

European Union support to Lankaran – Astara Economic
Region of Azerbaijan

Value chain analysis of fruit
and vegetable sector in
Lankaran-Astara Economic
Region



APPLE AND POTATO VALUE CHAINS IN LERIK DISTRICT



Funded by the
European Union

WEglobal

Project implemented
by WEglobal and its
consortium partners

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FOREWORD

We express our gratitude to the head and officials of Lerik District Executive Power Office, the representatives of the Executive Power in the administrative territorial villages and municipalities.

We also owe a debt of gratitude to the regional offices of the Ministry of Economy, including its Regional Branch in Lankaran, SME Development Center of Small and Medium Business Development Agency. The support of the Ministry of Agriculture's organizations in the region and district was invaluable. This includes the Lankaran Regional Training Center and the Lerik State Agrarian Development Center. In addition, the team was supported by the Lerik District Statistics Office. This support was essential in conducting analyses, surveys, interviews, field trips and observations. Assistance was also provided to organize discussions with focus groups and the collection of data for the report.

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February 2024

EU4Lankaran Project Team

LIST OF ABBREVIATIONS

ACDA	Agrarian Credit and Development Agency
AAS	Agrarian Advisory Services
AIC	Agrarian Innovation Center
EU	European Union
ASA	Agrarian Services Agency
ARC	Agricultural Research Center
ASAU	Azerbaijan State Agricultural University
AFSA	Azerbaijan Food Safety Agency
AIF	Agrarian Insurance Fund
APS	“Agro Procurement and Supply” Open Joint Stock Company
SRIPPTP	Scientific Research Institute of Plant Protection and Technical Plants
LSU	Lankaran State University
ASC	Agrarian Subsidies Council
SADC	State Agrarian Development Center
SRI	Scientific Research Institutes
EAIS	Electronic Agriculture Information System
MoE	Ministry of Economy
EDF	Entrepreneurship Development Fund
SMBDA	Small and Medium Business Development Agency
MoA	Ministry of Economy
RTC	Regional Training Center
SMB	Small and Medium Business
AzStat	State Statistical Committee
SRIVG	Scientific Research Institute of Vegetable Growing
AWF	Amelioration and Water Farm
SRIFTG	Scientific Research Institute of Fruit and Tea Growing
MLSP	Ministry of Labour and Social Protection of Population

INTRODUCTION

Lerik district, which is the part of Lankaran-Astara economic region (LAER) of Azerbaijan, is one of the areas that stand out due to its agricultural potential, comparative advantage, and geographical location. The main occupation and source of income for the population of the district, which is mainly located in a mountainous terrain is agriculture. Measures implemented within the framework of the adopted state programs related to the development of the socio-economic and non-oil sectors of the regions, including agricultural sector, have had a positive effect on the socio-economic situation. However, a comparative analysis of per capita output and income, fixed capital investment, credit investments and other economic indicators with other administrative districts included in the region suggest that the current level of development of the region is not at a desirable level compared to its potential, including geographical location, soil-climate conditions, labour resources, and traditional production methods of the population.

Apple and potato production are traditional and promising areas in increasing the income of the population and the development of the region's agriculture as a whole. The analysis shows that 53.0% of the apple orchards and 14.9% of the area under potato cultivation in the LAER are in Lerik district, and 24.1% of the apples, 8.1% of the potatoes are produced here. The share of income of the producers in the value chain for both products is however insufficient.

The purpose of the study is to investigate the strengths and weaknesses, opportunities and prospects in order to increase the share of producers in the structure of incomes with regards to the links of the value chain of apple and potato products in Lerik district, to make proposals for the development of modern and competitive value chains. In the report the role of apple and potato production in the district's economy is analysed along all links of the value chain of both products, including inputs, production, harvest and post-harvest, markets and traders, marketing and sales, logistics, and business environment. Conclusions are drawn and recommendations made for policy makers and value chain stakeholders.

1. METHODOLOGY

The research process includes desktop analysis, surveys, interviews, field visits and observations, focus group discussions and use of the obtained data and results.

Desk analysis: The publications and data of the following institutions were used as the main sources of information in conducting the research:

- *Reports on relevant projects implemented by international organizations (FAO, UNDP) and the European Union*
- *Socio-economic, regional, as well as sectoral adopted State Programs and measures implemented within the framework of these documents;*
- *Ministry of Economy and its institutions: Entrepreneurship Development Fund, Lankaran Regional Department, Lankaran Small and Medium Business Development Center information and reports;*
- *Ministry of Agriculture and its subordinate institutions: Lerik State Agrarian Development Center; Lankaran Regional Training Center; Department of work with farmers, associations and cooperatives; Plant growing organization and monitoring department; application of information technologies and electronic management department; Agrarian Research Center; Agrarian Credit and Development Agency; Scientific-Research Institute of Vegetables; Scientific-Research Institute of Fruit and Tea Growing ; Agrarian Innovation Center; State Seed Fund; Azerbaijan State Agriculture University and other institutions reports and information;*
- *Information and reports of the State Customs Committee;*
- *Information of the Lerik District Executive Committee;*
- *Reports and information of the Central Bank, other banks and non-for credit organizations operating in the region;*
- *Information of the State Statistics Committee and its Lerik district department;*
- *Information of the Lankaran Regional Department of the Azerbaijan National Academy of Sciences;*
- *Reports of the Center for Economic Reforms and Communication;*
- *Information of the Azerbaijan Fruit and Vegetable Exporters Association Public Union, etc.*

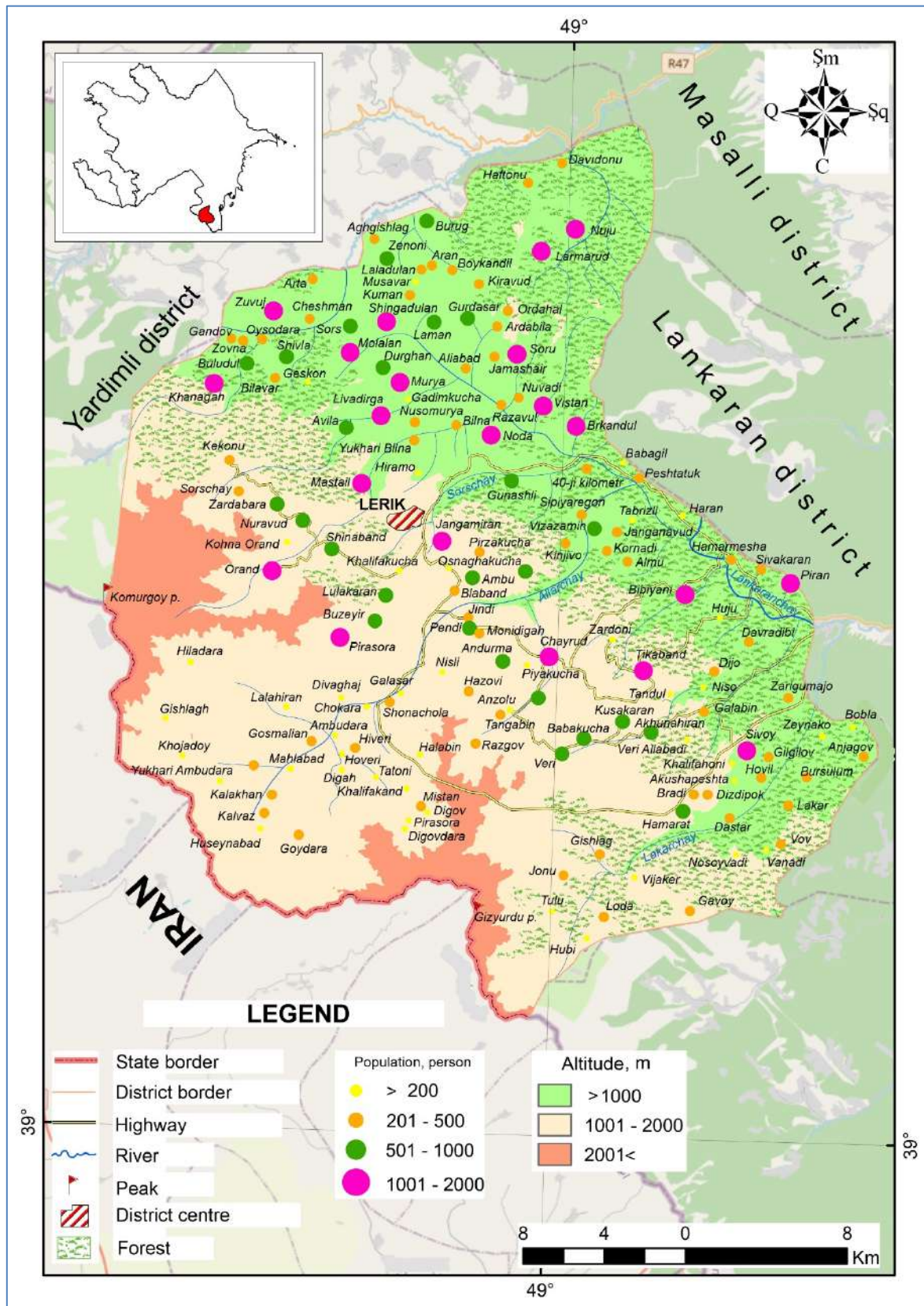
Surveys and observations: Involvement of all interested parties along the links of the value chain of apple and potato produced in Lerik district accordingly to survey, including agricultural producers, suppliers, processors, buyers, trade intermediaries and all other interested parties, as well as the data obtained within the framework from the field visits are methodologically based of the research work. The questions of the survey refer to the final product price, access to markets, competition, access to financial resources from the beginning of production process to the final buyer in the value chain, the level of preparedness of producers for this process, size of farms and their productivity, compatibility of soil and climate conditions, supply of seeds, other input materials and technical

resources, application of production methods, product quality and branding, packaging, labelling, supply of plant protection products and mineral fertilizers, access to agrarian advisory services, gender role in the value chain, opportunities and prospects for development of farming business.

Focus group discussions: The results of the fruit and vegetable sector screening and mapping followed by SWOT analysis with the local executive authorities, the Lankaran branch of the Ministry of Economy, State Agrarian Development Center, Lankaran Regional Training Center of the Ministry of Agriculture, Lerik State Agrarian Development Center, Lerik district branch of the State Statistics Committee and small, medium and large apple and potato producers; as well as of target group discussions with the participation of buyers, trade agents, and other interested parties.

Data verification: desktop analyses based on cross-checking the official statistics, field survey observations; data obtained through focus group discussions were refined through cross-checking with records made during the meetings. This enabled identification of deviations and inconsistencies and their elimination.

2. LERIK DISTRICT



2.1. Socio-economic development of the district

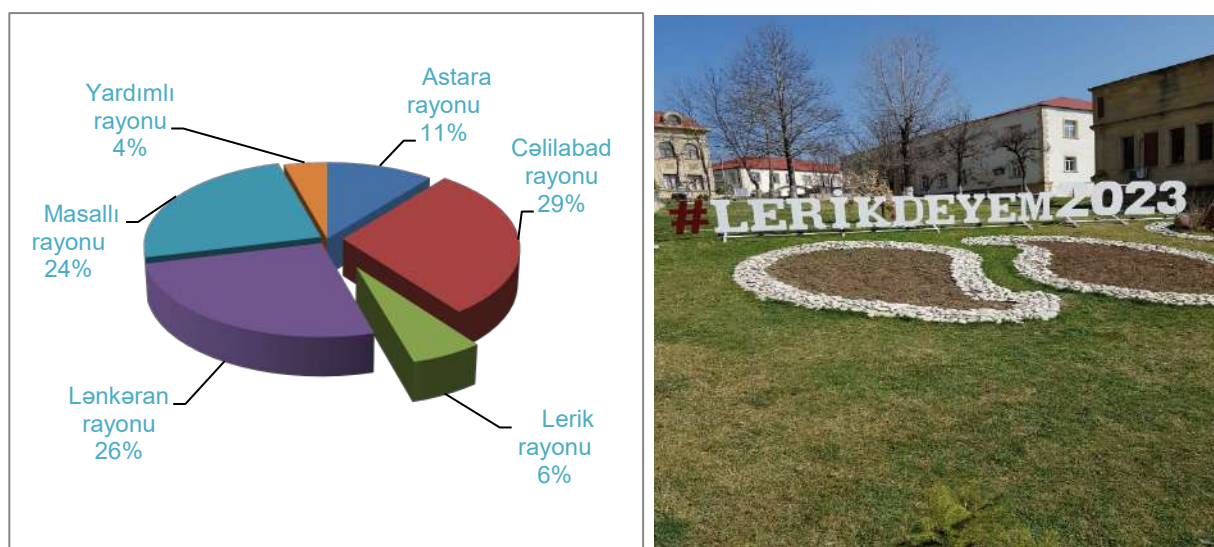
Lerik district, as part of Lankaran-Astara economic region is 1.08 thousand square kilometres. As of January 1, 2022, the district's population is 87.3 thousand people, and the number of people per square kilometre is 81, 10% of the population lives in Lerik district and 90% in its rural areas. In 2021, the natural increase in the district per 1000 people was 8.4 people, which is characterized as the land of longevity in Azerbaijan. High natural growth creates a favourable basis for low-cost production in labour-intensive agricultural areas. Looking at the structure of the population by age groups, we see that the share of the population between the ages of 16 and 64 is 68.7%, which is the precondition of the development in labour-intensive areas.

The number of settlements in the district is 162. The forest area is 40320 hectares. The agricultural land area is 52,568 hectares or 53.3% of the total land area. As a result of land reform, 13,801 hectares of land were allocated to 13,500 families, which mean on average of 1.02 hectares of land per household.

Measures implemented in the region within the framework of state programs related to the development of the socio-economic and non-oil sectors, are targeted at improving infrastructure and the well-being of the population. Within the framework of the "State Program for the Socio-Economic Development of the Regions of the Republic of Azerbaijan in 2019-2023", the 56-km Lankaran-Lerik and 22-km Lerik-Shineband-Orand-Nuravud-Zardabare highways were built, and asphalt was laid on the 2.5 km Blaband-Monidigah and 1.5 km Lulekaran highways.

Since Lerik district is predominantly located in a mountainous terrain with no industrial sites, the main occupation and source of income of the population is agriculture. Looking at the structure of the produced products in the Lankaran-Astara region in 2021 by administrative districts, we find that 1989.7 million AZN worth of products were produced. Of this the contribution from each district was as follows: 6% (or 116.6 million manats) Lerik district, 4% Yardimli, 11% Astara, 24% Masalli, 26% Lankaran and 29% to Jalilabad (Figure 1)

Figure 1. The structure of the gross product of LAER, 2021



Source: State Statistical Committee

As of January 1, 2022, the amount of capital investment in the district was 2899.1 AZN or 1.91% of the total investment to the region. The projects financed by the Entrepreneurship Development Fund of the Ministry of Economy within the framework of measures of state support for entrepreneurs play a significant role in the economic development of the region, including Lerik district (Table 1).

Table 1. Projects financed by the Entrepreneurship Development Fund in Lankaran-Astara economic district*

Indicators	Total	Astara	Jalilabad	Lankaran	Lerik	Masalli	Yardimli
Number of financed investment projects	413	110	57	97	87	52	10
%	100	26,6	13,8	23,5	21,1	12,6	2,4
Amount of concessional loan granted, 1000 AZN	9964	3285	1907	2116	1308	1184	164
%	100	33,0	19,1	21,2	13,1	11,9	1,6
Number of jobs created	280	86	27	68	66	28	5
%	100	30,7	9,6	24,3	23,6	10,0	1,8
Average cost of a project, AZN	2412,6	2986,4	3345,6	2181,4	1503,4	2276,9	1640,0

Source: Socio-economic development of regions, Statistical yearbook. Baku, 2023

The number of projects financed by the Entrepreneurship Development Fund in the region, in 2019-2023 was 413, of which 87 or 21.1% was in Lerik district. The district's share of concessional loans was 13.1%, and the number of jobs created was 23.6%. Of the average cost of a project, the lowest amount of 1503.4 AZN, was in Lerik district. This figure was 2412.6 AZN for the region, 2986.4 AZN for Astara, 3345.6 AZN for Jalilabad, 2181.4 AZN for Lankaran, 2276.9 AZN for Masalli, and 1640 AZN for Yardimli.

The main reasons for the low level of investments in Lerik district include the following:

- Small number of capital-intensive projects or applications;
- Predominance of small farms in the agricultural system;
- High credit risk in the region for credit institutions;
- Absence of bank branches in the district.

The focus of investments was as follows:

- Astara: animal husbandry, beekeeping, horticulture and fish farming
- Jalilabad: animal husbandry, potato farming, horticulture, agriculture, vegetable farming, poultry farming and beekeeping
- Lankaran: animal husbandry, poultry farming, beekeeping, plant breeding, horticulture, agriculture, decorative seedling, greenhouse vegetable growing and fishing, and milk processing
- Lerik: animal husbandry and beekeeping
- Masalli: animal husbandry, beekeeping, poultry, horticulture, agriculture and vegetable growing in greenhouse conditions
- Yardimli: animal husbandry and beekeeping

Development of horticulture and potatoes are important crops for Lerik district, The financing of investment projects for these value chains are important for the development of the district. The construction of modern irrigation systems, storages and the commissioning of mini-processing centers will have a positive cumulative impact.

As a result of the state's agricultural policy measures, subsidies and concessional loans are provided to agricultural producers in the region. In 2019-2022, the Agrarian Credit and Development Agency of the Ministry of Agriculture of the Republic of Azerbaijan granted concessional loans in the amount of 1.169,500 AZN for the development of animal husbandry in Lerik district, and 1.426,000 AZN for the development of beekeeping. In addition, the following state support measures were implemented for agricultural producers operating in the region:

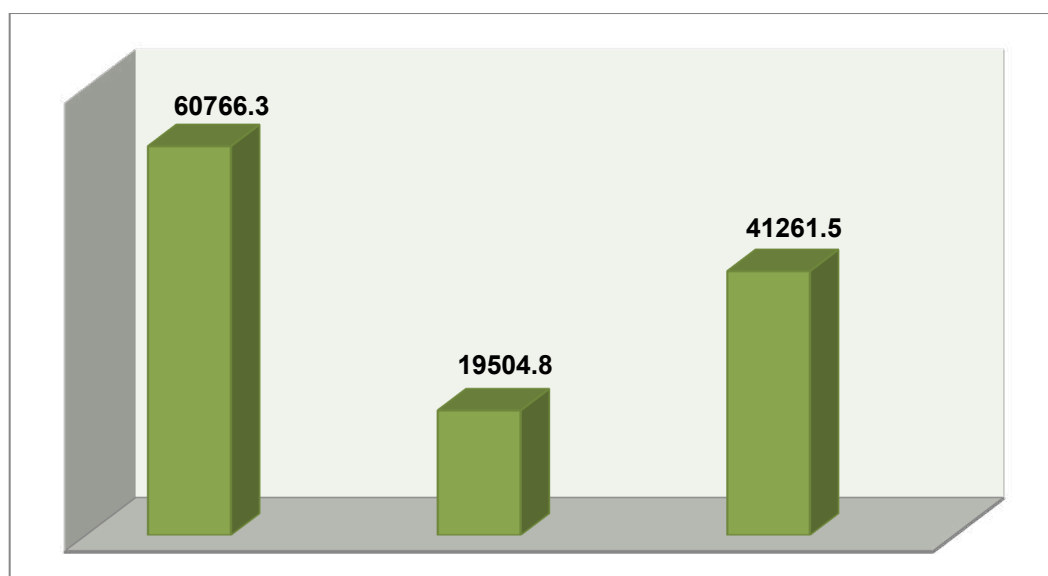
- Crop subsidies amounting to 612,800 AZN were provided to 2099 producers of agricultural products for their crops and perennial plantings on 2.88 thousand hectares;
- Animal husbandry subsidies of 54,000 AZN were provided to 280 animal owners for 540 calves raised through artificial insemination;
- 819 beekeepers received subsidies totalling 188,950 AZN for 18895 bee families.

To meet the demand from farmers for fertilizers and pesticides, 126.5 tons of fertilizers and 242.8 l kg of pesticides were sold at discounted prices by "Agroservis" OJSC.

Entrepreneurs were provided loans of 177,000 AZN and concession funds in the amount of 238.9000 AZN for the purchase of 36 technical equipment. A total of 182 pieces of machinery are registered with the state in Lerik district. Of these, 33 were registered between 01.01.2022 to 30.12.2022. Besides these 132 pieces of machinery was submitted for state technical review.

Agriculture, which is the main basis of the district's economy, produced products worth 60,766.3000 AZN in 2021, which is 52.1% of the total district output (Figure 2).

Figure 2. Total agricultural output in Lerik district, (000 AZN)



Source: State Statistical Committee

As can be seen from Figure 2, 41,262.5 AZN (67.9%) of the agricultural product (60,766.3 thousand manats) was livestock and 19,504.8 AZN (32.1%) were crops.

