” sector consumed 3,9 thousandm³ of fuel wood and 0.4 thousand tons of vegetal materials and residuals, while “agriculture, forestry, fishing consumed” 500 m³ of fuel wood and 100 tons of charcoal.

Energy intensity level of primary energy is the ratio between energy supply and gross domestic product measured at purchasing power parity. Energy intensity is an indication of how much energy is used to produce one unit of economic output. Lower ratio indicates that less energy is used to produce one unit of output. Energy intensity level of primary energy (MJ/USD 2017 PPP GDP) for Georgia in 2019 was 3.83.¹³

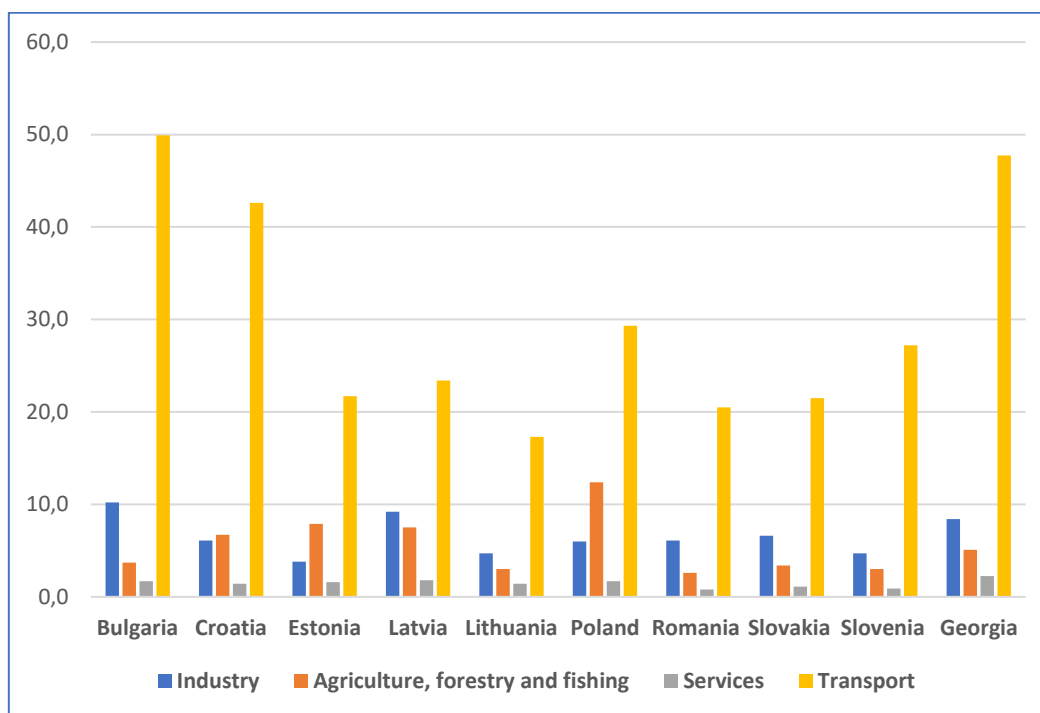
In 2019, the world energy intensity stood for 4,7 MJ per 2017 USD PPP. “The rate of improvement in global primary energy intensity—the global proxy for improvements in energy efficiency—has slowed in recent years. Global energy intensity improvements stepped up in the early part of this decade, but the 1.5 per cent improvement in energy intensity of the global economy in 2019 lies well below the initial SDG 7.3 annual target of 2.6 per cent. Recent slowdown was the result of weaker energy efficiency policy in many major economies, as well as strong demand growth in more energy-intensive economies. Current and planned policies modelled in the Stated Policies Scenario are projected to improve average energy intensity by 2.2 per cent per year to 2030.”¹⁴

¹² <https://www.geostat.ge/en/modules/categories/719/energy-balance-of-georgia-2020>

¹³ <https://data.worldbank.org/indicator/EG.EGY.PRIM.PP.KD?locations=GE>

¹⁴ <https://www.iea.org/reports/sdg7-data-and-projections/energy-intensity>

Fig. 9 Energy Intensity by Sectors-EU Countries and Georgia, 2020, TJ/M EUR



Source: Energy Balance of Georgia¹⁵
Exchange Rate GEL/EUR¹⁶

Changes in Energy Consumption and Energy Intensity in EU Countries as a Result of the COVID-19 Pandemic by Sector and Area Economy¹⁷

Table 10. Energy Intensity Factor by Economic Sectors, EU and Georgia,2020 [TJ/million EUR]

Country	Industry	Agriculture, forestry and fishing	Services	Transport
Bulgaria	10.2	3.7	1.7	49.9
Croatia	6.1	6.7	1.4	42.6
Estonia	3.8	7.9	1.6	21.7
Latvia	9.2	7.5	1.8	23.4
Lithuania	4.7	3.0	1.4	17.3
Poland	6.0	12.4	1.7	29.3
Romania	6.1	2.6	0.8	20.5
Slovakia	6.6	3.4	1.1	21.5
Slovenia	4.7	3.0	0.9	27.2
Georgia	8.4	5.1	2.2	47.7
EU-27 average	5.4	5.8	1.0	23.1

According to Geostat, in 2021 the agricultural holdings reported that they spend on average 5,3 per cent on fuel for own machinery and 11,5 per cent on hiring machinery (including staff and fuel cost).

¹⁵ https://www.geostat.ge/media/42219/Publication-of-Energy-Balance_2020-ENG.pdf

¹⁶ [Euro \(EUR\) and Georgian lari \(GEL\) Year 2020 Exchange Rate History. free currency rates \(FCR\)](https://www.frx.com/eur-gel)

¹⁷ https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewiilvyDiPv6AhWg_rsiHRTQC7kQFnoECA8QAQ&url=https%3A%2F%2Fwww.mdpi.com%2F1996-1073%2F15%2F17%2F6243%2Fpdf&usq=AOvVaw0ZinxQUFBXonCNPRhLe60n

2.4. ENERGY CONSERVATION POTENTIAL

The production and use of agricultural inputs, followed by food processing, packaging, and distribution to the final consumer, all need the energy. However, the extent to which energy is used across the food chain raises questions about how energy prices may affect food costs, national food security, and nation's reliance on foreign energy.