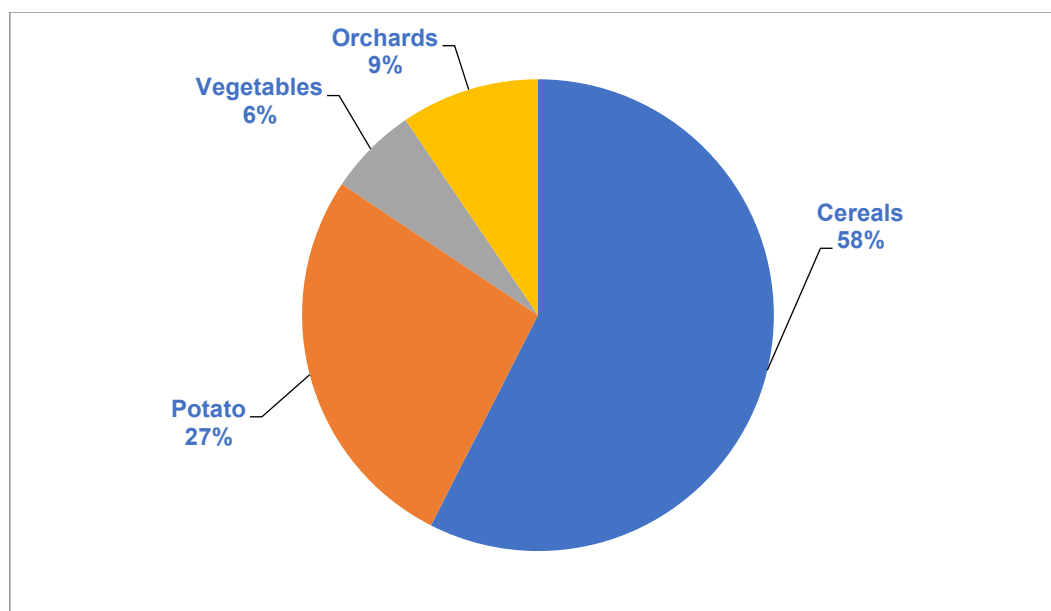
In 2022, 2864 hectares of land was cultivated, and 6760 tons of grain produced. The average yield per hectare was 2.36 tons. Of these, 22286.5 tons of potatoes were produced from 1537 hectares, 584.3 tons of garlic from 45 hectares, 2578 tons of onions from 200 hectares, 369.1 tons of cabbage from 28.5 hectares, 387 tons of cucumbers from 30 hectares and 517.5 tons of tomatoes from 39.5 hectares.

There were 3,8611 heads of cattle, 356 less than in 2021. The number of sheep and goats was 77807, which was 34347 less than in 2021. Farms produced 9632.4 tons of meat, an increase of 4141.0 tons over 2021, The production of milk at 24020.7 tons was 59.5 tons more than the previous year. In total 7930 thousand eggs were produced, 480 thousand more than in 2021, Less wool was produced at 86.7 tons, which was 31.7 tons less than in 2021. This shows clearly that both in the district and region and the country, the value of animal husbandry in total agricultural products is increasing. This trend can be attributed to:

- high market demand for livestock products;
- lower risk of animal husbandry compared to crop farming;
- Due to the low risk, bank and non-bank financial organizations are more interested in providing credit to this sector.

Cereals, and legumes accounted for 58.0% of the cultivated area, potatoes for 27%, orchards for 9%, and vegetables for 6% (Figure 3).

Figure 3. Structure of farmland in Lerik district in 2021



Source: State Statistical Committee

The analysis shows that, as in the whole country, cereals are the predominant crop grown and important for ensuring food security. The high level of mechanization and thus lower labour costs, less demand for water and the need for water during the low agriculture season mainly autumn and summer are the reasons why this crop is popular.

Table 2. Dynamics of arable land in Lerik district (in hectares)

CROPS	2015	2019	2020	2021	In 2021 compared to 2015, in %
Cereals and grain legumes	1514	3226	3038	3218	212,5
Autumn and spring wheat	1184	2782	2595	2721	229,8
Potato	1297	1422	1446	1505	116,0
Vegetable	295	314	322	343	116,3
Orchards and berries	474	529	530	531	112,0

Source: State Statistical Committee

As shown in the table, in 2021, compared to 2015, the sown area of grain crops in the district was increased by 112.5%, including winter and spring wheat by 129.8%, Potatoes by 16.0%, vegetables by 16.3%, orchards, and berries by 12.0%.

The analysis shows that although some work has been done in the direction of the application of innovations in agriculture, the expansion of cultivated areas played a key role in the increase in production of the main agricultural products. However, productivity did not keep pace. When the cultivated area of grain and grain legumes expanded by 112.6%, the productivity increase by 15.3%. However, the productivity of potatoes, fruits, and vegetables decreased.

Productivity is related to external and internal factors like:

- Climate change, subsidies, concessional loans, supply of inputs are external factors
- Internal factors include farmers' knowledge and skills in innovation of all links of the value chain, especially in the input, production, storage, and marketing stages.

A key weakness of the agriculture sector in Lerik and the region as a whole is the lack of good advisory services for farmers. There is a severe lack of specialists, especially agronomists. Accessible advisory services (AAS) allow for the application of new knowledge and ideas to improve farmers' incomes and the standard of living of their families. Left to their own, agricultural producers have limited access to the support and services required to improve incomes and competitiveness. Advisory services and training tailored to their expectations provide them with the knowledge and information needed to solve their problems. Currently, agrarian advisory services are provided by the state and private sector in the Lankaran-Astara region. The institutions involved in the provision of AAS in the Lankaran-Astara economic region are listed in diagram 1 below. There is need for providing additional agricultural advisory services in the Lankaran – Astara economic region. Due to the topography of Lerik district, the fact that the farmers have limited land and thus lower income, it is difficult to attract private consultancy services.

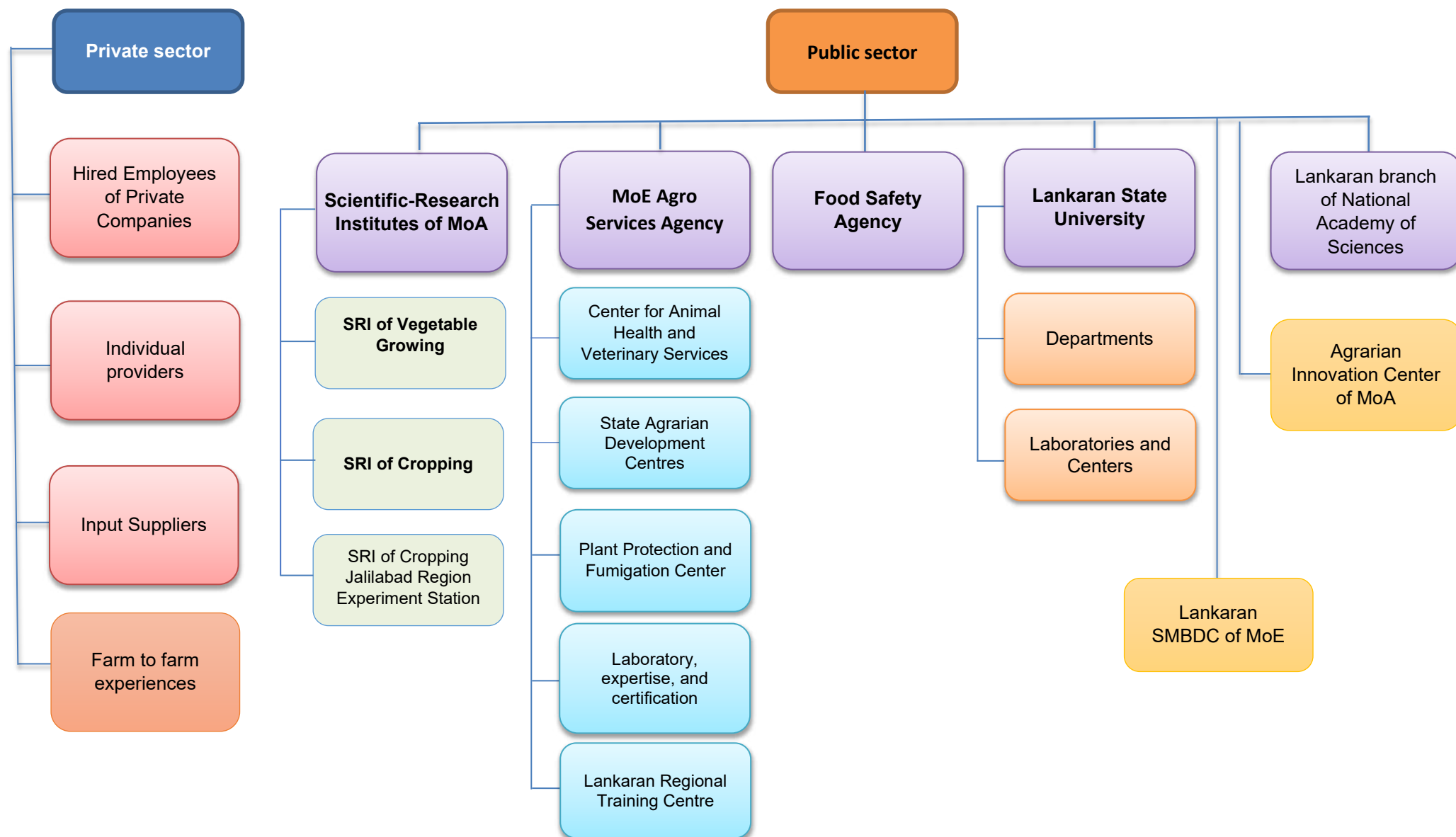
The main responsibility of AAS falls on the public sector, especially the State Agrarian Development Center (SADC). However, SADC's potential capabilities, personnel base, as well as numerous functions related to the provision of subsidies do not allow it to adequately meet the needs of all farmers in the district..Six SADCs operate in the Lankaran-Astara

economic region in Astara, Jalilabad, Masalli, Lankaran, Lerik and Yardimli districts. They ensure the implementation of agricultural policy, the organization and provision of public services in a uniform and coordinated manner. They oversee measures to support agriculture so that farmers can use the benefits and subsidies. They are responsible for cooperation with district executive authorities to solve issues related to agriculture. They are supposed to support local producers, organize the provision of agro-services, agrochemical, information and consulting and other services to agricultural producers and processors based on "single window".

They coordinate the activities of the other branches of the Ministry of Agriculture in the regions. They must ensure intensive development of crop and livestock production, make proposals on the application of new techniques and technologies and innovative methods. They also have to propose the establishment and reconstruction of enterprises for the production and processing of agricultural products and support their activities. The centers must ensure the efficient use of agricultural lands, improvements in quality land reclamation, restoration and protection of fertility. They offer support for the establishment and operation of coordination councils to support agricultural producers.

These centers operate under the Agrarian Services Agency (ASA). The agency's main goals are to ensure animal health, increased productivity in animal husbandry, and phytosanitary including agrochemical services for plant health. They are responsible for the management of seed production and state control of seed production, as well of agricultural machinery including innovations and their technical condition and operation.

Diagram 1: The structure of the agricultural advisory services in Lankaran-Astara Economic Region



The Agency provides 53 services in veterinary, phytosanitary, registration of selection achievements, seed production, and technical control. The services provided by Agrarian Service Agency are in the following table (Table 3).

Table 3. The services provided by the Agrarian Services Agency

ANIMAL HEALTH AND VETERINARY SERVICES	PLANT PROTECTION AND FUMIGATION SERVICES	STATE TECHNICAL CONTROL SERVICES	LABORATORY, EXPERTISE, AND CERTIFICATION SERVICES
<ol style="list-style-type: none"> 1. Treatment of infectious diseases (chargeable) 2. Providing information and advice in the field of veterinary medicine epizootics (free of charge) 3. Preventive disinfection, disinfection and derealization measures (chargeable) 4. Preventive measures to eradicate blood-parasitic diseases and helminthiasis (chargeable) 5. Implementation of preventive measures against epizootics (free of charge) 6. Taking pathological materials from a dead animal (chargeable) 7. Treatment of non-communicable diseases of animals (chargeable) <p>Total: 7 services</p>	<ol style="list-style-type: none"> 1. Fumigation service (chargeable) 2. Identification of pests and diseases in plants (free of charge) 3. Conducting plant protection measures against plant diseases and pests (free of charge) <p>Total: 3 services</p>	<ol style="list-style-type: none"> 1. Passing exams and issuing a driver's license to drive a tractor and other motor vehicles (chargeable) 2. Changing a driver's license to drive a tractor and other motor vehicles (chargeable) 3. State registration of motor vehicles (chargeable) 4. Re-state registration of motor vehicles (chargeable) 5. Temporary state registration of motor vehicles (chargeable) 6. Permanent deregistration of motor vehicles (free of charge) 7. Conducting-state technical inspection of motor vehicles (chargeable) etc. <p>Total: 12 services (4 services are free of charge)</p>	<ol style="list-style-type: none"> 1. Agrochemical analysis of soils (chargeable) 2. Agrochemical research on agricultural lands, issuance of agrochemical passports and preparation of cartograms (chargeable) 3. Agrochemical analysis of irrigation water (chargeable) 4. Registration of plant varieties (9 subservices-.8 out of them chargeable, 1 is free of charge) 5. Seed control (5 subservices-free of charge) <p>Total: 5 services</p>

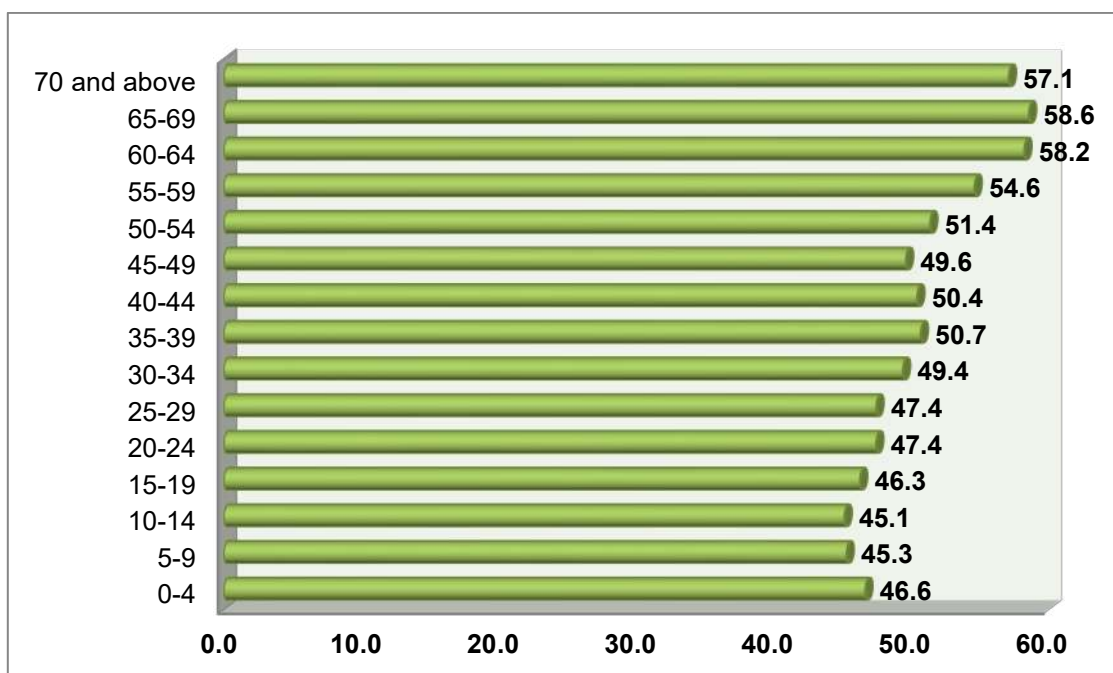
Source: www.axa.gov.az

The role of the Lankaran SME Development Center in the advisory services network is increasing as a whole in the region, including the Lerik district. The aim of the center is to support SMEs operating in Lankaran city, Astara, Lerik and Yardimli districts. They provide training, consulting and networking services for those starting new businesses. They are mandated to help develop existing businesses, in expanding their market and exporting their goods and services. They facilitate access to finance, offer strategic and operational management support and corporatisation of businesses. They also assist in the creation of entrepreneur associations and clusters. The center conducts training on access to finance for women and agricultural entrepreneurs, increasing sales and access to new markets, storage and packaging of agricultural products, analysis of sales channels for farmers and other relevant topics. <https://lenkeran.kobim.az/az/table>

Gender issues related to the value chain

Women play an important role in the development of agriculture in the Lerik district. According to the State Statistics Committee, by the beginning of 2022, 43,030 people, or 49.26% of the population of Lerik district were women. However, there are more women in older age groups, than in younger age brackets (Figure 4).

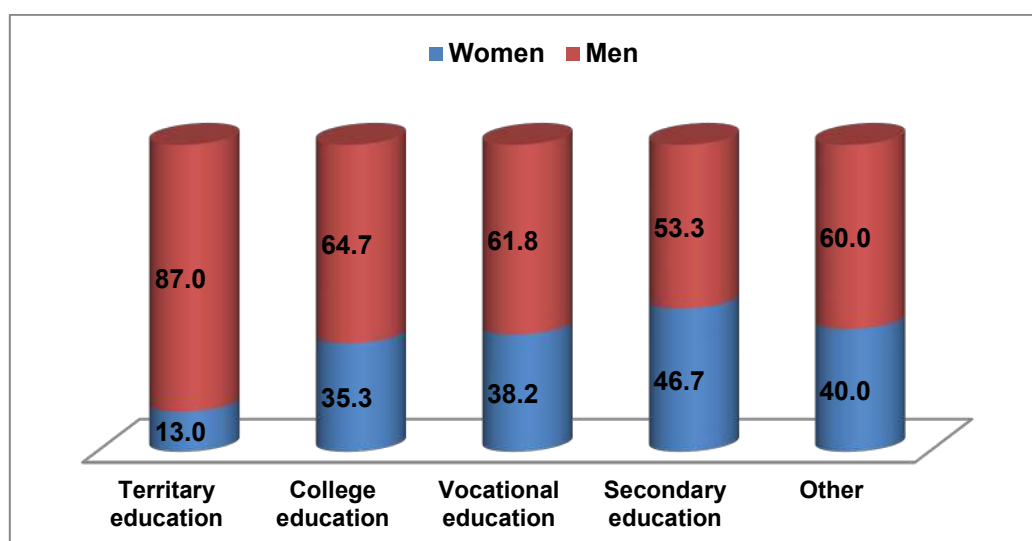
Figure 4. Share of women in the population by age groups Lerik district (as %)



Source: State Statistical Committee

The analysis shows that the share of women in the structure of the population is more in the age group 30 and above. These are women who could contribute more to the socio-economic development of the district. It is known that the earning power of women is closely related to their level of education. The share of women in the number of educated people in the district is overall lower than men at all levels of education (Figure 5).

Figure 5. Women and men by educational levels in Lerik district (in %)



Source: State Statistical Committee

As per the census of 2009, 87% of those studying in higher education institutions were men and 13% were women. In the case of college education, the figures are 64.7 and 35.3%, respectively. Women are more represented in vocational and secondary education at 38.2% and 46.7%, respectively. For other types of education men are 60 and women 40%.

The existing agricultural economy in the Lerik district, where consumption-oriented households predominate, creates a favourable basis for the wider involvement of women in economic activities. As seen in the graph below this holds true, especially in the production and harvesting links of the value chain (Figure 6.)

Figure 6. Share of women in the value chain, %



Source: State Statistical Committee

The share of women in the value chain is the highest in the production cycle. This indicator decreases to a minimum as the product move towards the market and the end consumer. Women are less involved in the value additions that occurs after the product leaves the farm and thus have lower incomes than those at other parts of the chain who are mostly men. There is scope to increase the role of women in the value chain.

The factors affecting the level of women's participation in the value chain include:

- age group, as women in the reproductive age are care givers to their children;
- farm size;
- labour intensity of a sector;
- farming in a yard or shared land. Shared land which are lands privatized and allocated as a result of land reforms, are located at a distance compared to backyards.

3. VALUE CHAINS OF APPLE AND POTATO PRODUCTS

3.1. Apple

Apple and potato cultivation in Lerik district are traditional and promising horticultural and agricultural activities. Data from the State Statistics Committee shows that the area under apple orchards in the district began to increase from 2003 and stabilized in the following years. There has been a steady increase in the area under cultivation from 132 hectares from 2000 to 2001, 175 in 2003, 246 in 2005, 247 in 2010, 252.6 from 2020, 2021 to 2022. In recent years, the district's share has remained stable as a result of intensive plantations of apples in the country (Table 4).

Table 4. The share of Lerik district in apple orchards and production, in %

Indicators	2015	2016	2017	2018	2019	2020	2021	The difference in 2021 compared to 2015,+;-
Apple orchards Azerbaijan	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0
Apple orchards Lerik district	52,7	52,6	52,4	52,0	52,3	52,7	53,0	+0.3
Apple production Azerbaijan	0,3	0,0	0,2	0,0	0,1	0,1	0,1	-0.2
Apple production Lerik district	36,3	0,8	35,0	3,5	25,7	26,2	26,1	-10.2

Source: State Statistical Committee

As the table suggests, the share of apple production in the district in relation to the entire country did not change from 2015-2021 remaining at 0.8%. There was a slight increase in the area under apple orchards from 52.7% to 53.0%.

Lerik district accounts for more than 50% of the area under apple orchards, in LAER. It occupies 18 % of the land area of the region and has, 8 % of the population. It however contributes only 6 % of the total product, and 7 % of the agricultural product. It has 2 % of fixed capital investment and 2 % of loan investment of the region. Improving the productivity of district's orchards, will raise the income of the population for which improvements to the inputs used to grown apples is essential. Though the area under cultivation has increased the share of the district in apple production has decreased in this period. Production decreased from 0.3% to 0.2% across the country, while it dropped by 10.2 % in Lerik falling from 36.3% to 26.1%. This is due to low productivity in the district and competition from intensive orchards in other regions of the country. The level of investment in the region also remains low.

From examining the results of surveys, interviews, field visits, observations, and discussions with target groups, it is clear that apple production in the Lerik district has the following comparative advantages:

- Widespread recognition under the name “Lerik apple”;
- Established production traditions and practices;
- Natural-climatic conditions, availability of a local work force, less use of chemicals and older varieties create conditions for growing a traditional, ecologically clean product;
- Opportunities to enter the market before other regions;
- Possibilities of growing different varieties of apples adapted to the local climate and soil.

In recent years, measures have been taken to develop fruit growing in the region. For example, in 2018, at the initiative of the "IDEA" Public Union, the UN Food and Agriculture Organization (FAO) and the Ministry of Ecology and Natural Resources, and the Lerik district Executive Committee apple orchards were established in several villages. The aim was to improve the financial well-being of low-income families.

3.1.1. Inputs

Water

Apple is a light and moisture-demanding plant. Regardless of the amount of annual precipitation, plants must be irrigated if there is no precipitation for more than 2-3 weeks during the growing season. One of the main problems for farmers is the lack of water. Without which it is difficult to irrigate orchards in accordance with technical requirements. Overall, the lack of irrigation is one of the main problems in Lerik district. As per data from the State Statistics Committee, the annual water consumption in the district was 1.0 million cubic meters in 2021, of which 0.8 million cubic meters or 80.0% was used for agricultural and horticultural irrigation and for farm use.

Measures are being taken by the state to improve this situation. In 2019-2021 irrigation works to improve water supply was carried out by the Azerbaijan Amelioration and Water Management JSC. Artesian wells were dug in Zovna and Zarigumaco villages in 2019, and in Kalakhan village in 2020.

In addition to other factors, intensive orchards are also threatened by limited water supply. As per data from the State Agrarian Development Center, in 2022, 11 of the producers who applied for subsidy owned 15.3 hectares of intensive orchards. Of these, 5 orchards were located on dry land, and 6 orchards depended on irrigation.

The most important issue is elimination of water shortage. This can be done through the conservation of water through rainwater harvesting and building storage tanks and by the application of technologies like drip irrigation that allow for economical use of water. This is important specially for small-scale farms that dominate the agriculture of the district. It was discovered during field visits that a number of farmers do use affordable and easy-to-apply techniques to prevent water scarcity and use available water resources sparingly like building storage tanks as shown in Case Study 1. ATR should raise awareness among

farmers on water conservation and efficient use and share these examples with the larger group.



Box 1

Water Reservoir, Hiveri village

Mr Javid Hashimli, a young farmer grows apples in a small orchard of 0.5 hectares. He also plants potatoes, tomatoes and other vegetables for personal consumption. In addition he invests in livestock,. In order to secure enough water Javid built a stone container retaining 15 cubic tons of water for his small farm use. Water from mountain springs and artesian wells is collected in the reservoir through use of gravity. Javid constructed the tank in order to ensure water supply for this farm. Through a network of a few hoses connected to his orchard and small potato plot, this simple system is sufficient to irrigate his apple trees.

During field visits it was noted that there is potential to plant new orchards as suitable land is available. The fact that the farms are mainly diversified with significantly less use of chemicals creates a favourable basis for the production of ecologically clean fruit.

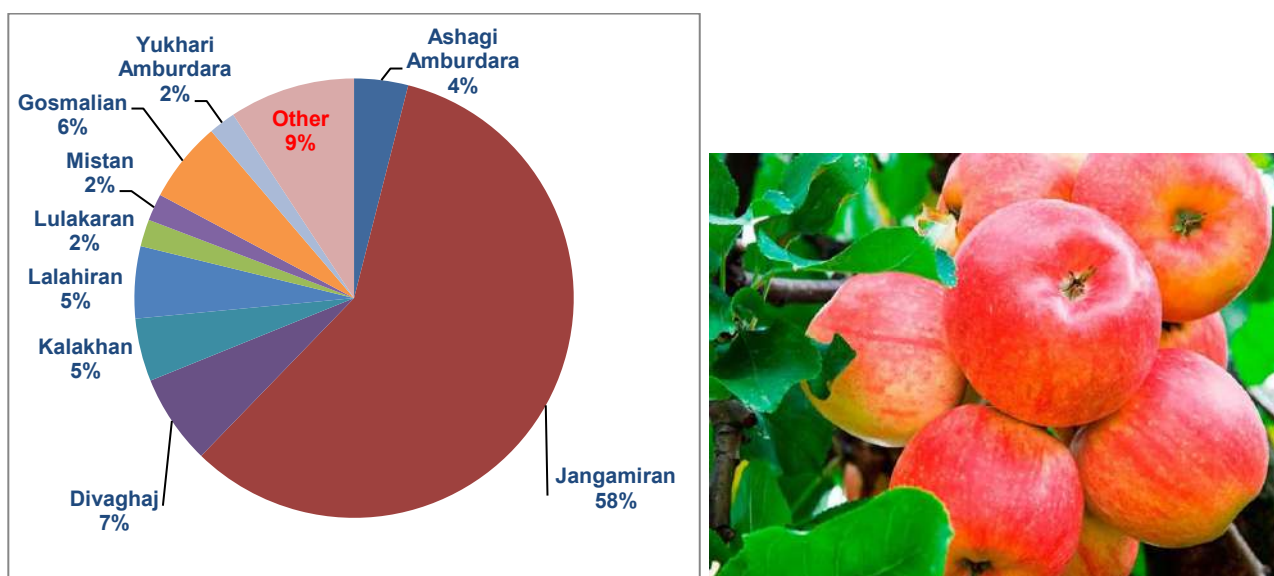
Animal husbandry is the primary sector in Lerik district's agricultural economy. In 2021, animal husbandry produced 41,262.5 AZN (67.9%) of the value of agricultural goods (60,766.3 AZN. Field crops generated 19,504.8 AZN (32.1%). Animal husbandry also provides a source of organic fertilizer improving land fertility at a low cost.

Subsidy

The main production of apples is in household plots. These producers are not covered by the system of state subsidies provided to farmers. Crop subsidy compensates farmers for a part of the expenses spent on the purchase of agricultural production tools, conducting agrochemical analysis of the soil, and the purchase and construction of modern irrigation systems and poles in perennial plantings. Data from the Lerik District Statistics Office and SADC shows that the number of producers who receive subsidy is low. In 2022, the area of apple orchards in the region was 252.6 hectares while the area covered by subsidies was 62.3 hectares or 24.7% of the total area, while 75.3% did not receive it not. The reason for this is that in the rules of subsidization of producers of agricultural products, subsidies are given only for cultivated area registered as arable land. The small area considered eligible for subsidies shows that market-oriented production opportunities are limited. The lack of subsidy impacts the income of small farmers making their production less competitive. The apple orchards that received subsidy mainly covered the villages of Jangamiran, Divaghaj,

Kalakhan, Lahahiran, Lulakaran, Gosmalian, Mistan, Yukhari Amburdara, and Ashaghi Amburdara (Figure 7).

Figure 7. Distribution of apple orchards declared for subsidy by villages, 2023



Source: Based on data from the Lerik State Agrarian Development Center

Taking into account the fact that agricultural producers in Lerik district are in a mountainous region where small farms are the norm, a different method for calculating subsidies, including planting subsidies, could be considered for local producers. According to the Procedure for Subsidizing Agricultural Production dated June 27, 2019, planting subsidy per hectare of orchards planted before 2020 has been established as 250 AZN (200 AZN x 1.25) for 2023 by the Agricultural Subsidy Council. This amount is the same for apple orchards for all districts of the country irrespective of terrain. The practice of differentiating subsidies depending on the terrain already exists. Thus, according to the relevant decision of the Agrarian Subsidy Council, from September 1, 2022, to May 31, 2023, planting subsidies in the amount of 8,000 AZN (200 AZN x 40) are provided for 1 hectare of vineyards planted in areas located above 400 meters above sea level. Refer <http://akia.gov.az/az/content/255-259.html>.

Subsidizing the production of agricultural products in backyards is considered a complex issue. Thus, in a large number of small and diversified farms, cross-surveillance, ground (satellite) observation and on-site observation for the purpose of subsidy are physically and technologically almost impossible. In such circumstances, it is appropriate to provide and calculate subsidies for each unit of fruit trees as follows:

$$S_{mh} = A_s \times V_s$$

Here:

S_{mh} - The amount of subsidy to be given for yard areas, manat

A_s - The number of trees that bear fruit in the yard areas, number

V_s - Amount of subsidy to be given for V_s -1 bearing fruit tree, manat

The following measures are recommended for the implementation of this experiment:

- declaration of fruit-bearing trees in backyards by farmers in the electronic agricultural information system
- field checking of the submitted data by relevant institutions and identification of trees

The implementation of the process requires the coordinated activities of the regional Executive Power and their representatives in the villages, the State Agrarian Development Center and the Statistical Office.

Fertilizers and Pesticides

The next problem in supplying inputs, which is the first link of the value chain of apple products in Lerik district, is the lack of a sales center for mineral fertilizers and agrochemicals. The Agroservis Open Joint Stock Company (ASC) carries out mobile sales of fertilizers, especially urea and ammonium-nitrate fertilizers, on preferential terms in villages located far from the district centre. The inputs distributor "Agroservis" OJSC has 3 supply warehouses, 9 regional representative offices and 33 regional divisions throughout the country. The sale of mineral fertilizers, pesticides and spare parts, the provision of various agrotechnical services, the mobile service of seasonal mineral fertilizers in Lerik district are carried out by their Jalilabad regional office.

During 2019-2022, 126.5 tons of mineral fertilizers and 242.8 l kg of pesticides were sold at discounted prices by the company in order to meet the demand for mineral fertilizers and pesticides. However, this indicator for fertilizers was 130.38 tons in Astara 1823.89 tons in Jalilabad, 600.8 tons in Lankaran, 597.26 tons in Masalli, and 149.31 tons in Yardimli districts. (Socio-economic development of districts, Statistical Collection (2019-2022), State Statistics Committee 2023).

During mobile sales, farmers get mineral fertilizers only through their "Farmer card" as per the new subsidy rules. The entire cost of fertilizer is deducted from the farmer's card, the farmer does not pay extra. However, farmers in Lerik consider it important to organize a stationary sales center in the district. When we take into account that only farmers provided with subsidy are provided with "Farmer cards", it is clear that a significant portion of producers are excluded from obtaining mineral fertilizers and pesticides at reasonable prices.

Seeds

A key issue is to supply apple producers with planting materials and seedlings suitable for local physiographic conditions. Growing different fruit varieties suitable for the soil and climate conditions of the region is one of the possible competitive advantage of the apple value chain in Lerik district. According to the Lerik district SADC, varieties such as Azerbaijan, Cir Haji, Simerenko rennet, Yellow sour, Absheron apple, Guba saffron, Yellow bellflower, Gyzil Ahmadi, Golden Delicious, Paizliq Guba, Champagne Rennet are grown in the orchards of producers registered for subsidy. All these are old, traditional varieties grown in extensive orchards. To introduce new methods of fruit cultivation and new varieties, there has to be cooperation between the Institute of Pomology and Tea of the Ministry of

Agriculture and fruit growers. Entities providing agricultural advisory services have also to be active, in order to disseminate knowledge and experience among orchard owners.

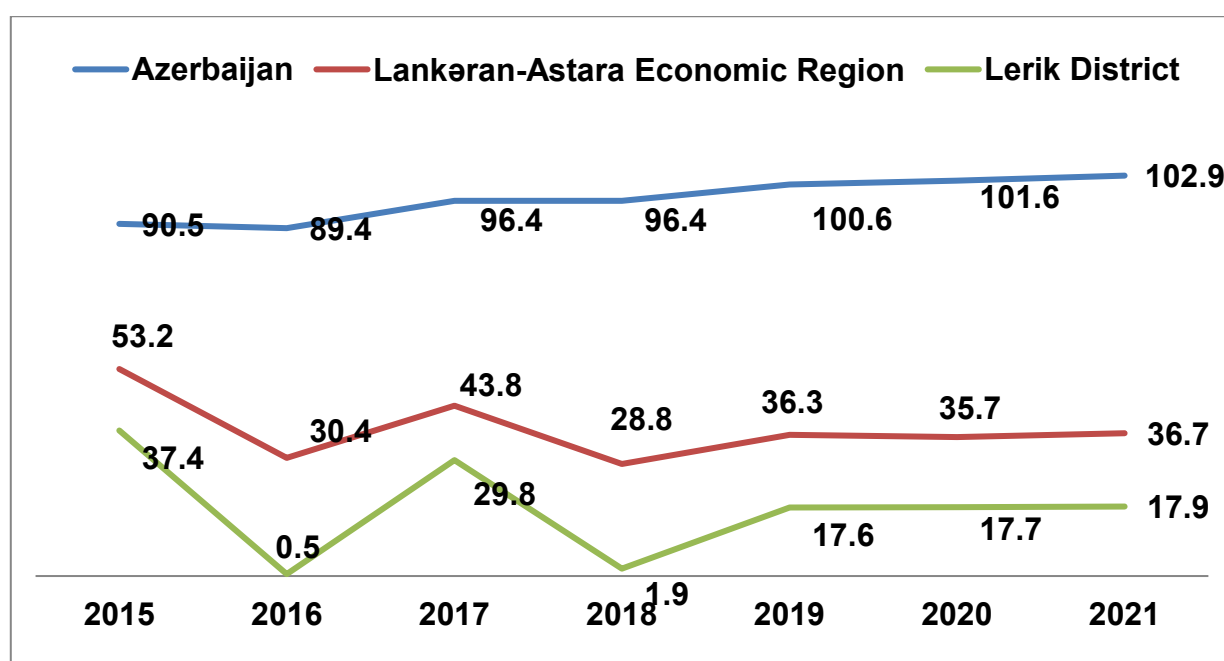
3.1.2. Production capacities

Increase in apple production in the country leads to an increase in the level of payment of the population's and industry's demand for this product. It is worth noting that in 2022, 52.0 million US dollars or 51.1% worth of production increase compared to 2021 (34.4 million dollars) from the country. <https://ereforms.gov.az/az/ixrac-icmali>.

The increase in exports is undoubtedly due to domestic production. The research shows that although the increase in apple production is observed in the country, the level of this indicator has decreased in Lankaran-Astara economic region, including in Lerik district.

For example, while production in the country increased by 20.3% in 2015-2021, it decreased by 26.3% in Lankaran-Astara economic region and 47.0% in Lerik district. The level of production increased by 46.2% and 30.9%, respectively, in Jalilabad and Yardımlı districts, which are part of the region. As the area under apple orchards remains largely constant, the decline in production is due to a decrease in productivity (Figure 8).

Figure 8. Productivity of apple orchard, 100 kg/ha



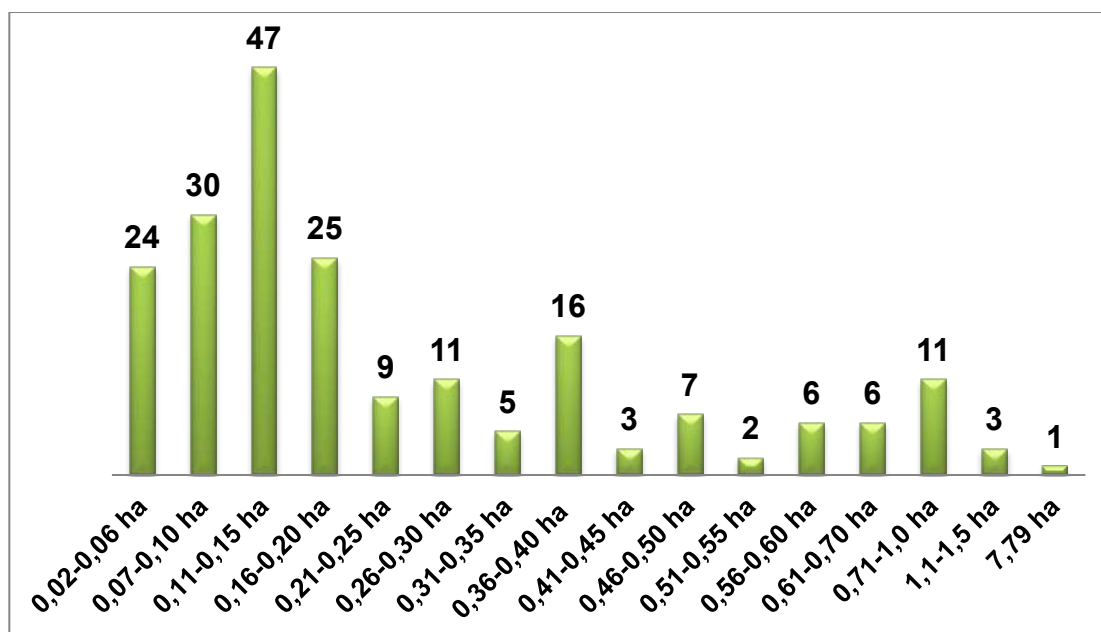
Source: Ministry of Agriculture

As in Figure 8, compared to the country and region, apple productivity in the Lerik district is low. For example, in 2021, the productivity of 1 hectare of orchard in the country was 102.9 centners, while it was 36.7 centners in the region and 17.9 centners in the Lerik district. While productivity has increased in the country over the years, it has decreased in the region and district. This can be attributed to the following factors:

- Compared to other districts of the country, the establishment of intensive orchards in the Lankaran-Astara economic region, including the Lerik district, is low;

- Natural and climatic conditions of the mountain area, limitations in access to water resources, lead to low productivity in drought conditions
- There is little use of innovative solutions and technologies in most orchards
- Farmers state that the reason for low productivity, is the small size of farms and limited opportunities for economies of scale (Figure 9).

Figure 9. Grouping of apple orchard farms in Lerik district by size



Source: The diagram was compiled based on the data of Lerik SADC

Figure 9 shows that farms of 0.11-0.15 hectares had an advantage in obtaining subsidy in 2022 (47 farms). Among the others, 30 farms with 0.07-0.10 hectares, 25 farms with 0.16-0.20 hectares and 16 farms with 0.36-0.40 hectares have received subsidy. Overall, 62.2 hectares of orchards were eligible for subsidy, the average size of a farm was 0.3 ha. The minimum size was 0.02 hectares, and the maximum was 7.79 hectares.

Calculations conducted on the basis of average productivity of the district show that in the conditions where small-scale farms prevail, the volume of the production and marketability is low. The average productivity of orchards in the district was 1,800 kilograms apple per hectare in recent years, it becomes clear that each of the farms with the most advantages between 0.11 and 0.15 hectares produces an average of 198-270 kilograms of crop. Considering that the average size of farms is 0.3 hectares, it is known that one farm produces an average of 540 (1800 kg x 0.3 ha) kilograms of crops per year. Thus, in a situation where small orchards prevail, the following problems arise:

- the volume of the product is small and access to markets (wholesale or retail) with this volume is not possible;
- low volumes and different varieties of apples available at various places do not make it attractive for buyers, especially for wholesale trade intermediaries;
- lack of links or invisible interdependence between the links of the value chain or disruption of its completeness results in improper management of resources, including spoilage of the product and loss of income from business activity;

- lack of interest in expanding production, introducing innovations, is due to the fact that low investments lead to a loss. Concentration of apple orchards in the Lerik district mainly on small farm reduces the demand for labour and for specialized support.

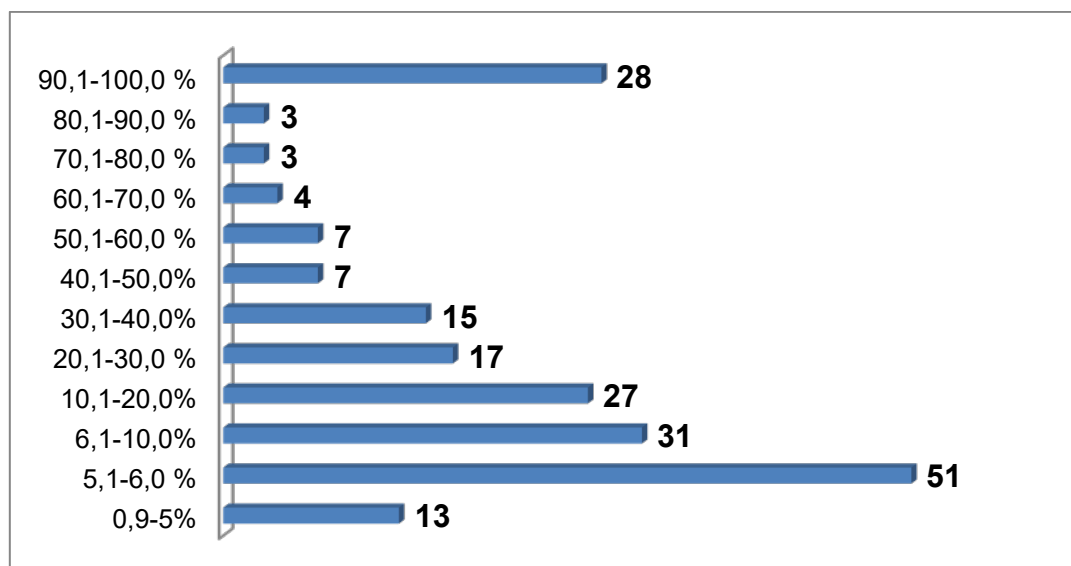
According to data from the State Statistics Committee, the average labour cost for the production of 1 centner of fruits and berries in the LAER is 20-man hours. Given that the productivity of apple orchards per hectare is 18.0 centners in Lerik, 360 man-hours are needed per hectare per year, with an average of 108-man hours (360 man-hours x 0.3 ha) per farm. All this indicates that the involvement of external labour and specialists is minimal.