Due to the affordable fossil fuels used in agriculture, countries have been able to satisfy rising food demands throughout the past century. But there are reasons to be concerned about how long this predicament might last. It will be very challenging to grow food production enough to fulfill expected food demand by 2050 (the FAO projects a 60 per cent rise in food consumption over 2006–2007 levels) if cheap fossil fuel is no longer accessible. Additionally, the usage of fossil fuels has made the world's food systems a large source of greenhouse gas (GHG) emissions, which have significantly impacted climate change.

Agri-food systems may be severely impacted by changing climate, which can result in severe droughts, floods, changes in water availability, and changes in soil quality. These changes can influence increased demand for energy. Farmers may use groundwater for irrigation in the absence of rain, which requires energy to pump; they may also use more chemical fertilizers as a result of increasing land deterioration, which also costs energy to produce.

As stated in 2021-2023 Action Plan of Georgia's 2030 Climate Strategy,¹⁸ by 2030, according to the Business as usual (BAU) scenario, emissions in the Georgian agricultural sector are expected to increase by about 40 per cent (compared to 2015) and reach 4,624 Gg CO₂ eq. Of these emissions, 36.8 per cent are attributable to intestinal fermentation, 47 per cent are attributable to agricultural soils (direct and indirect emissions), and 14.7 per cent are attributable to manure management. Pasture, synthetic fertilizers (direct emissions from agricultural soils), and nitrogen leakage and runoff are the main sources of emissions from agricultural soils (indirect emissions from agricultural soils).

The relatively low figure of energy consumption does not mean that there is no energy savings potential – the most promising fields for energy efficiency improvement are: fruit and vegetable processing - modern and energy efficient technological units and automated processes; new technologies for livestock breeding and meat processing.

Improving energy efficiency within the agricultural sector helps reducing energy demand and its associated costs. This also plays a significant role in reducing reliance on fossil fuels thus contributing towards GHG emission reduction. In other words, the benefits of implementing energy efficiency schemes to farmers include the following among others (Carbon Trust, 2006):

- Reduced costs and increased profitability;
- Improved crop quality;
- Increased sales from customers encouraged to purchase more 'green' produce;
- Enhanced business credentials through helping the environment.

Energy efficiency can be implemented in different agricultural sub-sectors as well as in various ways such as:

- Having a more energy efficient technology replacing a conventional lesser energy efficient technology, e.g replacing a hot water electric heater with a solar water system.
- Incorporating additional energy saving technologies to realize some energy savings, e.g. incorporating sensors for lighting and air-conditioning equipment, using double glazed windows and insulation in houses, etc.
- Behavior change, such as using composting rather than heavily relying on inorganic fertilizers.

¹⁸ <https://mepa.gov.ge/En/Files/ViewFile/50122>

Table 11. Energy Efficiency Practices Applicable to Field Crop Production

Energy demand	Recommended energy efficiency technologies and behavioral practices
Fertilizer use	Use of cover crops and manures <ul style="list-style-type: none"> • Nitrogen-fixing crops in rotations • Composting • Integrated pest management (IPM)
Irrigation (and fertigation)	Efficient irrigation pumps including variable speed motors <ul style="list-style-type: none"> • Using gravity where possible • Varying irrigation rates by using automatic regulation control systems • Proper pump-sizing • Upgrading to more efficient irrigation systems, e.g. from wheel lines to pivot or linear sprinkler systems, or drip irrigation in row crops • Frequent management/maintenance of irrigation systems
Lighting	Maximise on natural daylight by utilising translucent materials <ul style="list-style-type: none"> • Energy saving lighting technologies e.g.: <ul style="list-style-type: none"> - LED - CFLs - T5 fluorescent - induction lamps • Replacing electromagnetic ballasts with electronic and dimmable ballasts • Efficient automatisisation of lighting matching real demands <ul style="list-style-type: none"> o Timers • Cleaning dust off reflective surfaces of light fixtures to help maintain light output
Refrigeration (cold storage)	<ul style="list-style-type: none"> • Precooling produce with cold water before putting it into refrigerated areas • Improving insulation of the refrigerated cold storage area, e.g. cold room curtains • Insulation on all pipe work should be in good condition • Reducing infiltration of warm air through the doors, cracks, and other openings • Regular maintenance and servicing of refrigeration equipment • Utilizing energy-efficient compressors, heat exchangers, and refrigerants • Preventing and detecting refrigerant leakage • Ensuring refrigerators are full but not overloaded
Crop drying and other storage	<ul style="list-style-type: none"> • Use energy efficient dryers, e.g. solar dryers • Excellent humidity control of dryers
Machinery and farm vehicles	Using fuel efficient vehicles and machinery <ul style="list-style-type: none"> • Efficient automation (efficient electric drives and motors, as well as automate monitoring and control systems) for production and processing • Correct gear and throttle selection • Proper tyre inflation • Selecting optimum truck size for the load • Route optimisation • Regular vehicle maintenance • Reduced idling • Reduced-till or no till cropping systems • Overlap reduction systems, e.g. auto-steer, obstacle isolation, proper equipment sizing • Variable Speed Drives – in milling, mixing, sieving, conveying, ventilation and drying processes.

Biomass by-products from agricultural activities can be used to produce energy for processing, storage and cooking. Residues generated from crop production and livestock provide an important source of bioenergy.

Manure and agro-processing materials can be used to produce biogas at different scales and for different purposes, including in buildings for cooking and lighting and in commercial establishments to produce heat, electricity and transport fuel.

According to the study performed by World Experience for Georgia (WEG) (Assessment of Wood and Agricultural Residue Biomass Energy Potential in Georgia, 2015), total of 304 Kt of agricultural residue, with 5.6 PJ of energy resource is generated in Georgia from perennial crops production. The energy potential of perennial crops' residue is 1.565 TWh/year. Main resources for perennial crop residues are:

- Vineyard's pruning residue;
- Fruit orchards' pruning residue;
- Hazelnut shells and cuttings;
- Bay leaf cuttings.

Total residue 108 Kt, with 2,0PJ total energy resource is annually yielded in Georgia from established vineyards. According to the research, there are 37 419 hectares of vineyards in Georgia, and energy value of residue per unit of area is 54.2 GJ/Ha (2015). Vineyards have the biggest potential in agricultural residue of Imereti, Kakheti, Racha Lechkhumi and Kvemo Svaneti and Kvemo Kartli regions.

Vineyards have the biggest part in agricultural residue of Georgia, but they are not used as an alternative heating source, most of the residues are left in the field or burnt. There is a clear tendency to increase the area under grape plant; accordingly, through establishment of modern intensive vineyards the amount of produced biomass is increasing.

The vine prune residues can be collected directly in the field by bailing and then after drying in the storage shredded (chopped). Shredded vine prunings can be used for heating both by population and public buildings for heating. In public buildings (kindergarten, school or any administrative building) these chopped residues can then be burnt in autonomous heating system boiler. The vine prune residues can also be used for production of fuel briquettes.

The biggest provider of agricultural residue in Georgia is hazelnut. Currently, hazelnuts represent big portion of Georgian agricultural exports. Hazelnut shells are used as an alternative heating source in cities and suburban areas of Samegrelo and Guria Regions. Average harvest of hazelnut is up to 40 000 ton/year. Yielding up to 24 800 ton/year of shell residues. About 1.55-ton dry shell residue becomes available per hectare per year. Average Heating Value for hazelnut is 1.6 PJ.

The experience gained in hazelnut growing regions of Georgia, like Samegrelo and Guria positioned hazelnut shell as a good alternative to firewood. The calorific value of the shell 18.0- 19,0 MJ/kg, is almost as high as that of oven-dry wood 18.5 MJ/kg. With the consideration of the fact that the firewood burnt by population has in average moisture content about/even higher than 40 per cent and calorific value 10.12 MJ/kg the hazelnut shells could be used very efficiently as fuel wood substitute both by population and for organization of autonomous heating systems in public buildings.

Energy audits and life cycle assessments are some of the tools used to promote the implementation of energy efficiency practices and renewable energy technologies.

An energy audit is an important tool or method of finding potential for energy efficiency measures and for assessing their financial viability. Energy audits help in:

- Understanding how energy is used within the system or process, and where it is wasted.
- Finding alternative measures to reduce energy losses and improve the overall performance.
- Performing a cost-benefit analysis to identify energy efficiency measures that are best to implement.

The following energy-efficient measures could be suggested for use in the sector's businesses based on the results of energy audits conducted in various SMEs throughout Georgia's food manufacturing industry:

Table 12. Energy Efficiency Measures Applicable to Small Food Manufacturing Enterprises in Georgia

Energy Saving Measures in:	Energy Savings
Electricity supply and consumption	
Potential energy saving opportunities are: <ul style="list-style-type: none"> ➤ Shut-off sections which do not require electricity when in operation; ➤ Cogeneration; a precondition is the coincidence of electricity and the relatively high demand for steam. 	
Steam generation and distribution	
Steam and high temperature hot water boilers offer many energy savings opportunities which can make significant cost savings to industries. The most appropriate option depends on the type of boiler and heating system, the requirements of the process or other heating demands and budget.	
➤ Locate and repair steam leaks in fittings, equipment and steam traps	10% - 15%
➤ Insulate pipelines and equipment	3% - 13%
➤ Increase condensate return rate. In case there is no condensate return line at all, consider retrofitting of condensate return line in the whole system or in parts of it where it is financially viable	Up to 10%
➤ Retrofit the boiler with economizer and recover flue gas heat, if flue gas temperature remains high, after cleaning (economizers are usually viable for boilers with a capacity of over 3 MW)	5%, up to 15% for condensing boilers
➤ Install Variable Speed Drives (VSDs) for fans, blowers and pumps	Up to 50% of energy use are achievable by reducing the fan or pump motor speed by 20% Up to 5%
➤ Make use of waste heat from production processes to preheat combustion air	Case specific
➤ Use of alternative fuels such as biomass	Case specific
➤ Improve housekeeping and maintenance	Case specific
Pumping Systems	
➤ Shut down unnecessary pumps	Case specific
➤ Replace oversized pumps with more efficient models	1-2%
➤ Change the speed of a pump for the most efficient match of horsepower requirements with output	5-40%
Lighting systems	
➤ Use of high efficiency lamps and luminaires ¹⁹	~ 75% from incandescent to LED lamps and ~45% from T12 to T5
➤ Implement automatic time switches and motion detectors	
➤ Implement modern lighting management systems	~ 30 - 50%
Industrial refrigeration and cooling²⁰	
➤ Reducing refrigeration leakage	
➤ Use of high efficiency compressors – increase the compressor size	
➤ Good housekeeping of refrigeration plants	

¹⁹ <https://www.energy.gov/energysaver/led-lighting>

²⁰ <https://www.carbontrust.com/resources/refrigeration-guide>

Furnaces, kilns and ovens	
➤ Operating at optimum furnace temperature²¹	5-10%
➤ Optimum capacity utilization	Case specific
➤ Use of high temperature heat recovery systems (recuperators or regenerators)²²	10-30%

It is notable that replacement of old machinery with new energy efficient one due to high investment costs has a relatively long payback period and it is not an easy decision for businesses.

The technological side advocates replacing obsolete and ineffective equipment with new, eco-friendly, and energy-efficient machinery that consumes less energy and provides higher-quality products, enabling local businesses to better compete on both domestic and international markets.