The diversification of production is extremely important to reduce risks. It can:

- introduce rotational cropping system, increase soil fertility and raise the productivity of cultivated agricultural plants;
- increase of sources of income and income of farmers does not depend on one area;
- financial agencies give preference to diversified farms in granting loans as they are seen as less risky investments

Data from the Lerik district SADC shows that the farm area of apple orchards declared for the purpose of subsidy was 62.2 hectares or 15.7% of the land owned by the farms (Figure 10).

Figure 10. Farms specializing in apple production in Lerik district



Source: SADC, Lerik District

In the graph the percentage of farms specializing in growing apples is on the vertical axis and the number of farms on the horizontal axis. Farms that are 90 to 100% under apple orchards are 28. The bulk of the farms 161 out of 206 or 78.2% have less than 50% of their land under apple cultivation. The predominance of a specific crop in the production structure of a farm is seen as having a higher risk. Diversification leads to a lower level of risk. Thus orchards that have apple on 50% or less of their land can be considered more viable.

3.1.3. Harvest and post-harvest operations

Apple harvesting is almost entirely manual in Lerik district where small farms predominate. When $\frac{3}{4}$ of the apple orchards are in backyards in areas that are mostly mountainous, mechanization of harvesting and post-harvesting processes is not cost-effective.

In some regions of Azerbaijan where intensive horticulture is developed, there are farms with mechanized harvesting and post-harvest processes. For example, in Langu village of Guba region, along with intensive cultivation of gardens, harvesting and packaging are also carried out using modern methods. When the fruit is harvested, a tractor with a small trailer moves between the rows. The harvested apples are poured directly into large plastic screens on the trailer. These loads are transported to cold storages. Loss due to damaged apples is thus lower (Photo 1).

Photo 1: Apple Harvest, Langu village, Guba district



Source: www.azertag.az

A key issue in the collection and post-harvest link of the apple value chain is its storage. Between 83 to 85% of the apple is water and the fruit is highly sensitive to environmental conditions like temperature, humidity, and gas content of the air. Apples are stored at a temperature of 0⁰-50⁰ C (summer and autumn varieties) and 0⁰-10⁰ C (winter varieties), with a relative humidity of 90-95%. Some varieties can be stored at 1⁰-3.0 ⁰C (Antonovka, Rosemarin, Jonathan, Starking, etc.) and 0⁰- 2.0⁰ C (Simerenko reneti, etc.). Summer varieties are stored from several days to months in refrigerators, autumn varieties are kept from 1 to 3 months, and winter varieties from 3 to 6 to 7 months. Apples are stored in a controlled environment with reduced oxygen and increased carbon dioxide at constant temperature. This method is used when apples are stored for more than 3 to 4 months. (Practical Course on the Technology of Storage and Processing of Farming Crops. Fataliyev and others, 2013).

During field visits it was seen that the storage of apples is carried out in a primitive manner, without relying on scientific techniques. This leads to deterioration of the product after a certain period affecting its appearance. Such products are sold at a discount or not sold at

all. Mainly winter and later ripening varieties of apples are stored; only non-standard fruit should be processed.

Photo 2. Apple storage in Lalahiran village, Lerik district



Building cold storages when the production volumes are low is not a practical solution. Appropriate advice on how to improve product storage and practical training needs to be provided to producers. The resources of the Lankaran SMB Development Centre could be used for this purpose. Given the lack of suitable conditions for long-term storage of apples on most farms, processing the raw material at home or on a small scale into apple meal, compotes, jams, juices, purees, pickles, etc. should be supported to increase the value of the final product. This would require changes in the way the product is handled by producers and advisory services and technical support should be provided for this. The Self-Employment Program of the Ministry of Labor and Social Protection of the Population could be utilized in this regard.

The most widespread and seriously damaging fungal diseases in apples are black cancer, powdery mildew, scab, and fruit rot. Pathogens of the listed fungal diseases develop mainly in spring and summer. Pathogens develop intensively and infect new plants, especially when the weather is unstable mainly in rainy weather, Lerik District SADC and Lankaran Regional Agricultural Training Center have taken some measures to eliminate this problem. However, the current capabilities of both institutions is not sufficient to cover the entire district with such services. The links between the Institute of Plant Protection, the Institute of Pomology and Tea, technical departments of Ministry of Agriculture and other related institutions, advisory services (both public and private) must be strengthened to provide growers with relevant advice.

3.1.4. Markets and traders

The market for apples produced in Lerik is confined to the district and Lankaran. Due to the lack of appropriate conditions for medium and long-term storage of the product, the sales are carried out immediately after harvest, starting in October. By this time, the apple harvest in other regions has ended, and fresh Lerik apples readily find a market in Lankaran. However, farmers face problems in taking their products to Lankaran and especially to the Baku markets which are larger. This is due to the uneconomical cost of transportation of small amounts of the product. Due to the small volume of apple produced by Lerik farmers, there is practically no demand from wholesalers and supermarkets. It was observed by the team that even in the Lankaran market, Lerik apples were barely present. Traders attribute this to the lack of stable supply and the unattractive appearance of apples that have been stored in less than ideal conditions for a long time.

Though a sales network for food products has been formed in the country, market structures and institutions for trade in agricultural products are still not well developed. Since the market channels are both basic and scattered, the informal sector dominates. It is thus difficult to access the market under favourable conditions, for agricultural producers with small farms. There is substantial differences in sale prices of agricultural products at the farmgate and in the final consumer market. This problem is caused by insufficient development of both wholesale and retail markets. There are around 30 wholesale markets for fruits and vegetables across the country. However, the majority of transactions take place in 3 markets in Baku, most of it in one market-the "Meyvali" shopping center. The wholesale prices of agricultural products in the country is practically decided here. The main activity of all other markets is retail sales.

Potential buyers of Lerik apples are thus small shop owners and local operators in the nearby markets as well as visiting tourists. The market organized on odd days of the week in the city of Lerik creates additional opportunities for sales. Products here are mainly offered by local farmers and trade intermediaries from the villages of Goydara, Kalvaz, Kalakhan. Taking into account the increase in the number of tourists coming to the district and growing demand for local products, including apples, it would be appropriate to improve the organization of this market. For instance, the market days could be publicised with hoardings on the roadsides. Promotion of Lerik market could also be done in Lankaran as the regional hub.

Photo 3. Sale of apples in Lerik market



In 2015, within the framework of the project jointly implemented by the Ministry of Agriculture with FAO, information on prices of agricultural products is available on the Electronic Price Information Portal for Agriculture (www.aqrarbazar.az). Lerik district regarding sales to wholesale, retail, field, and processing enterprises is not mentioned. This is due to the lack of continuous and required volumes of supply.

The wholesale link in the value chain of apples in the region is undeveloped. The reason for this is that the volume of apples produced by the small-scale farms, that dominate the agricultural structure, is small, and the variety and quality are not stable.

Table 5. Classification of the main markets for apples in Azerbaijan

MAIN SALES MARKETS			
Farm gate sales	Wholesale sales	Retail sales	Sales to processing facilities
Absheron, Agjabedi, Agdam, Agdash, Agstafa, Agsu, Astara, Balakan, Beylagan, Barda, Bilasuvar, Jalilabad, Dashkasan, Fuzuli, Gadabey, Ganja, Goranboy, Goychay, Goygol, Hajigabul, Imishli, Ismailli, Kurdamir, Lankaran, Masalli, Neftchala, Oguz, Gakh, Gazakh, Gabala, Gobustan, Guba, Gusar, Saatli, Sabirabad, Shabran, Salyan, Shamakhi, Samukh, Sheki, Shamkir, Shirvan, Siyazan, Tartar, Tovuz, Ujar, Khachmaz, Yardimli, Yevlakh, Zagatala, Zardab	Baku-8km market Baku-Meyvali market Baku-Green market Ganja market	Baku-8km Bazaar Baku-Supermarket Baku-Taza Bazaar Baku-Green Bazaar Beylagan Bazaar Barda Bazaar Jalilabad Bazaar Ganja Bazaar Goychay Bazaar Lankaran Bazaar Kazakh Bazaar Sabirabad Bazaar Salyan Bazaar Shamakhi Bazaar Shaki Bazaar Shamkir Bazaar Sumgait Bazaar Tovuz Bazaar Ucar Bazaar Khachmaz Bazaar Yevlakh Bazaar	Absheron Agdash Agsu Balakan Jalilabad Goychay Goygol Lankaran Kazakh Gabala Guba Sabirabad Salyan Sheki Shamkir Tovuz Ujar Xachmaz Zagatala

Source: www.aqrarbazar.az

As seen in the above figure, the wholesale market of apples in the country as a whole is poorly developed. The lack of Lerik market among the sales markets suggests that the region's position in the apple market is not at a satisfactory level.

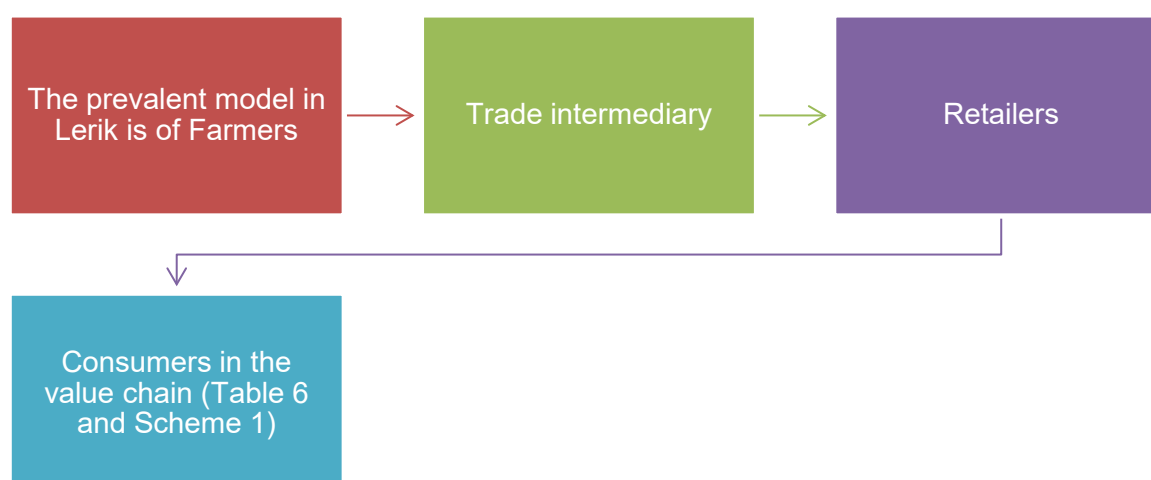
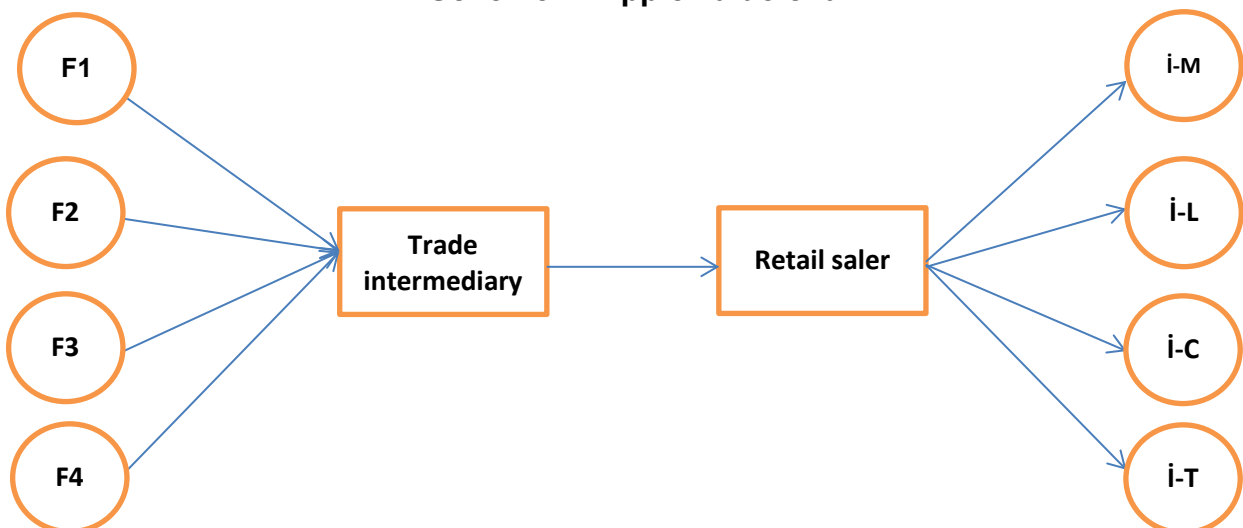


Table 6. Apple product sales channels

SALES CHANNELS	DISTRIBUTION	CHARACTERISTICS
Farmers → Consumers	Partially	Some farmers sell the apples they grow directly to consumers in Lerik, Lankaran and Masalli markets. Those in this category are mainly farmers who have diversified their farms in order to reduce their costs and increase their income. They market apples and other agricultural products as well.
Farmers → Retailers → Consumers	Partially	Farmers deliver their products to consumers through retailers. This is done in two ways: at the farmgate and through market sales. In both cases, there is a price difference, which is related to the cost of transportation and the volume of the product.
Farmers → Trade intermediary → Retailers → Consumers	Many	This sales channel is more typical. Trade intermediaries buy apple products from farms and offer them to retailers, who in turn offer them to final consumers.

Scheme 1: Apple value chain



The large number of links in the value chain reduces the farmer's share of income. However, intermediaries play a key role in connecting the producer and the consumer. They also acquire the goods for later sales. The seller receives benefits from the active role played by the intermediary and pays for this service by increasing the price of his goods.

Promoting the sale of locally grown fruit and vegetable crop at the fairs organized by the Ministry of Agriculture in Baku can help increase the demand for local products. The special market opportunity for Lerik apple producers is the "Agrarian Procurement and Supply" Open Joint Stock Company, for which apples must meet certain requirements:

- the economic entity operating in the field of food products must have food safety registration;
- if the manufacturer of food products does not have a food safety registration, the products offered for sale by the manufacturer must have a food safety certificate;
- laws related to ensuring minimum quality and safety of food products must be followed;
- should be a regular taxpayer with no taxes and other mandatory payments due in the Republic of Azerbaijan;
- should have at least six months of experience in the production of food products, and at least one year in sales.

Publicity among producers about the possible purchases made by the company and the demands placed on the product is one of the recommended steps to strengthen the sales link in the Lerik apple value chain. Some Lerik apple growers are supplying apple to the above-mentioned company. In 2023, they plan to purchase 4,300 kilograms of apples. However, this is a very low share compared to the apple production capacity in the district (Table 7).

Table 7. Specific ratio of demand, apple orchards and production of "Agrarian Procurement and Supply" OJSC in Lankaran-Astara Economic Region for the year 2023

#	By districts	Volume of demand for 2023 (in kg)	specific share, in %	Specific share of apple orchards, in %	Specific share of apple production, in %
1	Lankaran	27104	41.2	9.5	28,9
2	Jalilabad	14244	21.65	4.2	7,9
3	Masalli	9300	14.1	5.4	6,7
4	Astara	7900	12	10.5	18,3
5	Lerik	4300	6.52	53	26,1
6	Yardimli	2933	4.45	17.4	12,0
	Lankaran-Astara ER	65781	100,0	100,0	100,0

Source: www.tedaruk.az/demand; www.stat.gov.az

In 2023, the company plans to purchase 65,781 kilograms of apples of which 41.0% is from Lankaran, 21.65% from Jalilabad, 14, 1% from Masalli, 12.0% from Astara, 4.45% from Yardimli and 6.52% from Lerik district. However, there is a discrepancy between demand

and the production capacity in the districts. As mentioned Lerik district accounts for 53 % of the overall apple production in LAER and 26.1% of total productive apple orchards. However, only 6.52% of the product has been planned to be purchased by the Company from the district. The fact that apples produced in Lerik do not meet the relevant standards is one of the main reasons for this. Local growers and institutions supporting the local farming economy should take these quality requirements seriously and make an effort to meet it. Establishing agricultural marketing cooperatives of small farmers to ensure better prices and efficient sale of apples and preserves is key to increasing the competitiveness of the Lerik apple value chain.

The predominance of small farms in the countryside and the lack of cooperation between them to access inputs and/or market their products is a key issue in the agricultural sector. In most of these farms, the area of agricultural land does not exceed 1.5-2 hectares. Such a structure does not ensure profitable agricultural production. Intensive farming is not possible limiting incomes and profits. The use of modern agricultural technologies, and efficient irrigation systems and access to finance on favourable terms is limited.

Contract-based farming is not well developed in the country. This model has several advantages for producers of agricultural products. By signing a contract with the buyer, the producer accesses not just an assured market but also material and technical support for production. The model is also convenient for the buyer as they get a stable supplier for a long period of time and can ensure the continuity of sales without spending additional time and money. As a result of measures taken to develop the traditional fields of cotton, tobacco, silk worm cocoons, sugar beet, and tea contract based production has started to expand in recent times.

It is well known that most of the value addition and profits in the agro-industrial complex is generated in the processing of agricultural raw materials and the sale of products. Cooperatives enable a fair distribution of income in the production-processing-sale cycle.

The level of cooperation between farmers in Lerik district is low. In response to the survey conducted within the framework of the "EU4Lankaran" project, 97.7% of the surveyed farmers or 86 out of 88 people stated that they are not members of any cooperative, association, or producer group aimed at bringing farmers together for common economic benefits. However, 74 of the farmers (84.09%) indicated that they would like to receive information about agricultural cooperation or other forms of joint economic activity (Analysis and assessment of country, regional, district and village data under collaborative undertakings in Lerik district - EU4Lankaran survey, May 2023)

The government is actively encouraging the setting up of cooperatives. The Law "On Agricultural Cooperation" has been passed and the State Program for the Development of Agricultural Cooperation in the Republic of Azerbaijan for 2017-2022 was developed. A few cooperatives have been set up in the country including the first women's cooperatives set up by the Azerbaijan Rural Women's Cooperatives. It is essential to raise awareness about the benefits of cooperation drawing on international experience and the local experience in this field. In the case of Lerik as in other regions, joint economic activities, like agricultural producer/ farmer community groups in the region needs to be actively supported. These

groups can be focused on inputs, production, or marketing or all these links of the value chain.

Box 2: Increasing the voice of farmers in the market

Awareness need to be raised among farmers of the benefits of cooperation. At present there are no forms of cooperation like:

- Networking
- Community groups
- Producer groups
- Cooperatives
- Associations
- Building informal and formal groups among farmers in Lerik will enable them to:
 - Get better inputs at a good price
 - Rent or buy machinery together at lower costs
 - Negotiate better sale prices
 - Reduce costs of transportation
 - Make available larger volumes to wholesale buyers and supermarkets
 - Exchange experiences and adapt technology better



As per the current legislation cooperatives can cover all aspects of the value chain. This include, inputs and marketing including wholesale and retail sale of agricultural products, as well as storage, sorting, drying, washing, weighing and wrapping, packaging, and transportation of these products. For market product branding and advertising can also be undertaken.

Establishing and developing cooperative relations with the support of the Association of Fruit and Vegetable Producers and Exporters of Azerbaijan and the Azerbaijan Rural Women's Association can provide impactful results to develop cooperative relations between export-oriented fruit and vegetable producers in the region as a whole. Both these associations are supported by the Ministry of Agriculture.

3.1.5. Marketing and sale

Marketing of their produce by growers is extremely weak. There are many shortcomings in the appearance of the Lerik apple produce, and there is no advertising or branding at all. These shortcomings lead to a decrease in the producer's share in the income from sales in the value chain. It also leads to a large differential between the prices expected by apple producer and offered by buyers. Most of the profits are captured by the intermediaries. In the current market structure where primary sellers, sell mostly at the farmgate, the role of commercial intermediaries in shaping the value chain is strongly visible. Typically, independent traders collect the apples from the villages and sell them in the Lerik or

Lankaran market. This weakens the position of local producers and apples from other districts or abroad start to dominate and eliminate the local product from the market.

Coordinating the sale of apple products brought to the market with other products cultivated in Lerik district will lead to a decrease in additional costs incurred for sale and an increase in income. Farmers have already taken steps in this direction as illustrated in Case study 2 below. In order to improve marketing apples can be packaged alongside honey in the same carton. This is a popular and well-known product of Lerik district.

Box 3: Diversified marketing of apple and potato

Goydara, village

Mr. Altay Aliyev grows apples in his orchard of 0.8 hectares, which is listed as private property (farm yard) in the land register. He also grows potato on 3.08 ha of arable land.

Altay has diversified his farm business to reduce operational costs and increase farm income. He buys apples and potatoes from local farmers and sells them together with his own crop in the markets in Lankaran and Lerik and to small shops. His market offer is competitive in relation to small suppliers with one or two bags of products. He has a pick-up truck, which allows him to transport larger quantities of products. In addition, the farmer's family makes cheese and butter from the milk produced by his cows, which are also sold. Another product is honey, which he collects from 22 beehives in his apple orchard.

While he supplies the local shops with apples and potatoes, his offer is complemented by cheese plates and jars of honey, which significantly increases his income and customer base.

A key issue highlighted during the discussion with growers was the fact that apples from other districts are sold as Lerik apples, due to the lack of branding and labelling of the genuine product. This also damages the reputation of apples produced in Lerik among consumers. Apples produced in Lerik are known for being 'local', 'clean', having 'good taste' and being 'special'. Potential thus exists for creating a unique product brand for Lerik apple.

Currently, apples produced in the district are mainly sold as unprocessed fruit. To get assistance for processing and sales of homemade apple farmers can apply to "ABAD" - Simplified Support for Family Business measure.

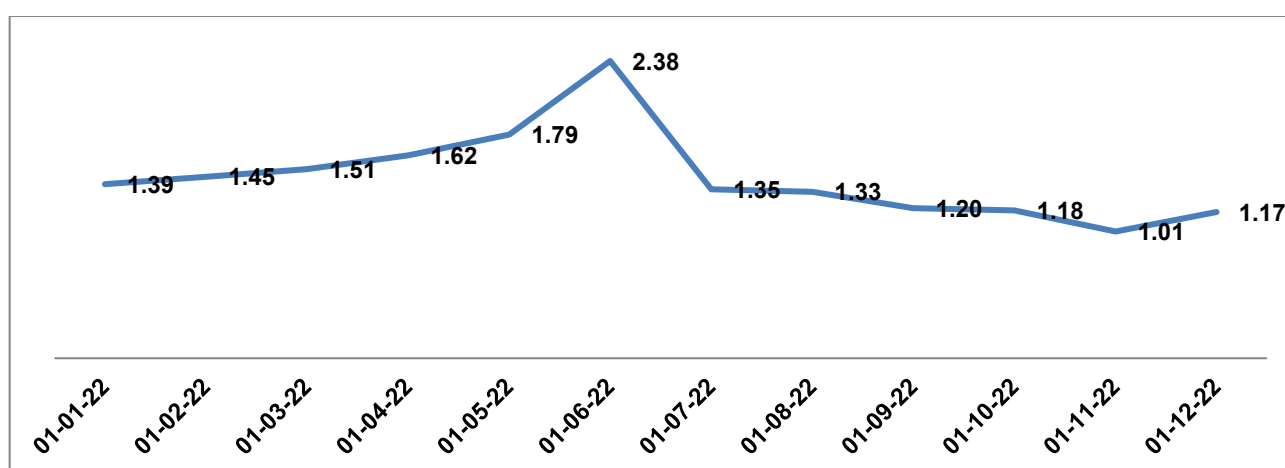


The nearest ABAD centre is in Masalli district and it offers the following services to small rural entrepreneurs:

- analysis of the capacities and actual market demand for their product, identification of new markets and development of business plans
- provision of necessary equipment for increasing production capacity, improving the means of production, and producing new products
- branding and design of label and transportation and marketing of the products of members.
- Provides financial literacy and assists its members to establish their own accounting system.
- Legal support to manage documentation properly, help with certifications.

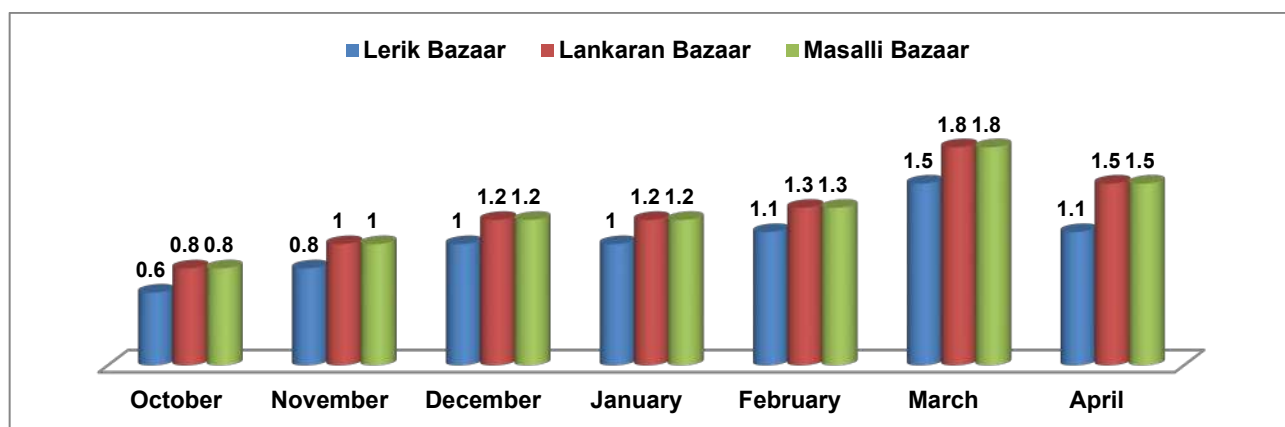
The price of farm products in the market is determined by factors such as -demand and supply, product quality, and the number of sellers, buyers and competitors. The time of the year that apples are available in the market also makes a difference. The graph below shows the selling price of apples in Baku's 8th-kilometer bazaar, one of the main retail fruit markets in the country. In 2022, the maximum price for apples was in June and the minimum in November (Figure 11).

Figure 11. Dynamics of apple price in Baku 8 km bazaar, AZN/kg



Source: Ministry of Agriculture

Figure 12. Dynamics of apple price in Baku's 8th kilometre market, AZN/kg



Source: Ministry of Agriculture

The minimum price level coincides with the harvesting period. Producers who have access to appropriate product storage and cold storages have the opportunity to offer products to the market when supply is low and thus get better prices. Producers who do not have proper storage are forced to sell their products upon harvesting at the minimum price level. With the limitation of storing agricultural products, including apples, in the Lerik district, it becomes clear how low the share of producers in the value chain is in general.

Azerbaijan has several varieties of apples grown in the country. These are mainly Fakhima, Shirvan Rennet, Papirova, Melba, and Yeva which are summer apple varieties. Autumn varieties are Azerbaijan, Yellow Belfler, Winter Golden Parmen, Landsberg Rennet. Jir Haji, Yellow Sour, Reinette Simirenko, Golden Delishes, Gizil Ahmadi, Champagne rennet, Red Delicious, Royal Red Delicious are winter varieties. Besides this Granny Smith, Fuji, Golden Delicious, Jonagold, White Rennet and Spur which are introduced from abroad are also cultivated.

The analysis of apple varieties supplied to the market shows that only Palmet is marketed for all months and the maximum price occurs in July. Gandi Sinab, Gizil Ahmadi, Gala, Reinette Simirenko, Fuji, Granny Smith, Jir Haji, Slava, Summer Apple, Jannat apple variety apples are offered in the market at certain times of the year (Table 8).

Table 8. The price of apples in Baku's market by month, AZN/kg

Apple varieties	01.01.22	01.02.22	01.03.22	01.04.22	01.05.22	01.06.22	01.07.22	01.08.22	01.09.22	01.10.22	01.11.22	01.12.22
Gandi sinab	-	-	-	-	-	-	-	1,15	1,5	1,25	0,9	1,1
Gizil Ahmadi	2,25	2,25	2,25	2,25	-	-	-	-	-	2,25	2,25	2,9
Gala	-	-	-	-	-	-	-	-	0,9	0,9	0,9	1
Palmet	1,1	1,25	1,25	1,4	1,75	2,25	1,5	1,5	1,5	0,9	0,75	0,85
Reinette Simirenko	1,1	1,25	1,25	1,25	1,4	1,75	-	-	1	0,9	0,75	0,85
Fuji	1,25	1,25	1,4	1,6	2	2,75	-	-	-	1,25	1,25	1,25
Grani Smith	1,25	1,25	1,4	1,6	2	2,75	-	-	-	0,65	0,65	0,75
Jir Haji	-	-	-	-	-	-	-	-	-	0,65	0,65	0,65
Slava	-	-	-	-	-	-	1,4	1,25	1,1	1,1	-	-
Summer apple	-	-	-	-	-	-	1	1,25	0,9	0,9	-	-
Jannat apple	-	-	-	-	-	-	1,5	1,5	1,5	2,25	-	-
On average	1,4	1,5	1,5	1,6	1,8	2,4	1,4	1,3	1,2	1,2	1,0	1,2

Source: Table was developed on the basis of the data of portal www.aqrarbazar.az

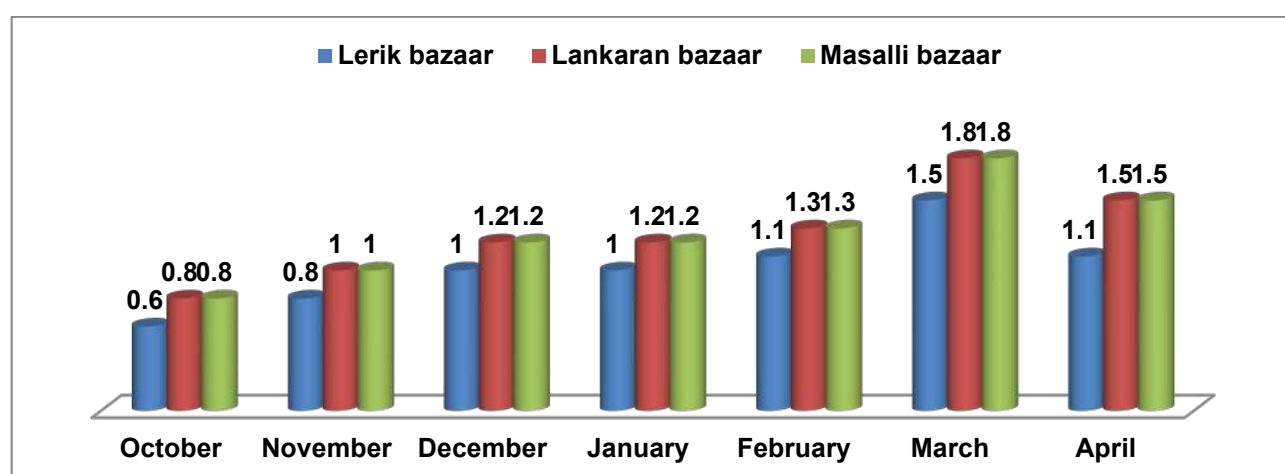
Some apple varieties are available all year or for most of the year as they are produced by enterprises and farms with access to appropriate storage. Apples from Lerik district are in the market between October and April. When we look at the price dynamics in the transportation and sale of products. produced the Lerik, Lankaran, and Masalli markets, we observe that the minimum price in the market is in October and the maximum in March. Price in the Lerik is lower than prices in the Lankaran and Masalli markets. This price

difference is maximum in April when prices are high overall in the market., due to limited storage capacity and spoilage.

Table 9: Prices from direct sale to consumer, via retailer or through intermediary

Sales markets	Farmer	Trade Intermediary	Retailer	Consumer
Value Chain 1 -Farmer to Consumer				
Lerik	0,8			0,8
Lankaran	1,0	-	-	1,0
Masalli	1,0	-	-	1,0
Value Chain 2-Farmer to Retailer to Consumer				
Lerik	0,7	-	1,0	1,0
Lankaran	0,8	-	1,2	1,2
Masalli	1,0	-	1,2	1,2
Value Chain 3-Farmer-Intermediary- Retailer -Consumer				
Lerik	0,5*	0,7	1,0	1,0
Lankaran	0,5*	0,9	1,2	1,2
Masalli	0,5*	0,9	1,2	1,2

Figure 13. The price of Simerenko rennet apples produced in Lerik, AZN/kg



Analysis of the different parts of the value chain shows that the price level in the direct-to-consumer chain is considered acceptable for both producers and buyers. At other levels of the value chain, the gap between producer and consumer prices increases.

In recent years, modern warehouses and cold storages have been constructed in the country. These facilities are often not affordable or accessible for small-scale farmers. This is due to the cost and because such facilities are limited and often not available within easy distance. There are no such facilities available to farmers in Lerik and they are also limited by the small volumes that they sell.

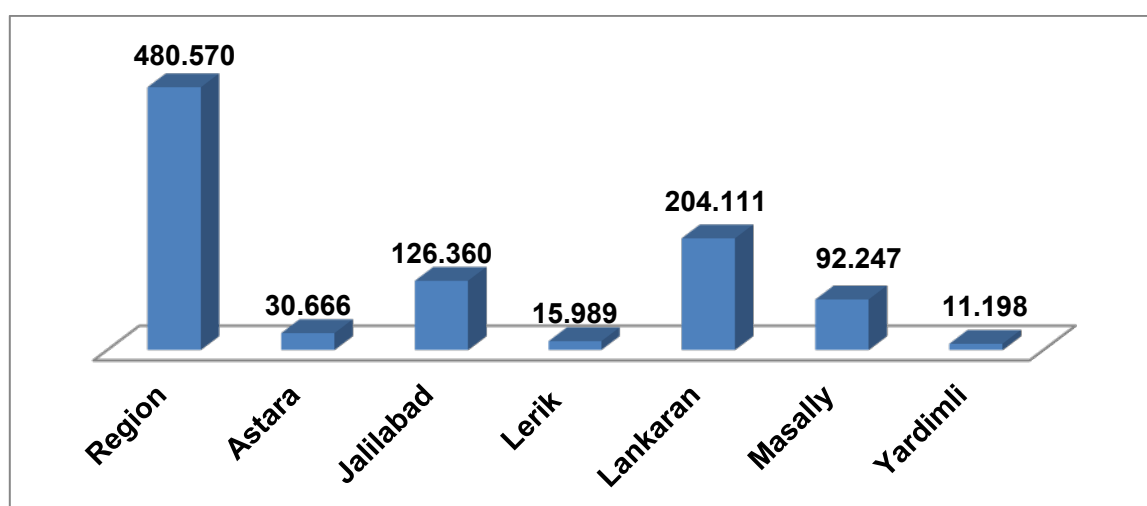
An assessment of the current state of cold storage infrastructure for fruit and vegetable products and the needs in this area was conducted by the Entrepreneurship Development Fund and the Agrarian Research Center. It showed that currently there are 168 cold storage complexes with a total capacity of 672,000 tons. Of these, 143 warehouses with a capacity

of 503,000 tons are for the storage of fruits and vegetables. The largest warehouses are in the Absheron (276,000 tons), Guba-Khachmaz(101,000 tons) and Ganja-Gazakh (97,000 tons) economic regions. The country needs storage for 835.000 tons, taking into account the current storage capacity and the season. Warehouses for vegetables (potatoes, onions) and persimmons that meet modern requirements with an additional capacity of 287.000 tons are needed.

3.1.6. Business environment

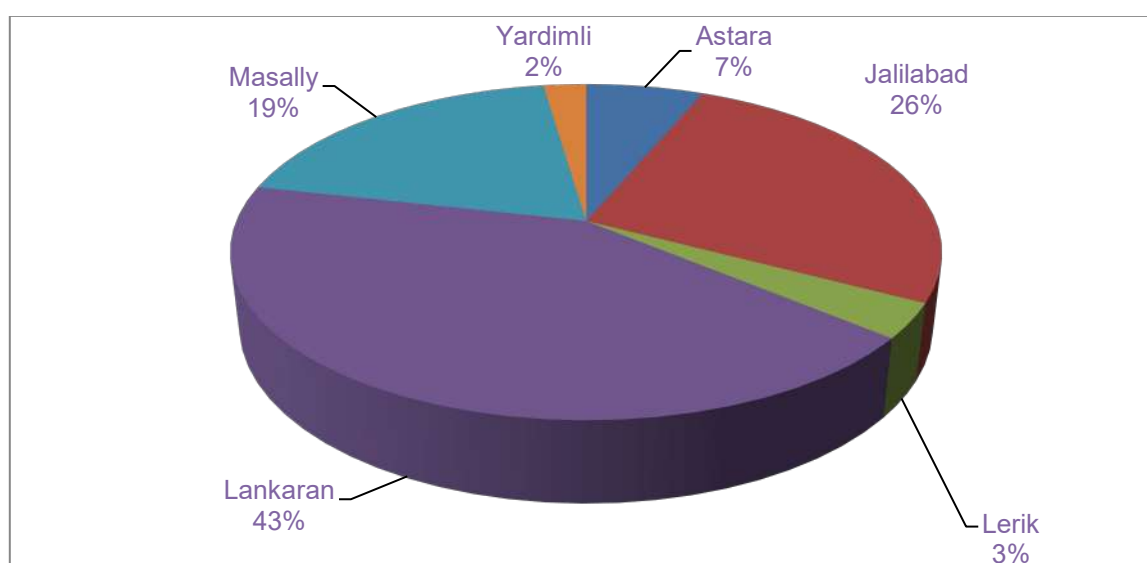
Apple orchards to be profitable require medium and long-term financial investments. As the size of farms in Lerik district is small, banks and non-bank financial institutions are less interested in providing credit. In general, the share of Lerik district in the lending portfolio of the region is small (Figures 14 and Figure 15).

Figure 14. Loans by districts in the Lankaran-Astara economic region, million AZN (04.01.23)



Source: Central Bank of Azerbaijan

Figure 15. Loans by districts in the Lankaran-Astara region (04.01.23)



Source: Central Bank of Azerbaijan

Only 3% of the credit investment in the region is in Lerik district. Loans per capita was 480.6 AZN in the region and 16 AZN in the Lerik district. During discussions with representatives of credit organizations in Lerik and Lankaran, it was determined that diversification of farm production in Lerik district reduces the risks of non-performing loans. Farmers also need new tailored financial products like insurance. Awareness needs to be raised among farmers, regarding the benefits of obtaining agricultural insurance. The insurance rates for the apples are low at 3.32%. This covers for the risks of hail, fire, earthquake, landslide, hurricane, storm, flood, excessive snowfall, and attack by wild animals, and actions by third parties. It is 2% for protection against the risks of plant diseases and pests, 1.24% for the loss of quality in products caused by the risk of hail, and 1.10% for damage by frost. <https://asf.gov.az/bitkilik>

In addition, taking into account the fact that agricultural producers in Lerik district operate mainly in mountainous terrain, differentiation of subsidies, including planting subsidies, as well as subsidization of backyard cultivation is needed due to the less favourable terrain in Lerik compared to other districts of the country.

3.2. Potato Value Chain

Potato cultivation is one of the agricultural sector crops that contributes significantly to raising the income of the population in Lerik District. Upto 30% of the cultivated fields are given to potato cultivation. Measures have been taken to increase the production of this crop and not keep it confined to just personal consumption. This has been done through the provision of subsidies, seeds, and subsidized sale of mineral fertilizers to producers.

In Azerbaijan, nearly 90% of the overall demand for potatoes is met by local production (88.8% in 2021). Production in the country increased by 26.5% between 2015 and 2021. However, import increased by 63%, and export by 3.6 times. The driving force for both import and export is rising competition. The crop is available at a different period compared to many other countries, and the ease of access to international markets, especially the Russian Federation is also stimulating exports.

In 2021, 40,077,700 USD worth of potato products amounting to 92,343.5 tons were exported, of which \$38.4 million USD (96%) was to the Russian Federation. Besides this 1.6 million was exported to Ukraine, 389,000 to Belarus, 128,500 to Kazakhstan, and 22,900 to other countries. All figures are in USD. In the same year 55,799,4 USD worth of potatoes or 214,970.4 tons was imported. Of this 40,077 USD (71.8%) was from Iran, 8,719.7 USD from the Russian Federation, and 2,847.1 USD from Georgia. The rest came from Ukraine (1049.6 USD), Germany, Holland and other countries.

The Lankaran-Astara economic region, including Lerik district, borders Iran. The main portion of imports come from Iran. It is possible to gain a competitive advantage on non-price factors, especially quality factors, by strengthening the value chain of potatoes produced in Lerik district, as well as in increasing the share of producers. The analysis of potato cultivation in the country and district shows that in 2021, the share of the district in the area under potato cultivation area increased by 0.6 points from, from 2.1% in 2015 to 2.7%. In the region the increase was 1% for this period (Table 10).

Table 10. Share of Lerik district in potato cultivation (as %)

Indicators	2015	2016	2017	2018	2019	2020	2021	Difference in 2021 compared to 2015, +/-
Area under potato farming in LAER	2.1	2.3	2.3	2.3	2.5	2.5	2.7	+0.6
Potato farming area in Lerik	13.9	14.7	14.9	13.8	14.7	14.4	14.9	+1.0
Potato production in LAER	2.1	2.2	1.9	1.8	1.8	1.8	1.8	-0.3
Potato production in Lerik	12	11.1	9.8	9.9	7.7	8	8.1	-3.9

Source: www.stat.gov.az

However, the district's share in production has decreased in the comparable period. (0.3 points for the country, 3.9 points for the region). This is because, as in the case of apple production, the productivity levels are low across the country and region (Table 11).