The institutional side of modernization involves altering behavior and management strategies, emphasizing more concrete examples of the advantages of energy efficiency, and raising public awareness through successful informational campaigns and research initiatives that support these sources of energy.

This is due to a number of factors:

- Energy efficiency education and information programmes are lacking.
- Lack of technical expertise. Energy-efficiency knowledge is now in short supply in Georgia and local energy efficiency and renewable energy sources project experience is insufficient, and thus prolongs the technological investment cycle.
- Georgian businesses are largely motivated by productivity and have minimal understanding of or awareness of energy-saving strategies. This trend is much more pronounced among small businesses.
- Lack of trained personnel, especially in regions, for installation, operation and maintenance of the renewable energy and energy efficiency technologies.
- Lack of commercial bank experience in financing energy efficiency and renewable energy projects, with lack of awareness of their possible economic benefits.
- Lack of interest in making investments in the growth of such renewable industry as biomass energy.
- Limited capacity of local research institutions.
- Lack of strategies and policies for the implementation of energy efficient projects.
- Insufficient professional expertise among local authorities for implementation of identified renewable energy projects.
- Lack of awareness by consumers, who regard energy as a public service rather than a valuable good and are very reluctant to change their consumption behavior unless this will tangibly improve their standard of living. For example, households' unwillingness to adopt renewable energy for fear of unreliability.
- Lack of fiscal and tax incentives, as well as lack of innovative financial instruments. Such incentives would ease the financing of projects, for example incentive that would reduce upfront capital costs. Innovative financial instruments would include dedicated credit lines providing soft loans, tax exemptions or support schemes for third-party financing.
- IFIs (International Financial Institutions) are encouraging EE/RES development through their credit lines, but the efforts are still insufficient, constrained, and connected to the specific projects. For instance, the EBRD offers local banks affordable credit lines, including subsidized loans and free technical assistance during the project development stage, to boost energy efficiency and development of renewable energy sources; KfW also has a similar programme.
- Shortage of informational/promotional means (media, advertising agencies, as well as engineers ensuring advertisement of utilization of technologies), best examples, case studies.

²¹ ["Roadmap for Process Heating Technology"](https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/process_heating_0401.pdf)
https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/process_heating_0401.pdf

²² <https://eippcb.jrc.ec.europa.eu/reference/energy-efficiency>

III. MAJOR GOVERNMENT POLICIES IN AGRICULTURAL SECTOR TO MEET CHALLENGES OF CLIMATE CHANGE

Environmental protection, rational use of natural resources and sustainable development of agriculture is a significant challenge for Georgia, especially against the backdrop of the continuing process of climate change.

Georgia is considered highly vulnerable to the effects of climate change, facing threats that include increased frequency and severity of **droughts, flooding, landslides. These are expected to have serious implications for agriculture, which is central to the Georgian economy.** A changing climate will also significantly impact the coastal zone. **The most vulnerable sectors are agriculture, forestry, tourism, health and cultural heritage**

Georgia's fourth National Communication (NC4), along with its National Inventory Report, was submitted to the UNFCCC in April 2021. The legal framework for a binding monitoring and reporting greenhouse gas emissions (MMR) system is not complete.

The NC4 reports increase in the mean annual ground air temperature in 1986-2015, compared to 1956-1985, – in the range of 0.25-0.58°C. The average increase in the territory of Georgia is 0.47°C. During the same period, the annual precipitation in western Georgia has mainly increased, while it decreased in some eastern regions. Average temperatures in Georgia have increased steadily since the 1960s and are projected to rise by more than the global average by the end of the 21st century. By the 2090s, the average temperature in Georgia is projected to increase between 1.4°C to 4.9°C above the 1986-2005 baseline, for emissions pathways RCP2.6 and RCP8.5, respectively. The frequency of heat waves is projected to increase significantly by the 2090s under higher emissions pathways, representing major risks to human health, livelihoods, and biodiversity.

Georgia has specific goals for developing agriculture and sees it as one of the nation's sources of economic growth. The Ministry of Environment Protection and Agriculture developed “Agriculture and Rural Development Strategy 2021–2027,”²³ which is based on the sustainable development principles to diversify and develop economic opportunities in rural areas, improve social condition and quality of life.

Strategy goals are:

1. Development of competitive agricultural and non-agricultural sectors;
2. Sustainable usage of natural resources, retaining the eco-system, adaptation to climate change;
3. Development of effective systems of food/feed safety, veterinary and plant protection;

To increase the competitiveness of the agricultural sector, the Strategy prioritizes the following specific objectives:

- Raising awareness and improve knowledge of farmers and entrepreneurs;
- Developing agricultural and non-agricultural value chain by focusing on diversification, innovative technologies, cooperation and support to producers' unions;
- Increasing access to various financial instruments;
- Supporting integration of farmers/entrepreneurs on the market;
- Stimulating young farmers and entrepreneurs in rural areas;
- Increasing access to infrastructure and services;
- Improving the irrigation and drainage systems;
- Dissemination climate-smart and environmentally adapted agricultural practices;
- Supporting the implementation of energy-efficient and renewable energy technologies and practices;

Maintaining agro-biodiversity. The processes related to the development of Georgia's LEDs Strategy (Long-Term Low Emissions Development Strategy) has started in the second half of 2020 and is currently ongoing. Georgia developed a Climate Change Strategy focused solely on mitigation. Since 2019, the country is in the

²³ <https://eu4georgia.eu/wp-content/uploads/Agriculture-and-Rural-Development-Strategy-of-Georgia-2021%E2%80%932027.pdf>

process of creating a national system for policies, measures and projections and updating its legislation to align with the EU standards. At national level, there are no generally applicable reporting formats. The GHG inventory compilation is project based and conducted according to the IPCC guidelines. Georgia continued developing its NECP in 2021, with regular meetings of the working groups including public authorities and energy sector stakeholders. Specific meetings with civil society have started in autumn 2021, as agreed under the Namakhvani mediation, followed by a public consultation. Depending on the outcome of the consultations, Georgia plans to finalize the NECP in 2022.