Table 11. Cultivated area, production, productivity of potatoes in LAER 2021

Districts	Area, ha	%	Production, ton	%	Productivity, 100 kg/ha	Difference compared to the region, +/-
Astara district	971	9.6	7589	3.2	78	-132
Jalilabad district	5400	53.5	179300	76.8	292	82
Lerik district	1505	14.9	19023	8.1	126	-84
Lankaran district	430	4.3	3858	1.7	90	-120
Masalli district	894	8.9	15531	6.7	174	-36
Yardimli district	887	8.8	8241	3.5	93	-117
Lankaran-Astara ER	10087	100.0	233542	100.0	210	0

Source: www.stat.gov.az

3.2.1. Input

According to DAIM in Lerik district in 2022 in areas declared to be under potato farming, "Agila", "Telman", "Amiri", "Agria" were the most planted varieties. However, while meeting farmers in the field for this study it was found that some farmers stated that they were not sure what variety they were planting. Farmers in Lerik, buy seed potatoes from Jalilabad district and some seeds come from neighbouring farmers. Observing the yield on a neighbours field helps the farmer to learn from the experience and select the seeds that are productive. The neighbour's field serves as a demonstration plot. While seeds from Jalilabad are bought without observing what the yield would be and whether it is best suited to the climatic conditions and terrain in Lerik which is quite different. The selection of and production of seeds in Lerik needs a different approach. It should involve scientific breeding

and acclimatization research, organisation of demonstration plots and “field days” enabling producers to gain hands-on knowledge and experience.

Some efforts are being taken in this direction, In Kalvaz village a meeting was held in 2022 with potato farmers, representatives of the executive authority of the district, and experts from the Scientific Research Institute of Vegetable Growing. Potato fields were inspected and recommendations provided on methods of cultivation and proper care. The experts also took samples of old local potato varieties to identify the local potato gene pool. The goal is to improve the quality of traditional varieties through research, to preserve the national gene pool, and to re-introduce productive varieties to farmers. Discussions were also held regarding the creation of a local potato seed breeding system in Lerik district with support provided.

Photo 4. Meeting with potato farmers in Lerik district, July 30,2022



In addition, in cooperation between the Ministry of Agriculture and FAO, monitoring of potato diseases and pests was carried out under the project "Establishment of a national system for the production of healthy seed potatoes in Azerbaijan".

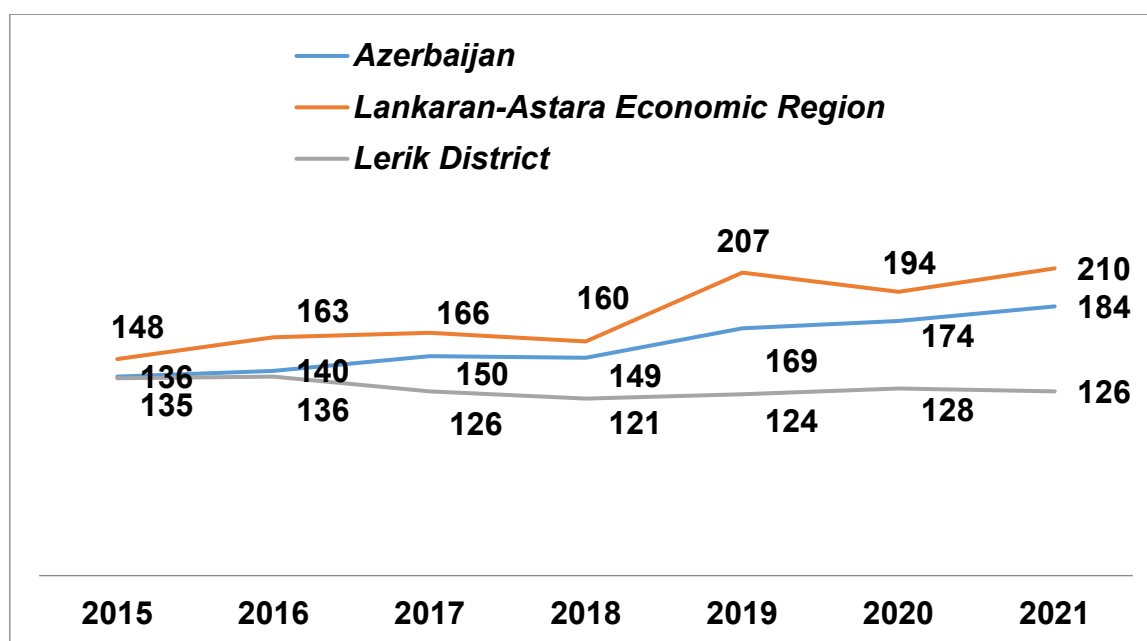
One of the main problems of the input link of the value chain is related to the limitation and scarcity of water. The problem is similar in the case of apple production. There is a need for application of technologies that allow efficient use of water (especially for small-scale farms that dominate agriculture in the region), along with other measures to eliminate water shortages in this area, and at the same time raising awareness among farmers as well as exchange of experience regarding the effect of climate change and its impact on farming efficiency. Looking at potato fields declared for subsidy in 2022, it is seen that 51 of the 190 applicants were farming on dryland.

There are also shortages in the application of mineral fertilizers and pesticides, as a result of the limited income of farm owners. There is also a visible lack of appropriate agrarian support services. Improvements are need in seed varieties grown, in access to water for cultivation and to fertilizers and pesticides and to advisory and other services to improve the position of producers in the value chain.

3.2.2. Production Capacities

In 2022, 22,286.5 tons of potatoes were produced from 1,537 hectares of land in Lerik district. In 2020, per capita consumption of potatoes in LAER was 81.4 kilograms. The population of the district was 83.7 thousand on January 1, 2022. The volume of potatoes required for consumption is 6,813.2 tons or 30.6% of total production. According to initial calculations, the share of potatoes used as seeds and lost during the harvest is about 20%. The rough calculations confirm that up to 50% of potato produced in the district is for sales. However, potato productivity in the region is low comparing with the regional and national production (Figure 16).

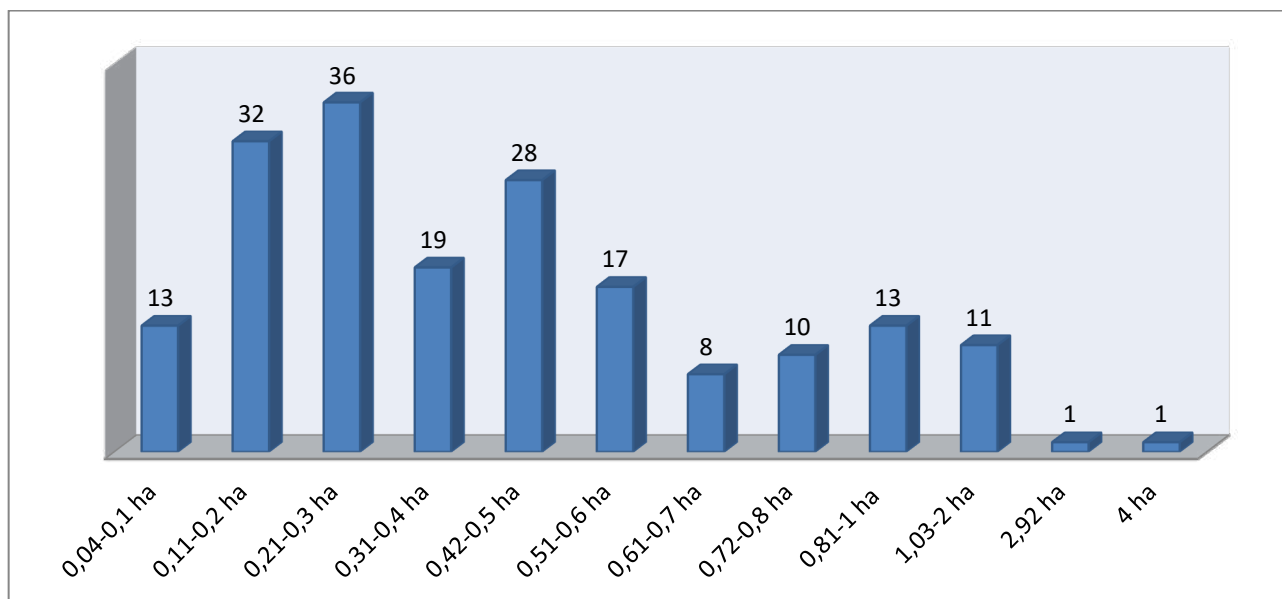
Figure 16. Potato harvest yield, 100 kg/ha



Source: www.stat.gov.az

As we see from Figure 16, the yield per hectare of potatoes in the country in 2021 was 210 centners. The figure for LAER was 184 centners, while in Lerik district it was only 126 centners. Low productivity is due to many factors, including the small size of farms which makes it difficult to apply innovative techniques. Farms in the range of 0.04-0.6 hectares dominate in the district.

Figure 17. Classification of Lerik potato farms by size



Source: Lerik SADC

Diversification of farm output is of exceptional importance to mitigate risks for small farmers.

3.2.3. Harvest and post-harvest

Manual labour is used for harvesting potatoes as is the case for apples too. Horse carts are used in many instances for transportation from fields to storage sites.

As a result of surveys conducted among potato producers within the framework of the "EU4Lankaran" project, The question "What machines and equipment do you use on your farm?" was answered as follows (Table 12).

Table 12: Machines and equipment used on the farm

Works Accomplished	Number of Farmers Involved in the Survey	%
Manual labour	72	81,82%
Horse	42	47,73%
Harvesting machine	11	12,50%
Tractor	31	35,23%
Trailers	5	5,68%
Other	0	0,00%

Source: (Analysis and assessment of country, regional, district and village data under the collaborative undertakings in Lerik district. Anar Guliyev. Senior Non-Key Expert on farm cooperation and businesses, May 2023)

Manual labour dominates with 81.82% of surveyed farmers stating they only use manual labour on their farms, 47.73% use horses. Machines are used by a smaller number with 12.50% using harvesting machines, 35.23% tractors and 5,68% trailers. The shortage or lack of agricultural equipment means that farmers have limited access to modern equipment (including technology) or do not want to use it due to the small size of plots and low labour

costs. In general, the use of machines for harvesting and post-harvest operations across the whole country is limited. According to the State Statistics Committee, in 2021, the number of potato harvesting machines in the country was 59. The area per harvester was 951 hectares. <https://stat.gov.az/source/agriculture/>

The poor conditions for product storage is a key obstacle in increasing farmers' incomes in Lerik. Packing is done in a simple and primitive way. The product is packed in sacks or bags without label or other indication of origin, weight, etc. No sorting is carried out, only spoiled potatoes are removed. Potatoes are simply kept in a pit in the backyards covered with slates, in the basements of houses, and only sometimes in separate simple storage buildings. Potatoes are transported to the nearby Lerik market using own vehicles. Sometimes middlemen buy potato sacks or bags from the farmgate. For transportation to the Lankaran and Masalli markets farmers usually share the cost of hiring a truck.

3.2.4. Markets and traders

The main buyers of potatoes produced in Lerik district are residents of Lerik town and surrounding settlements, consumers who shop at Lankaran and Masalli regional markets, and tourists who come to Lerik for recreation. Limited volumes are also delivered to Baku by order through trade intermediaries. They purchase potato from farm gate whereas consumers and owners of catering facilities purchase small amounts from the market. In addition, tourists visiting the district, take Lerik potatoes with them on their way back home as an ecologically clean, tasty and special product. Sales are subject to verbal contracts and seasonally changing prices in Lerik, Lankaran, Jalilabad and Masalli markets. Payments are made in cash.

Photo 5. Survey of Market Traders in Lankaran

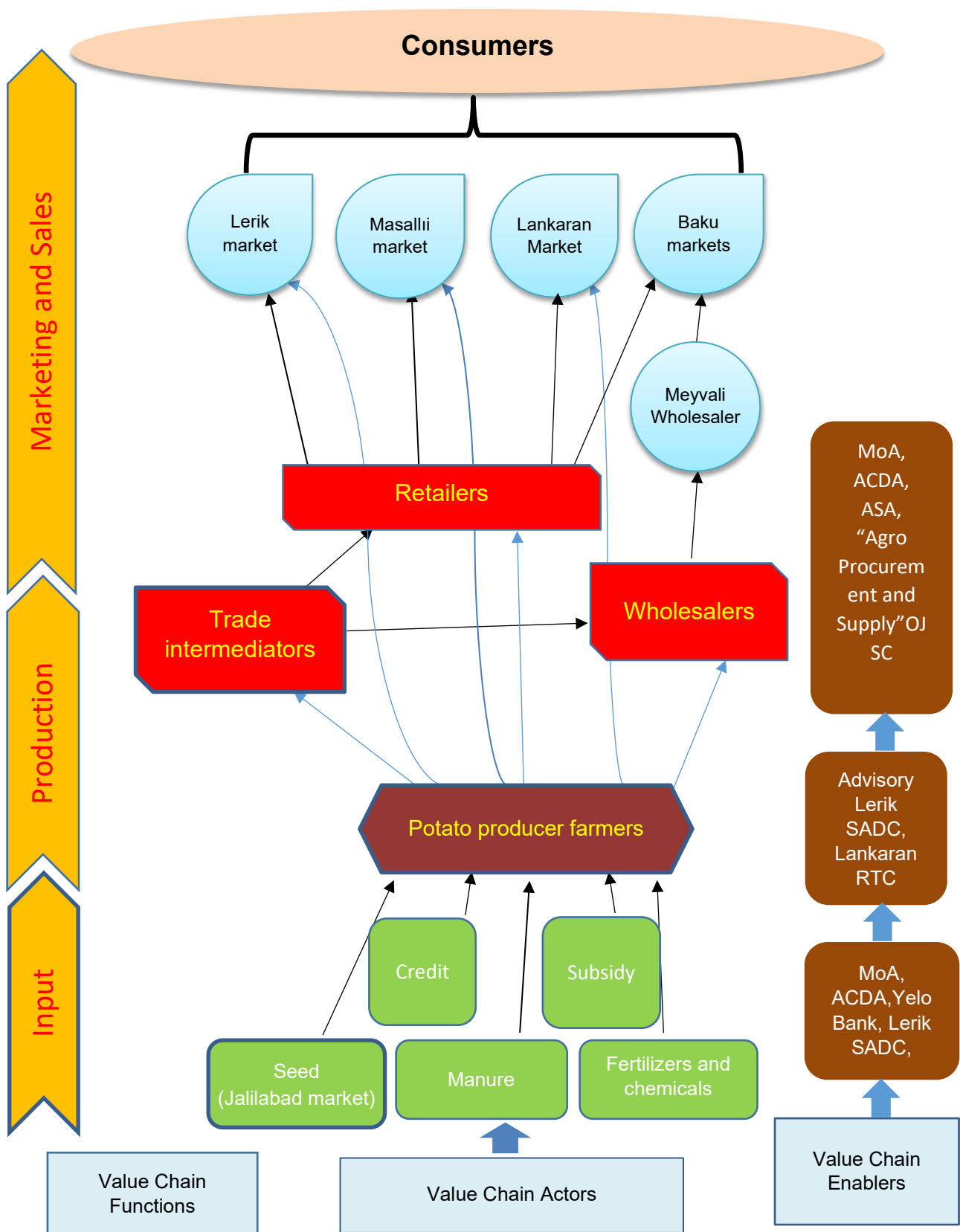


Farmers' experience of using a single e-platform to market their produce or making sales using online channels is limited. This leaves them in a weak position while negotiating with buyers and traders on price. Currently, there are no producer groups, commodity

associations, or formal or informal network of potato producers in Lerik district. Individual bargaining without the joint selling power of a group of producers leaves small farmers in a vulnerable position. They are also not able to use new techniques or technologies where the cost of the applications could be shared with a group.

Promoting sale of agricultural products at the fairs organized by the Ministry of Agriculture in Baku, as well as supplies to external markets through the "Agrarian Procurement and Supply" Open Joint Stock Company, is one of the possible ways of providing new sales channels. The last is a demanding process to meet quality and other requirements which needs assistance from support service providers.

Diagram 2. Value chain of potato in Lerik district



3.2.5. Marketing and sales

Potato growers in Lerik district offer products to the market mainly from September to March. Potato is mainly sold in Lankaran market in 50 kg bags. There are 3 wholesale markets for potatoes in Lankaran, which is the regional market town. The market offers domestic products and imports from Russia and Iran. Potatoes imported from Iran are offered in the October to May period, and potatoes imported from Russia are offered in from January to April. In addition, potatoes produced in Astara, Jalilabad and Tovuz regions are sold in the market. The fresh product from Astara and Jalilabad districts enter the market in April-May and the product from Tovuz district in July-August.

In the table below, the prices of local and imported potatoes in the central market of Lankaran for the last 3 years are shown (Table 13).

Table 13. Price of potatoes in Lankaran market, manat/kg

	Production	Yan.	Feb.	Mar.	Apr.	May	June	July	Aug.	St.	Oct.	Noah.	Dec.
2021	Lerik	1	1.2	1.4						0.80	0.70	0.8	0.90
	Local					0.50	0.30	0.50	0.60				
	Russia	0.70	0.85	0.85	0.90								
	Iran	0.70	0.70	0.70	0.70	0.70					0.60	0.60	0.60
2022	Lerik	1.20	1.30	1.50						0.80	0.80	1	1.10
	Local					0.50-1.10	0.30	0.60	0.60				
	Russia	0.70	0.85	0.85	0.90								
	Iran	0.75	0.80	0.85	0.80	0.70					0.60	0.60	0.60
2023	Lerik	1.20	1.30	1.40			-	-	-	-	-	-	-
	Local					0.50-1.20	-	-	-	-	-	-	-
	Russia	0.85	0.90	0.95	0.95		-	-	-	-	-	-	-
	Iran	0.85	0.90	0.95	0.95	0.90	-	-	-	-	-	-	-

Source: survey conducted among sellers in the Lankaran market in May 2023

Potatoes from Lerik appear in the market at the same time as imported products. It does not coincide with the period when other local products, namely from Astara, Jalilabad and Tovuz. Thus, the competition for producers of Lerik potatoes is from imports.

Survey of sellers in the market, showed that the price level in September, the first month when potatoes produced in Lerik enter the market, has remained almost stable in the last two years. The quality, ecological purity, and uniqueness of Lerik potatoes are the main factors that offer a competitive advantage. Stressing this as part of the marketing strategy would enable producers to sell at higher price compared to competitors.

Local market research also revealed that the daily supply of domestically produced and imported potato products in Lankaran central market is approximately 10 tons. Each of the 10 big sellers engaged in retail sales, sell 1.5-2.5 tons of Lerik products daily, averaging 150-250 kg per seller. The amount of the product sold during the month varies from 45 to 75 tons. Thus, approximately 25% of the products brought to the Lankaran market are Lerik produced, 75% are from other districts. Local retailers avoid transportation costs by not sourcing products directly from farmgates as it is inefficient in terms of time and costs. Of the sellers surveyed in the Lankaran market 23% were wholesalers, and 77% were in retail sales. All were men (Table 14).

Table 14: Characteristics of surveyed vendors

Questions	Respondents' answers	(%)
1) Gender	Male	100
	Female	0
2) Type of trade	Wholesale	23
	Retail	77
3) Source of product purchase	Individual farmer	0
	Trade intermediaries	77
	Group of farmers	23
4) How do you build relationships with farmers or groups of farmers?	I have no connection	0
	Informal	77
	Verbal consent	23
	Official contract	0
5) Do you trust farmers?	Have no confidence	0
	A certain amount	100
	Fully trust	0
6) Do you trust a group of farmers?	Have no confidence	100
	A certain amount	0
	Fully trust	0
7) Do you trust other wholesalers?	Have no confidence	77
	A certain amount	23
	Fully trust	0

Most of those engaged in sales are specialized exclusively in selling potatoes. They also sell some types of fruit and vegetables. Almost none of them are residents of Lerik and only have economic ties with the district. The market survey shows that 23% of the vendors get their products from farmers, and the remaining from intermediary traders.

Due to the low productivity and unattractive appearance of potato, most of the yield is consumed by the farmers' families. The inability to provide a stable volume of products of a known variety according to market demand is one of the main issues faced by farmers. This, along with the solution of other issues, makes it necessary for farmers to work together to improve their market standing by offering a stable volume of products.

The relationship between producers and sellers is weak and this affects the integrity of the value chain.. The main reason for this is the frequent failure of farmers to deliver the product

to sellers at a pre-agreed time, volume, quality and price. This is due to the lack of comprehension of commercial transactions, especially among small and medium-sized farm owners.

The results of the survey conducted among the sellers regarding the demand of buyers (consumers) in the market regarding- price, variety, quality and other factors are shown in the following tables (Table 15).

Table 15: What characteristics do your customers prefer for the potatoes you sell (including potatoes produced in the region and imported from other countries)?

Indicators	Selection level, in %
Price	50
Size	70
Taste	100
Other	60

The market demand of consumers is formed depending on various factors or a combination of these factors. The only category where Lerik potato is weak is price. The inability to supply the market with large and consistent volumes throughout the year is a factor that makes Lerik potato more expensive compared to competitors. It should be a priority to seek support from scientific research institutes to promote the use of more productive seeds that are suitable for local conditions to increase productivity and marketability (Table 16).