Georgia has established a high-level Climate Change Council, chaired by the MEPA Minister. The Council is intended to provide policy direction and guidance on climate action; improve cross-ministerial co-ordination; and oversee the country's measuring, reporting, and verification system.

The Georgia's updated Nationally Determined Contribution (NDC)²⁴ which was adopted on 8 April 2021 has a target to reduce greenhouse gas emission by 35 per cent below 1990 level of its domestic total greenhouse gas emissions by 2030. And in case of international support, Georgia is committed to a target of 50-57 per cent of its total greenhouse gas emissions by 2030 compared to 1990. Updated NDC is setting out feasible targets for limiting emissions in seven sectors (transport, buildings, energy generation and transmission, agriculture, industry, waste and forestry).

The Climate Strategy and Action Plan²⁵ was adopted by the GoG (Government of Georgia) on 8 April 2021, and primarily prepared by the Ministry of Environmental Protection and Agriculture of Georgia. The Plan includes tangible targets and measures for the decarbonization of all Georgian sectors. The Strategy was prepared for the period of 2021-2030, while the Action plan covers a period of 2021-2023.

The section "Agriculture" of the Climate Strategy and Action Plan covers emissions from livestock and crop production sectors, including manure management, enteric fermentation, agricultural soils, and energy use in agriculture, fishing, and forestry. Emissions from agricultural soils include direct emissions from synthetic and organic nitrogenous fertilizer use, decomposition of crop residues and emissions from pastures and paddocks, as well as indirect emissions from atmospheric deposition and nitrogen leaching and run off. Energy use in off-road vehicles, including the use of agricultural machinery, is not accounted in this section but rather within the transport chapter. Emission reduction targets against the baseline 3,326 GgCO_{2e} (2015) with implementation of measures outlined in the Climate Action Plan by 2030 as specified in the strategy is 4,624 GgCO_{2e}. The mid-term target by 2024 is 3,635 GgCO_{2e}.

Goal 5 of the Climate Action Plan aims at the support the low carbon development of the agriculture sector through encouraging climate-smart agriculture technologies and services and corresponds to Sustainable Development Goals 2, 6, 12, and 15.

In particular, the following actions are foreseen for the implementation:

Implement sustainable management of soil and pastures and support the introduction of sustainable domestic animal feeding practices:

- Reduce the emissions generated by enteric fermentation of the cattle, develop a methodology for changing the feed for the cattle and run a recommendation campaign. The objective of the measure is to maximize feed quality for up to 20 per cent of cattle by 2021, leading to lower emissions from enteric fermentation. Georgia has enough diversity in terms of forage plants, limiting rumination while increasing or keeping livestock productivity. Optimal feed mixes need to be identified and then communicated to dairy farmers through a manual. Further, Georgian grape map should be explored

²⁴ <https://mepa.gov.ge/En/Files/ViewFile/35777>

²⁵ [Ordinance of the Government of Georgia №167, on adopting the Nationally Determined Contribution, Climate strategy 2030, and Climate Action Plan 2021-2023 as Defined by the "The Paris Agreement" \(08/04/2021\); https://mepa.gov.ge/En/Files/ViewFile/50123; https://mepa.gov.ge/En/Files/ViewFile/50122](https://mepa.gov.ge/En/Files/ViewFile/50123)

since grape peel, and stone can be used as an alternative cheap dietary supplement for tackling ruminant emissions.

- Develop legislation on pasture management and prepare a project proposal with the aim of increasing the quality of livestock nutrition and conservation of pasture biodiversity as well as the reduction of the maintenance costs for cattle livestock for beneficiaries by handing over intensive grass production equipment to beneficiaries.
- Establish a climate-resilient and multifunctional Windbreak and Agroforestry Ecosystem (WAE), reducing land degradation, increasing soil and agricultural productivity, and diversification.

Build capacities of generating scientific evidence for the development of climate-smart approaches in the agriculture sector

- Develop cost benefit analysis and feasibility study to identify best options to increase further change in livestock feed for the next iteration of the Climate Action Plan.
- Develop cost benefit analysis and feasibility study to identify best options in which manure management systems can be implemented.
- Support existing and emerging cooperatives to implement sustainable pasture management practices and replicate the success factors of successful cooperatives for other cooperatives.
- Research and consultation processes to define economic and socially feasible Climate Smart Agriculture (CSA) actions in the context of Georgia.

IV. GOVERNMENT AND DONOR SUPPORT FOR THE DEVELOPMENT OF AGRICULTURAL AND FOOD SECTOR

LEPL (Legal Entity Under Public Law) **“Enterprise Georgia”**’s mission: supporting of manufacture and agriculture industries Government offers:

- Subsidies for loan interest payment
- Free lands/buildings for factory construction

“Enterprise Georgia” operates under the Ministry of Economy and Sustainable Development. It is a “one-stop-shop” for investors to support companies before, during and after the investment process as well as a moderator between investors, government and local companies.

“Enterprise Georgia” has a dedicated programme supporting **Micro and Small Businesses**²⁶. The programme is implemented in all regions of Georgia and supports more than 300 economic activities, including agriculture and food manufacturing. The programme supports businesses started or expanded in Georgian villages/mountainous regions by providing grant in the amount of 30,000 GEL. With the support of the European Union, the grant volume in the pilot regions of Imereti, Kakheti, Guria, Racha-Lechkhumi and Lower Svaneti is higher up to 40 000 GEL.

NNLE (Non-entrepreneurial Non-commercial Legal Entity) **Rural Development Agency**²⁷ (RDA) implements variety of programmes/projects initiated by the Ministry of Environmental Protection and Agriculture of Georgia. The agency’s mission is to promote the well-being and prosperity of farmers and rural residents by providing them with necessary resources in most efficient way. Supporting donor organizations of the Rural Development Agency are UNDP, ENPARD, USAID, IFAD, FAO, JICA, UN Women, and GIZ.