Table 16: As a trader, what factors of potatoes produced in Lerik district affect your choice?

Indicators	Selection level, in %
Size	85
Appearance	80
Variety	100
Price	50
Retention period	75

The survey results shows how important it is for commercial buyers to have a quality product that can compete with Iranian and Russian products. Since potatoes produced in Lerik are considered a high-value product in the market, traders can still make a profit despite the high price. They all prefer the local "Kepaz" variety due to its size, taste and appearance (Table 17).

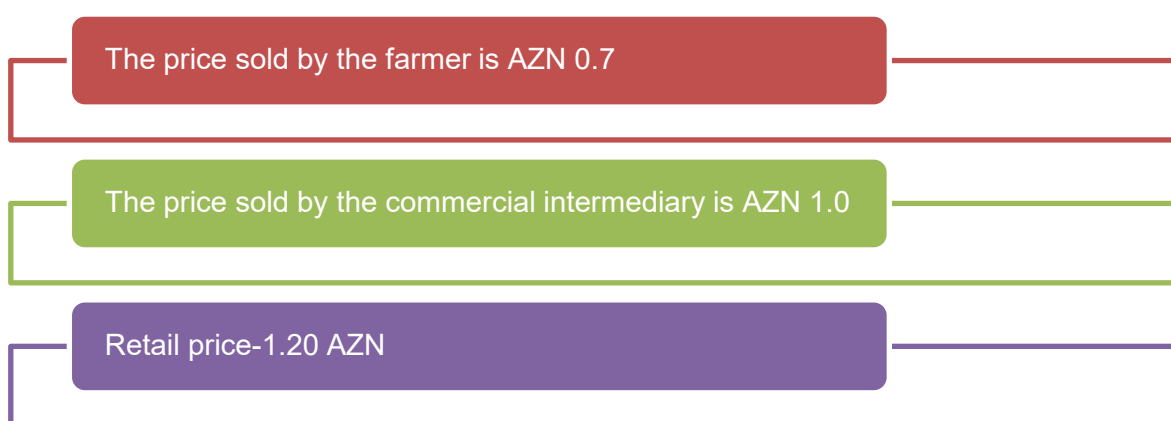
Table 17: Classification of buyers of potatoes produced in Lerik

Buyers	Selection level, in %
Families	85
Small shops	15
Cafes and restaurants	0
Processing enterprises	0

Families are the biggest consumers of Lerik potatoes. But since the quantity is small and there is no attempt to achieve commercial production, big retail or wholesale networks are not interested in buying small volumes from dispersed sources. Restaurants and cafes are not willing to pay extra as they want to keep overall costs low. There are no potato processing enterprises in LAER. Potatoes produced in Lerik district are sold unprocessed in the markets of Lerik, Lankaran and Masalli. The sales prices and the volume of the product sold mainly depend on the situation in these markets.

Potatoes are usually sold by the farmers to middlemen who add their margin to the price set by each participant in the value chain before it reaches the final consumer. According to the information obtained from farmers and trade intermediaries, the price of potatoes is formed in the below shown way (Scheme 2).

Scheme 2: Potato price setting



In recent years exhibitions, fairs and festivals promoting specific products have become widespread in different regions of the country. Examples include:

- Exhibition and sale fair of hazelnuts and hazelnut products and international festival of hazelnuts, walnuts and chestnuts in Zagatala region;
- Cherry and sour cherry festival in Khachmaz district;
- Persimon festival in Balakan district;
- Pomegranate festival in Goychay district;
- Grape and wine festival in Shamakhi district.

Photo 6: Hazelnut Festival in Zagatala



Apple and potato festivals, exhibition and fairs could be organized promoting "Lerik's ecological products" and other products like herbs produced in Lerik district.

3.2.6. Business Environment

Farmers' access to financial resources is from three sources: own funds and borrowings. Despite the increase in the amount of loans granted to the agricultural sector in recent years, the share of these loans in the total loan portfolio, is small. As in other areas of crop production, potato farming is dependent on natural and climatic conditions. Low capital turnover, unfavourable collateral conditions for producers, most of which are small farms, lack of adequate mechanisms to reduce credit risks as well as producers' low level of financial literacy is reflected in the lack of access to credit. There is only one Kapital Bank branch in Lerik District. Farmers apply for loans to banks and loan providers in Lankaran.

Loans on favourable terms are provided by the Entrepreneurship Development Fund (EDF) and the Agrarian Credit and Development Agency (ACDA) of the Ministry of Agriculture. However, the analysis by this team shows that loans in 2022 were mainly provided for animal husbandry. ACDA granted loans in the amount of 1169.5 AZN for animal husbandry in Lerik district, and 142.6 AZN to the development of beekeeping. In this period 87 projects were financed by EDF in the amount of 1308 AZN is directed towards the development of animal husbandry and beekeeping.

As in the case of apple production, most of the farmers are not eligible for subsidies, for farming, fertilizers, pesticides and seeds due to the fact that the main part of potatoes is produced in backyards. The amount of subsidy given for the declared crops is 280 AZN per hectare for main planting and 100 manats for the next planting given in advance, it is the same rule as in other regions of the country. The provision of subsidies for cultivation in backyards as well as amendments to regulations to differentiate between lands depending on the terrain should be done.

Steps should be taken for the cultivation of potatoes on a scientific basis. For this purpose the cooperation between the Scientific Research Institute of Vegetable Growing, Scientific-Research Institute of Plant Protection and Technical Crops, Azerbaijan State Agricultural University, Lankaran Regional Training Center, Lankaran State University, Lankaran Small and Medium Business Development Center with farmers should be strengthened.

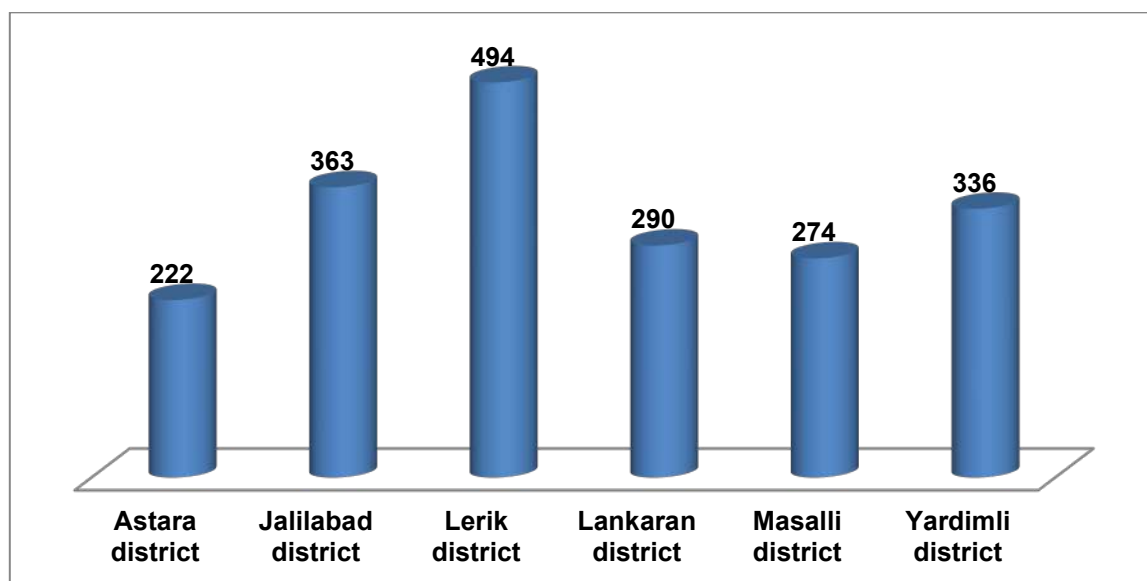
Infrastructure

Work has been undertaken for reconstruction of the road infrastructure, provision of natural gas, electricity, and water with investments from the state budget. in 2006 Lerik district was connected to gas supply pipeline for the first time when the President visited.. The opening of the Piran-Hamarat-Vijaker highway, the supply of drinking water to the city of Lerik, the commissioning of a power plant with a capacity of 16.5 MW have had a positive effect on socio-economic development.

The 56-km Lankaran-Lerik and 22-km Lerik-Shineband-Orand-Nuravud-Zardebara highways were built by the State Agency of Azerbaijan Highways within the framework of the "State Program for the Socio-Economic Development of the Regions of the Republic of

Azerbaijan in 2019-2023". Asphalt was laid on the 2.5 km Blaband-Monidigah and 1.5 km Lankaran highways. Lerik district ranks first for the longest length of locally and nationally important roads among the districts of the region.

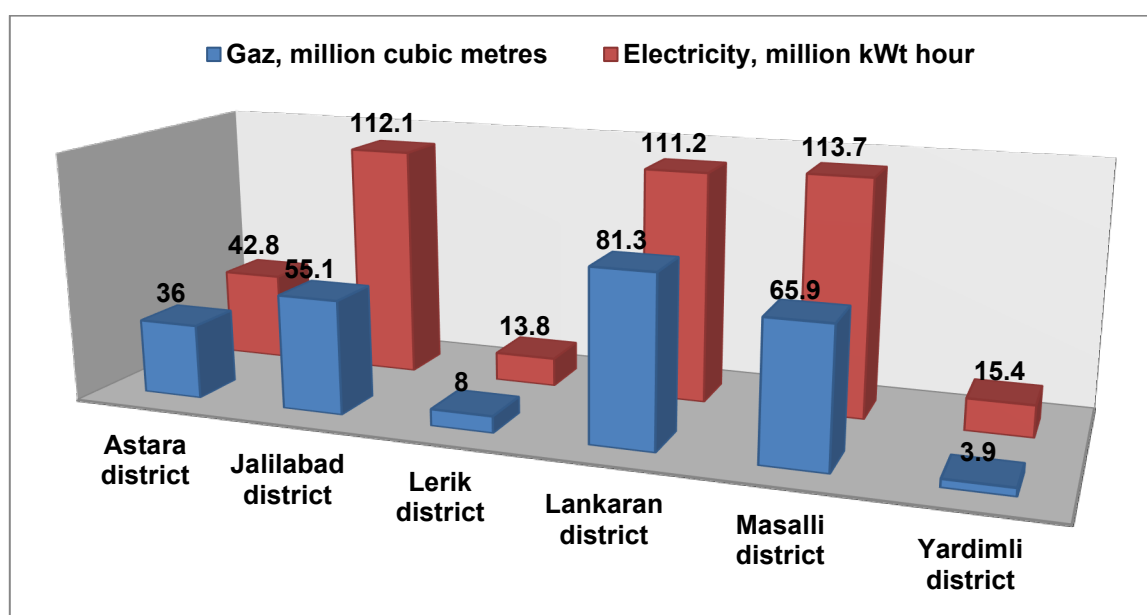
Figure 18. Length of roads of republican and local importance, end of 2021, km



Source: "Transport in Azerbaijan", Statistical yearbook, Baku, 2022

Providing the region with gas, electricity and water is one of the priority areas of socio-economic development. During 2019-2023, a new gas pipeline of 70.74 km was built. The gas line of 1.0 km has been overhauled and 6 settlements were connected with gas.

Figure 19. Natural gas and electricity consumed by the population of LAER by district



Source: Energy of Azerbaijan, Statistical yearbook, Baku 2022

Potential for e-commerce

There are several online platforms for selling agriculture products online in Azerbaijan.

<https://tedaruk.az/>, <https://aqrar.az/>, <http://shop.agrotrade.gov.az/>,

In some districts of Azerbaijan, agriculture activities are more commercialized and the farmers in these districts are using the opportunities offered by e-commerce platforms. These districts are Shamkir, Guba, Gusar, Ismayilli, Barda, Gakh, Agjabedi, and Beylagan. In 2019 the Lerik SADC attempted to build links between the Lerik farmers and the “Agro Procurement and Supply” Open Joint Stock Company for selling honey processed by Lerik farmers on the e-commerce platform. The sample was taken but no sale took place. Lerik farmers have not used any e-commerce service, because there are some constraints in getting them on these sites including:

- Lack of awareness among farmers about e-commerce
- Complex requirements of the online selling platforms
- Inadequate logistics and transportation from Lerik district
- The lack of packaging and labelling of the product
- Most of the farmers' agriculture activities are not commercialized

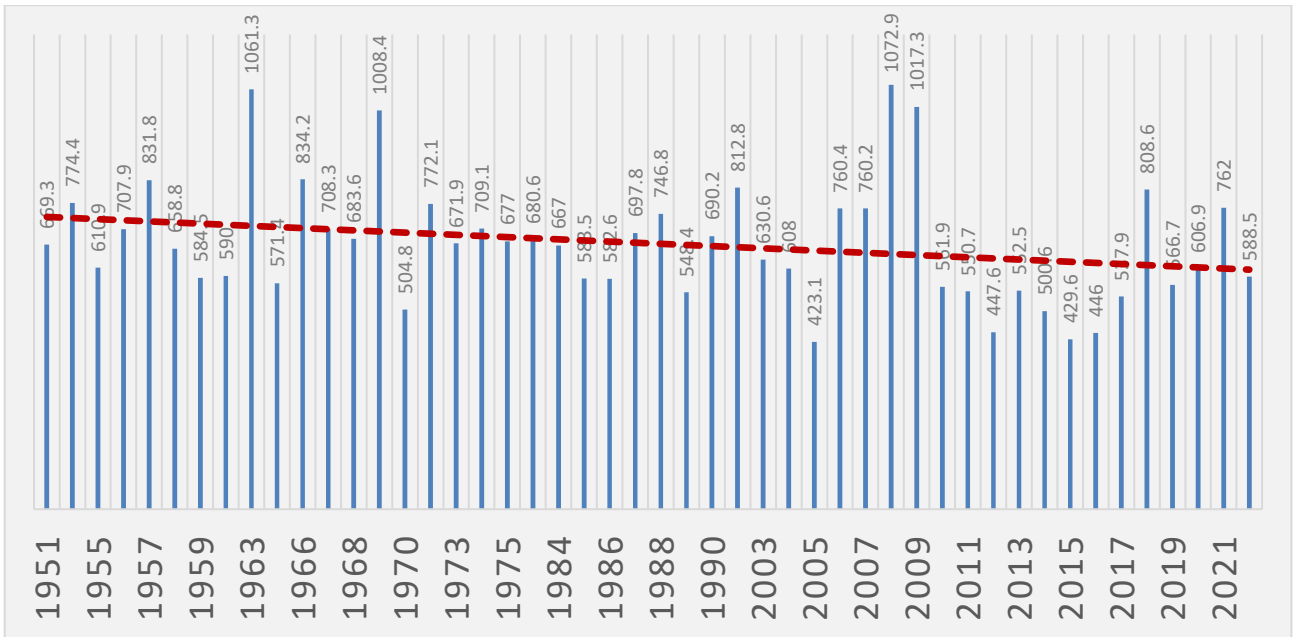
Lerik farmers only use Whatsapp messenger. A group of farmers from Orand village intend to create a Whatsapp group to share information about agricultural products and services.

4. ENVIRONMENT AND CLIMATE CHANGE

The ecosystem in Lerik district is fragile being a mountainous region. Preserving the biodiversity of the flora and fauna is important. There are two reserves in the district, the Zuvand State Reserve and the Ruvarud State Reserve shared with the neighbouring Yardimli district. The flora of Lerik is also rich in numerous wild medicinal and herbal plants. There is a collection point for the Genetic Research Institute under the Academy of Sciences in Zuvand. The fauna includes, lynx, leopard, boar, bear, wolf, jackal, fox, rabbit, forest cat, squirrel, dormouse, as well as bird species like partridge, turaj, wood grouse, lark, quail, and others. Though in the last 10 years the boundaries of the forests have not changed, thinning of trees is noticed. One factor for this could be the collection of firewood for heating and cooking. The number of forest fires have also increased. In 2021 there were 43 fires as opposed to 3 in 2015.

Rainfall trends: are changing as a result of climate change. The analysis of data for the last 70 years shows that there is a decrease in rainfall. During the last 30 years, the amount of rainfall Lerik district received has decreased by 8 percent. There is an increase meanwhile in the number of rainy days with precipitation above 30 mm, this has a great impact on water resources and agriculture. To conserve water for the summer months when it is most needed for irrigation reservoir should be built. Such reservoirs can play a major role in the development of agriculture in the district.

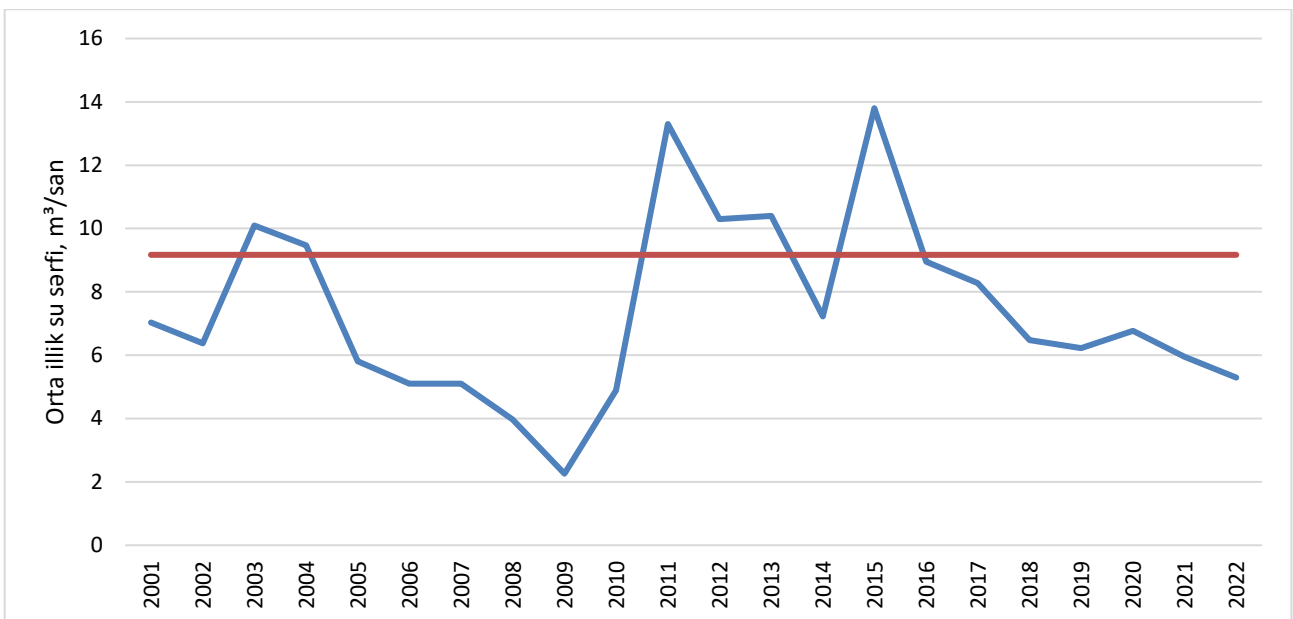
Figure 20. Precipitation in Lerik district (mm)



Source: National Hydrometeorological Service, Ministry of Ecology and Natural Resources

River water: is used for irrigation. Reduction in river flows is also observed in Lerik District. A comparison of the data for the last 20 years with the norm of 1960-1991, a 20 percent decrease in water flow is observed in the Lankaran river. This is the main river in the district which also flows into Lankaran District before entering the Caspian sea. The main factors behind this decrease is reduced precipitation, lower snow fall and snow melt, increase in temperature and evaporation, and inefficient use of water.