RDA’s agricultural programmes include greenhouse, fruit growing, livestock, horticulture, breastfeeding, agricultural machinery, beekeeping, sowing. The projects implemented by the agency are:

²⁶ <https://www.enterprisegeorgia.gov.ge/en/business-development/microgrants>

²⁷ <https://rda.gov.ge/en/programmes>

- The project "**Plant the Future**" is initiated by the Ministry of Environmental Protection and Agriculture. Its objectives include making effective use of the nation's uncultivated lands. The project components include co-financing for gardens, nursery gardens, seeding, anti-hail systems and well/drip irrigation system.
- **Bioproduction Promotion Programme** aims at the growth of production of bioproducts and provides financial support to potential beneficiaries. The programme supports financially the certification, consulting services, purchase of organic fertilizers and/or biopreparations for bees and honeycomb.
- **The Georgian Tea Plantation Rehabilitation Programme** seeks to maximize the potential of Georgian tea, encourage the production of high-quality tea that will boost exportability and self-sufficiency, and support contemporary processing businesses. RDA will contribute to the costs of the tea plantations rehabilitation.
- **Milk processing enterprise component** envisages support in the construction of milk processing enterprises in Akhalkalaki, Dmanisi and Tsalka municipalities.
- **Pilot Programme for Women** offers financial and technical assistance to potential female beneficiaries for setting up a new greenhouse in the municipalities of Marneuli and Lagodekhi.
- **Integrated Development Programme for the Pilot Regions** in Imereti, Kakheti, Guria, Racha-Lechkhumi and Kvemo Svaneti aims to increase the competitiveness of small and medium-sized enterprises and strengthen the regional innovative ecosystem
- **Preferential agrocredit/agroleasing** is given to the enterprises engaged in the processes of primary agricultural production, processing and storage. Agrocredits are granted by the commercial banks and financial institutions involved in the project, in compliance with the terms and conditions set by the Rural Development Agency.
- **Industrial apple sale promotion programme** was valid until 15 December 2022. The programme promoted the sales of non-standard apples grown by natural persons engaged in fruit farming by offering a subsidy of 0.10 GEL per 1 kg for non-standard apple purchased by the apple processing company for at least for 0.24 GEL per 1 kg.
- **State programme for Support of Agricultural Landowners** is subsidizing the price of the goods necessary for implementation of agricultural activities.
- **State Co-financing Programme of Refrigerated Storage Facilities for Berry Crops of Agricultural Cooperatives** aims at promotion of cooperation and storage of harvest from the orchards planted under the berry crop financing subcomponent within the state programme "Plant the Future".
- **Agroinsurance** covers such risks as hail, flood, storm, autumn frost (citrus crops).
- Some of the programmes that are temporarily suspended include the State Programme of Co-financing Agricultural Mechanization; State Programme of Dairy Modernization and Market Access; Green grants programme (insulation, solar do-it yourself systems, solar plant manufactured systems, solar air heating systems); Agricultural Machinery for Harvesting Co-financing Programme; Co-financing of Processing and Storage Enterprises; State Programme for Co-financing Storage Enterprises of Agricultural Cooperatives; State Programme for Support of Beekeeping Agricultural Cooperatives.

The European Union provides support to rural development and agriculture in Georgia through ENPARD, the European Neighbourhood Programme for Agriculture and Rural Development. Implemented since 2013, the main goal of the ENPARD is to reduce rural poverty. Programme assistance is provided to the government and also to NGOs working directly with communities on the ground.

With total budget of EUR 234.5 million for ENPARD²⁸ in Georgia, for the period of 2013-2025, the programme aims to reach three goals:

- To build capacity and support government institutions in the reform of the agriculture and rural development sector;
- To improve employment and living conditions of rural populations by strengthening farmers' cooperation skills and access to resources;
- To promote diversified social and economic opportunities in rural areas, particularly for women and youth, in due respect to the environment and the cultural heritage.

²⁸ https://eu4georgia.eu/wp-content/uploads/Factsheet_Eng_Final.pdf

Food and Agriculture Organization of the United Nations (FAO) assistance is shaped by the 2021-2025 FAO Country Programming Framework (CPF) and derived from the UN Sustainable Development Cooperation Framework for Georgia (UNSDCF). FAO will bring expertise and international experience to assist Georgian government in reaching development priorities by:

- Reducing the disparities between urban and rural areas through maximization of agriculture potential and diversification of the economy in the rural areas.
- Supporting small holders by enhancing productive employment, strengthened livelihoods and agri-food systems, and enabling policies.
- Supporting private sector competitiveness particularly Micro, Small and Medium-Sized Enterprises involved in agriculture and food processing.
- Providing policy support to enable food safety standards, traceability of agriculture products and better consumers' protection and enhanced export opportunities.
- Supporting the government of Georgia in implementing the agricultural extension strategy and strengthening the capacities to improve agricultural extension services, with a focus on gender related issues.
- Enhancing resilience, mitigation, and adaptation to climate change of the agri-food sector by strengthening natural resource management of soil, reducing land degradation, protection of biodiversity including forestry and fisheries.

FAO ongoing projects²⁹ in Georgia include:

- **Achieving Land Degradation Neutrality Targets of Georgia through Restoration and Sustainable Management of Degraded Pasturelands (MSP)** -Donor: Global Environment Facility (GEF)
- EC ENPARDIII³⁰ - **Improving the Agriculture Sector in Georgia** - assistance to Georgia's Ministry of Environment Protection and Agriculture improve access to finance, services and inputs for farmers, rural households, cooperatives and other small and medium enterprises. The project offered pilot activities for farmers, including various types of demonstration, information dissemination, and training events. Finally, individual matching grants were provided to small farmers, rural entrepreneurs, cooperatives, and other small and medium enterprises and municipalities to encourage investment and improve their overall competitiveness. Grant amount ranging from USD 1000 up to USD 150,000, co-funding up to 60 per cent of the investment costs. Small and medium producers received over 200 grants in total, with the large-scale enterprises getting 14 grants in 2020. EU and FAO awarded 175 matching grants³¹ with a total amount of 8.5 million GEL in the last two years. Grant support co-funding various capital investments in Georgia's agriculture sector aimed at increasing production, creating extra jobs, and preventing instability in food supplies. In 2020, Georgian farmers and agricultural producers could make capital investments – purchase new tractors and machinery, optimize the processing and storage of the goods with new automated solutions, buy the equipment for large-scale dairy, vegetable, and fruit productions and many more.
- EU Innovative Action for Private Sector Competitiveness in Georgia implemented by four UN agencies strengthens capacities of policymakers and other stakeholders to identify and develop clusters in the packaging and seeds/seedlings sectors.
- The Farmer Field Schools foster economic empowerment of women farmers by supporting homemade dairy production in Georgia. Donor: Swiss Agency for Development and Cooperation.
- Support to the Food Safety and Sanitary and Phytosanitary Sector in Georgia under ENPARD IV is continued with the support to the development of policy tools, administrative and technical capacity of the food safety and sanitary and phytosanitary sector of Georgia. Donor: European Union.

The United Nations Industrial Development Organization (UNIDO) established the Resource Efficiency and Cleaner Production (RECP) Clubs for industrial enterprises. RECP clubs are defined as a group of companies coming together to share information, advice and experiences in RECP practices. They jointly take part in an intensive training and coaching programme leading to a customized action plan for all member companies.

²⁹ <https://www.fao.org/georgia/programmemes-and-projects/project-list/en/>

³⁰ www.EU4Georgia.ge

³¹ <https://eu4georgia.eu/eu-and-fao-award-over-gel-8-5-million-in-agricultural-grants/>

Implementation of the action plan will help the club member companies to save energy, water and materials, reduce negative impacts on the environment and human health, increase their profit, improve compliance with the Georgian environmental legislation and increase access to financial resources to invest in cleaner technologies. To support national RECP activities among SMEs, the clubs can promote the online resource efficiency self-assessment tool I-GO Assistant for SMEs and navigation tool I-GO Network.

The United States Agency for International Development (USAID) has the five-year (2018-2023) USD 23 million Georgia Agriculture Program³² which aims to accelerate the growth of agricultural sub-sectors that show strong potential to create jobs, improve incomes, and increase revenues of the micro, small, and medium enterprise (MSME). The Programme also contains an integrated grant component to deliver cost-share grants to producers, processors, cooperatives, service/information/extension providers and associations.

The Georgia Hazelnut Improvement Project³³ is a USD 7.3 million five-year project (2015-2022) funded and implemented by a Global Development Alliance (GDA) between USAID, Ferrero and CNFA. The project aims to increase the sustainable capacity and private sector development of the hazelnut industry in Georgia.

USAID Potato Program³⁴ in Georgia aims to sustainably increase the productivity and value of potato sales among smallholder farmers. It will do this by increasing the scale and quality of local seed potato production. The programme will address the root causes of low productivity and facilitate the commercial and institutional platforms that underpin a sustainable potato marketing system.

Austrian Development Agency (ARD)'s³⁵ main focus of activities in Georgia is agriculture and developing a sound legal base as well as introducing modern agro-technologies and agro-management through the so-called good agriculture practices (GAPs), demo-plots, training and direct assistance to beneficiaries. ARD is supporting a number of projects on agriculture and rural development in Georgia. The aim of the projects is to improve the diversification and competitiveness of the rural economy, inclusion of vulnerable groups and sustainable use of resources in the municipality of high mountainous regions (municipality of Mestia).

³² <https://www.cnfa.org/programme/usaaid-agriculture-programme/>

³³ <https://www.cnfa.org/programme/georgia-hazelnut-improvement-project/>

³⁴ https://cipotato.org/cip_projects/usaaid-potato-programme-in-georgia/

³⁵ <https://www.entwicklung.at/en/countries/south-caucasus/georgia>

V. CONCLUSIONS AND RECOMMENDATIONS TO REDUCE ENERGY COSTS AND IMPROVE ENERGY EFFICIENCY BY FOOD PRODUCING AND FOOD PROCESSING SMALL BUSINESSES IN RURAL AREAS OF GEORGIA

5.1. CONCLUSIONS

According to Energy Balance of Georgia, the energy consumption of the “agriculture, forestry and fishery” sector in 2020 amounted to 24,900 toe, which is only 0.6 per cent of the total energy consumed in Georgia, making the sector the least direct energy consuming sector in the country. At the same time, the energy used for production of food, beverages and tobacco is included in the industry sector and makes 8 per cent of energy used by this sector. To add estimations on energy consumed (2.5 per cent of energy consumed by households) for economic activities of family holdings (households) for plant growing, cattle breeding and poultry raising in the amount of 35,200 toe, the estimated energy consumed by agricultural sector and food production in 2020 was 128,932 toe or 2.9 per cent of total energy consumption.

Energy intensity level of primary energy (MJ/USD 2017 PPP GDP) for Georgia in 2019 was 3.83 MJ per 2017 USD PPP lower than the world energy intensity which stood for 4.7 MJ per 2017 USD PPP. At the same time, energy intensity of the Georgian industry and agriculture is higher than in some European countries.

In 2020, oil and natural gas accounted for 29.3 per cent and 38.5 per cent, respectively, of the total energy consumption in Georgia. Both of these energy sources are imported, so it is crucial to conserve energy in the agriculture and food industries, which depend on imported fuels, given the current volatile state of the energy markets and price increases. With pricey fossil fuel, it will be extremely difficult to increase food production by as much as necessary to meet anticipated food demand by 2050 (the FAO anticipates a 60 per cent increase in food consumption over 2006–2007 levels).

Climate change may have a significant impact on agri-food systems since it can lead to severe droughts, floods, changes in water availability, and changes in soil quality. These adjustments may have an impact on rising energy demand. According to 2021-2023 Action Plan of Georgia’s 2030 Climate Strategy, by 2030 emissions in the Georgian agricultural sector are expected to increase by about 40 per cent.

Energy demand and related expenses could be decreased by increasing energy efficiency in the agricultural sector.

This significantly contributes to reducing reliance on fossil fuels and, consequently, GHG emissions. In other words, implementing energy efficiency has the advantages of improved crop quality and leads to higher crop yields and more profitability, which boosts sales as consumers buy more "green" products. Helping the environment also boosts a company's reputation.

The most promising fields for energy efficiency improvement are:

- Fruit and vegetable processing which uses modern and energy efficient technological units and automated processes;
- New technologies for livestock breeding and meat processing.

Energy efficiency can be adopted in numerous agricultural sub-sectors and approaches, such as:

- Substituting a less energy-efficient technology for a more energy-efficient one, such as a solar water system for an electric water heater.
- Using extra energy-saving technologies, such as adding sensors to lighting and air-conditioning systems, double-glazing windows, and insulation in homes, can achieve some energy savings.
- Behavior change, such as composting instead of largely relying on inorganic fertilizers.

Energy efficiency practices applicable to field crop production include fertilizer use, efficient irrigation systems, switching to energy efficient lighting systems, energy efficient improvements in cooling and refrigeration systems, energy efficient (solar) dryers, using fuel efficient vehicles and machinery, etc.

Biomass by-products from agricultural activities can be used to produce energy for processing, storage and cooking. Residues generated from crop production and livestock provide an important source of bioenergy.

According to energy balance for 2020, biofuels and waste accounted for only 5.1 per cent of the consumed energy. In physical units this was made up of 1211.9 thousand m³ of fuel wood, 9.3 thousand tons of other vegetal materials and residual (pellets, briquettes, etc.), 1,000 tons of biodiesel, 100 tons of charcoal. From this amount “food, beverages and tobacco” sector consumed 3.9 thousand m³ of fuel wood and 0.4 thousand tons of vegetal materials and residuals, while “agriculture, forestry, fishing consumed” 500 m³ of fuel wood and 100 tons of charcoal.

According to the study performed by WEG (Assessment of Wood and Agricultural Residue Biomass Energy Potential in Georgia, 2015), total of 304 Kt of agricultural residue, with 5.6 PJ of energy resource is generated in Georgia from perennial crops production. The residue from perennial crops has a 1.565 TWh/year energy potential. The residue from perennial crops has a 1.565 TWh/year energy potential. Vineyard prunings, fruit orchard prunings, hazelnut shells and cuttings, and bay leaf cuttings are the main sources of perennial crop residues.

As demonstrated by the energy audits performed in numerous small size enterprises, there is also a significant potential to decrease energy usage in food manufacturing sector. Based on the findings of energy audits carried out in various SMEs throughout Georgia's food manufacturing industry, various energy-efficient measures related to electricity supply and consumption, steam generation and distribution, pumping and lighting systems, industrial refrigeration and cooling and furnaces, kilns and ovens could be recommended for application in the sector.

Modernization means replacing outdated and inefficient technology with new, environmentally friendly, and energy-efficient machinery that uses less energy. This will enable local businesses to better compete on both domestic and international markets. The institutional side of modernization involves altering behavior and management strategies to emphasize the advantages of energy efficiency.

It is noteworthy that replacing outdated machinery with new energy-efficient equipment has a somewhat long payback period due to significant investment costs, making it a difficult choice for enterprises.

Georgian businesses are largely motivated by productivity and have minimal understanding or awareness of energy-saving strategies. Energy-efficiency knowledge is now in short supply in Georgia, and local EE and RES project experience is insufficient. It thus prolongs the technological investment cycle.

Regions experience lack of qualified technical skills in implementation and maintenance of clean energy technologies. Commercial banks also lack the experience necessary to finance these initiatives and have limited understanding of the potential environmental and economic benefits of such projects.

There are no fiscal and tax incentives, as well as innovative financial instruments. Such incentives, for instance the one that would lower up-front capital expenses, would make project financing easier. Although IFIs are promoting EE and RES development in the country with their credit lines, the efforts are still not enough, limited and tied to the particular projects or interests. Therefore, a massive and all-inclusive information campaign is necessary.

5.2. RECOMMENDATIONS

There are recommendations addressed to the Ministry of Economy and Sustainable Development, and the Ministry of Environmental Protection and Agriculture:

- For the programmes implemented by “Enterprise Georgia” and “Rural Development Agency,” introduce the energy efficiency potential assessment for small business as well as procurement of energy efficient machinery and equipment during the implementation process.
- Create data collection mechanism for the assessment of energy efficiency potential of the components of various food production systems, create sub-sector benchmark indicators and use those indicators to define support mechanisms to the companies for improvement of their energy efficiency performance.
- Provide government support or facilitate donor support to programmes for energy auditing of small enterprises and provide assistance to small businesses to assess their energy efficiency potential, help them to define necessary measures for the improvement of their energy and environmental performance.
- Support the creation of horizontal platform for knowledge sharing and information exchange among experts, small business owners and stakeholders interested in improving energy efficiency in small and medium enterprises. This can be done on the basis of experience of RECP (Resource Efficiency and Cleaner Production) Clubs established by UNIDO.
- Support sector associations, clusters, organizations with expertise in energy efficiency to provide expert advice, assess sector energy efficiency potential, assist companies with preparation of business plans and financial proposals for loan applications to the banks and assist companies with reporting to the bank.
- Support design and development of proposals (energy efficiency or renewable energy projects which reduce, avoid, or remove greenhouse gas emissions from the atmosphere and contribute to the mitigation of climate change) for inclusion of sector enterprises in carbon offset trade projects.

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