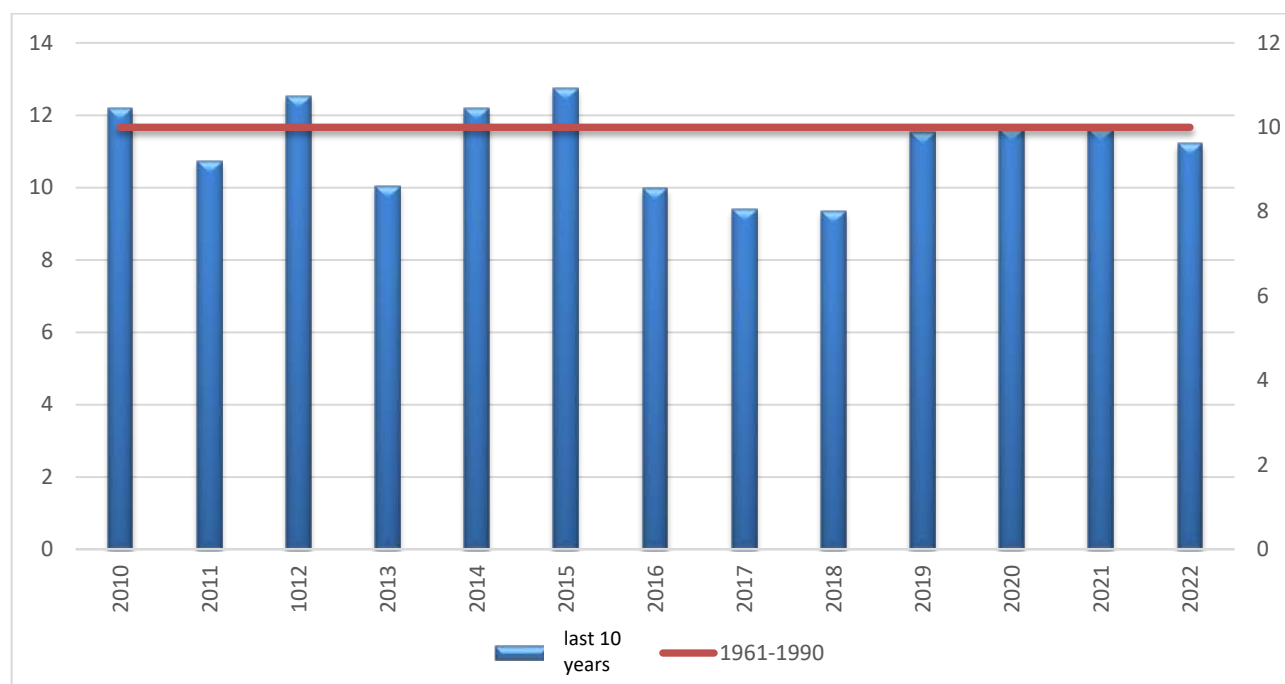
Figure 21. Comparison of the average annual water flow in the Lankaran river in Sifidor area with the norm



Source: National Hydrometeorological Service, Ministry of Ecology and Natural Resources

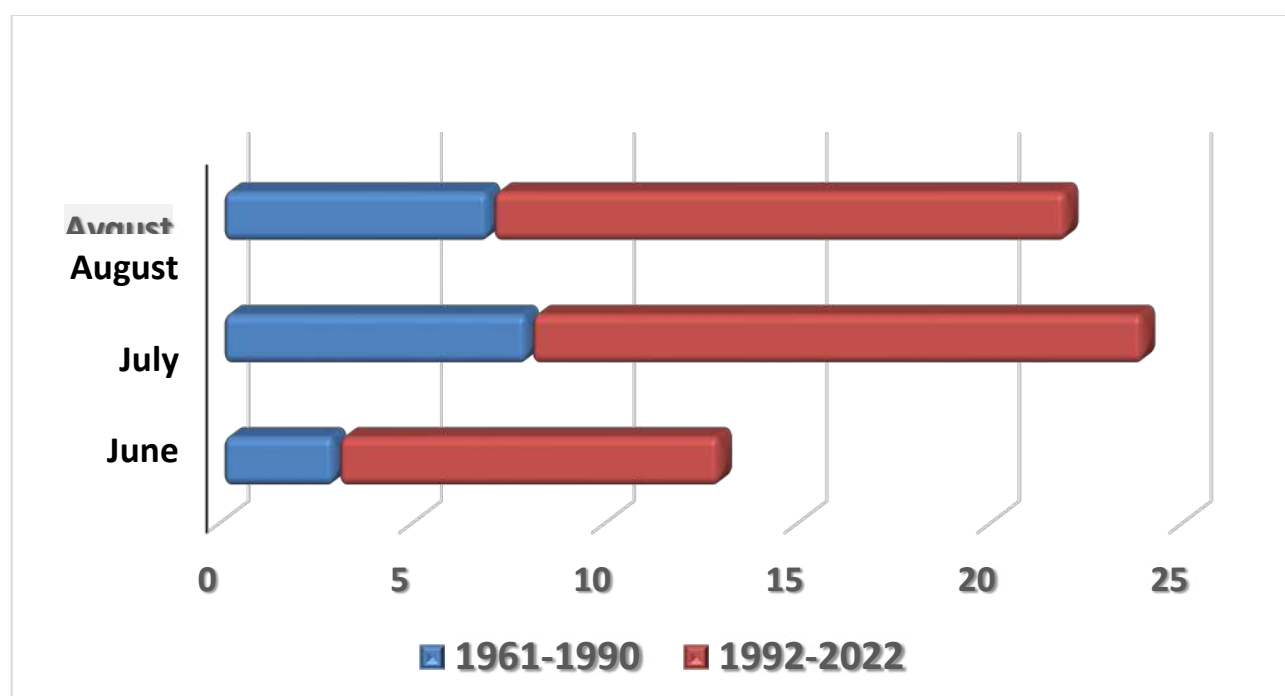
Temperature: Analysis of data on long-term average daily temperature is it noticed that the annual average temperature has increased by 1.1 degrees.

Figure 22. Average temperature in Lerik district compared to the norm (celsius)



Source: National Hydrometeorological Service, Ministry of Ecology and Natural Resources

Figure 23. Number of days with temperature above 25 degrees celsius in summer



Source: National Hydrometeorological Service, Ministry of Ecology and Natural Resources

As a result of climate change, the number of days above 25 degrees Celsius in summer in Lerik district has more than doubled in summer months. In August and July the figure has doubled compared to 1961 to 1990 and it has tripled in June. As the district is a mountainous, temperatures above 25 degrees are not typical for summer. This has an impact on agriculture, with more water usage. Farmers have also observed an increase in pests and diseases.

Table 18: Average annual indicators of Lankaran river at Sifidor station 2022

Designated components	Readings
pH	8,3
SSAM mg/l	0,02
Phenol mg/l	0,001
NH ₄	0,34
NO ₂	0,08
NO ₃	4,93
PO ₄	0,03
Dissolved O ₂ mg/l	7,6
%	81,2
OBS5	2
Σ ion	406
Cl	89,8
SO ₄	87,6

Source: National Hydrometeorological Service, Ministry of Ecology and Natural Resources

Contamination from sewage and manure is observed in the river water samples. This is because most houses in villages do not have proper sewage pits and manure from livestock is not secured properly and is leaking into the river during rainfall. This can also impact agricultural production as river water is used for irrigation in both Lerik and Lankaran districts.

5. SWOT ANALYSIS OF APPLE VALUE CHAIN

Table 19: Swot Analysis- Apple Value Chain

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • The existence of production traditions • Low labour needs • Production of environmentally friendly products • Production in a different time period • Access to Lankaran market • Access to the Silk Road • State support • Prevalence of apple orchards 	<ul style="list-style-type: none"> • Inadequate recognition of Lerik apples • Lack of demonstration areas • Lack of experts • Limitation of irrigation water and lack of modern irrigation systems • Pest attacks are difficult to contain • Lack of information about agricultural insurance • Small farm size • Lack of product sorting • Lack of access to other regional markets • Limitation of storage facilities • Limitation of plant protection machinery and equipment • Poor marketing • Lack of fruit processing centers • Unattractive appearance of the product • Lack of agrochemical sales center • Poor access to efficient sales markets
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Availability of favourable climate and fertile land • Access to the main transport corridor leading to Baku the largest market in the country • State support • Availability of tourists • The large number of farmers interested in apple production • Planting of new and intensive gardens • Possibilities of using productive seedlings • Efficient irrigation and water harvesting and storage. 	<ul style="list-style-type: none"> • Climate change • Limited water resources • Declining interest in the field • Lack of recognition of the "Lerik apple" brand • Increasing competition in the market • Increase of pest attacks

5.1. Conclusion and recommendations - Apple value chain

Table 20: Conclusions and Recommendations-Apple Value Chain

Description of the problem	Suggested remedies	Executers
Limited water resources and climate change problems	Applying affordable climate smart technologies, raising awareness among farmers and local communities, and exchange of experience with other regions	AWF, SMBDA, Lerik SADC
Subsidies not granted to the farm backyard areas, non-differentiated subsidies	The subsidy programme and measures of ACDA improved and adapted to meet the needs of farmers in less favoured areas	MoA, ACDA
Lack of a stationary sales centre for mineral fertilizers and agrochemicals	Revision of the current supply system and establishing a stationary sales centre as needed	Lerik Excom, MoA
Low productivity of apple orchards	Research and application of innovative agricultural solutions. State support for modernisation of orchards.	SRITFG, AIC, Lerik SADC, SMBDA, RTC
Improving knowledge and practices on apple storage. Introducing small farm processing.	Training and advice on effective technologies for on-farm apple storage.	SRITFG, AIM, Lerik SADC, SMBDA, RTC
There is no producer group, commodity association, or any kind of farmer network in Lerik district	raising awareness of the benefits of cooperation	KTN, SMBDA, RTC, Lerik SADC
Demand for processing of apple to manufacture homemade apple powder, compotes, jams, juice, puree, marinades, etc.	Avail assistance from the Self-Employment Program of the Ministry of Labour and Social Protection of the Population.	SMBDA
Limited access to the Baku market	Promotion of sales at agricultural product fairs. Advertising the opportunity for sales to the "Agro Supply and Supply" OJSC among apple growers with practical instructions how to meet the requirements	MoA, APS

Lack of recognition of Lerik's ecological product brand	Organization of apple and potato festivals, exhibition and fairs of local, traditional products. Promotion of the district produce on social media and through billboards in Lankaran followed by Baku and other regions with demand for local products. Design of Lerik made brand. Implementation of short and medium term marketing strategy.	Lerik Excom, MoA, AFSA
Risks to production in Lerik area reduces the interest of farmers	Insuring the product after raising awareness of farmers regarding risk and risk mitigation and diversification	AIF, Lerik SADC

6. SWOT ANALYSIS OF POTATO VALUE CHAIN

Table 21: SWOT Analysis- Potato Value Chain

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • The existence of production traditions • Production of ecological products • Production in a different period • Demand exceeding supply • Access to regional market in Lankaran • Access to the Silk Road • State support 	<ul style="list-style-type: none"> • Inadequate recognition of the Lerik potato • Lack of demonstration areas • Lack of specialists • Limitation of irrigation water and modern irrigation systems • Difficulties in dealing with pests • Lack of information about agricultural insurance • The small size of farms • Lack of product sorting • Limitation of storage facilities • Limitation of plant protection machinery and equipment • Lack of processing shops • Unattractive appearance of the product • Lack of agrochemical sales center • Lack of guaranteed seed • The high price of productive seeds • Lack of seeds suitable for natural-climatic conditions • Limited number of machines and equipment • Lack of qualified personnel • No access to low-interest loans • No subsidy for production in backyard areas • Non-branding of the product
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Availability of favorable climate and fertile land • Access to the main transport corridor • State support • Growing demand of tourists • Access to markets • Being labour intensive 	<ul style="list-style-type: none"> • Climate change • Limited water resources • Declining interest in the field • Increasing competition in the market • Increase of pest attacks • Sale of other products as Lerik potato

6.1. Conclusion and recommendations

Table 22: Conclusions and Recommendations – Potato Value Chain

PROBLEM DESCRIPTION	RECOMMENDATIONS	EXECUTERS
Farmers lack of information about planting good quality seeds.	Conducting awareness campaigns and organizing field days to see good varieties	Lerik SADC, RTC
Limited water resources	Application of water efficient technologies, awareness programmes, trainings, exchange of experience	KOBIA, Lerik SADC
Lack of potato harvesting techniques suitable for terrain	Provision of terrain-friendly equipment and machines to farmers on preferential terms	"Aqroservis" OCSC
No producer group, commodity association or farmer network of any kind	Advising farmers on the benefits of group activity to farmers	MoA, SMBDA, RTC, Lerik SADC
Limited access to Baku market	Promotion of sales at agricultural fairs. Supply to "Agrarian Procurement and Supply" Open Joint-Stock Company with support to meet the criteria	Ministry of Agriculture,
Lack of recognition of "Lerik's ecological products" brand	Organization of apple and potato festivals, exhibition and fairs under "Lerik's ecological products: Branding of the product	Lerik ExCom, MoA, AFSA
The risks of farming reduces the interest of farmers	Insuring the product, after educating the farmer on risk mitigation	AIF, Lerik SADC

ANNEX

Chart 1. Area occupied by districts in the region (%)

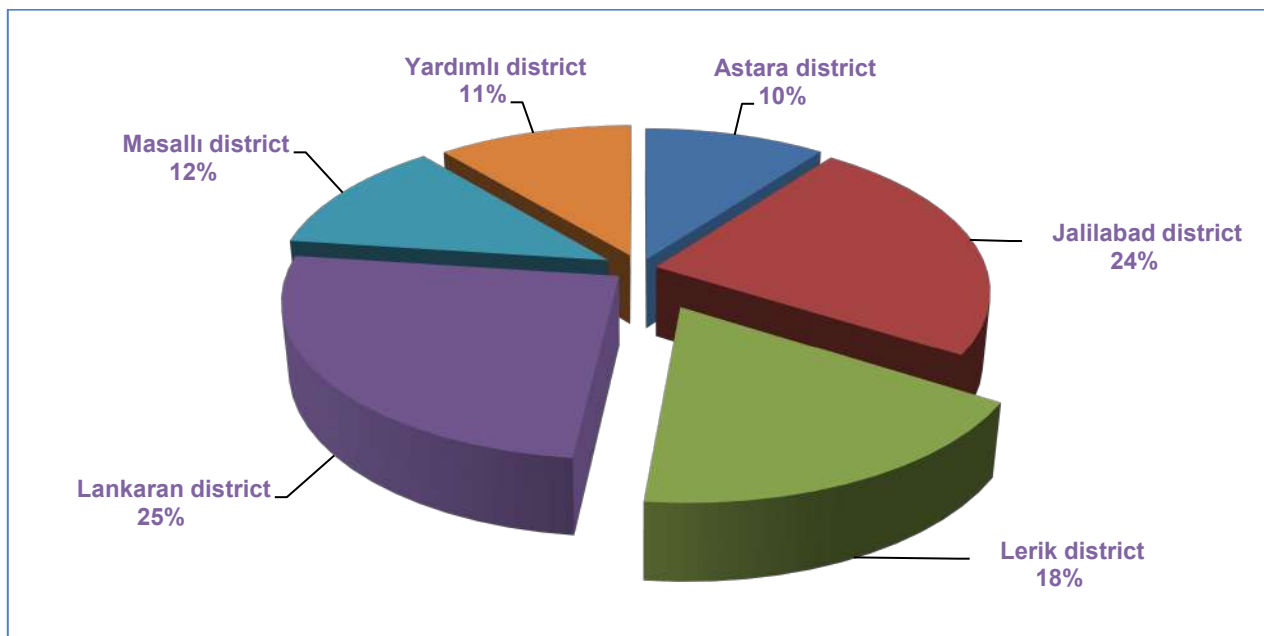


Chart 2. Division of population in LAER by districts (%)

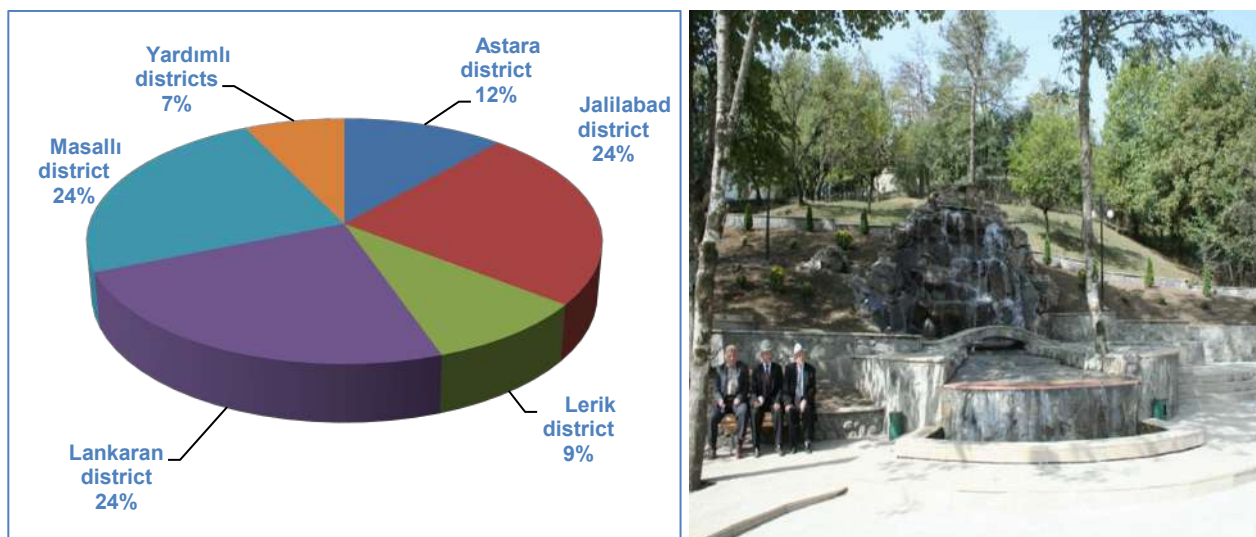


Chart 3. Gross output by districts of LAER (%)

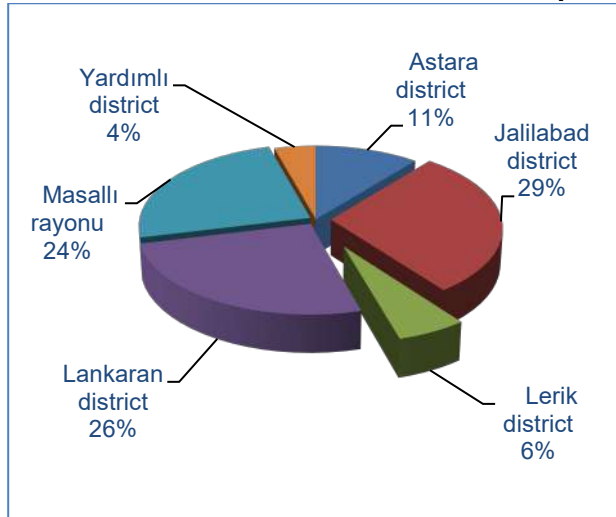


Chart 4. Capital investments by districts (%)

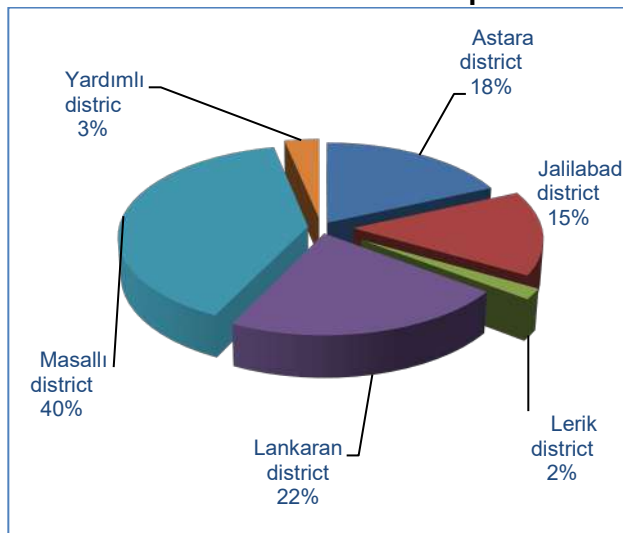


Chart 5. Allocated credits by administrative districts of Lankaran-Astara Economic Region (as on 01.04.23)

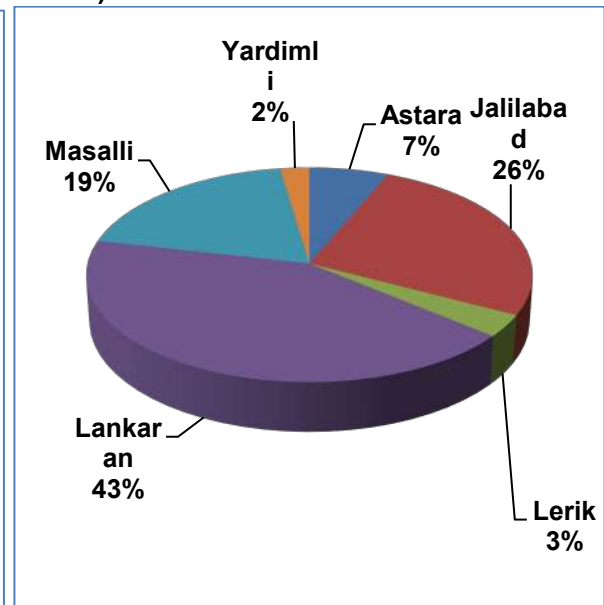
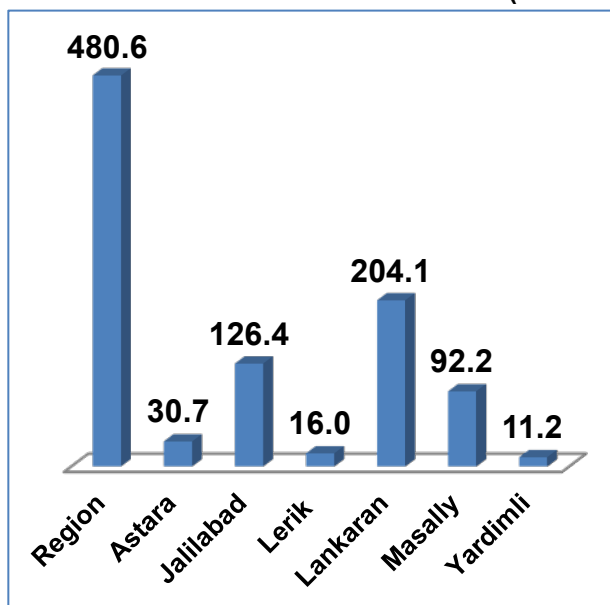


Chart 6. The structure of gross agricultural output by administrative districts of Lankaran-Astara Economic Region

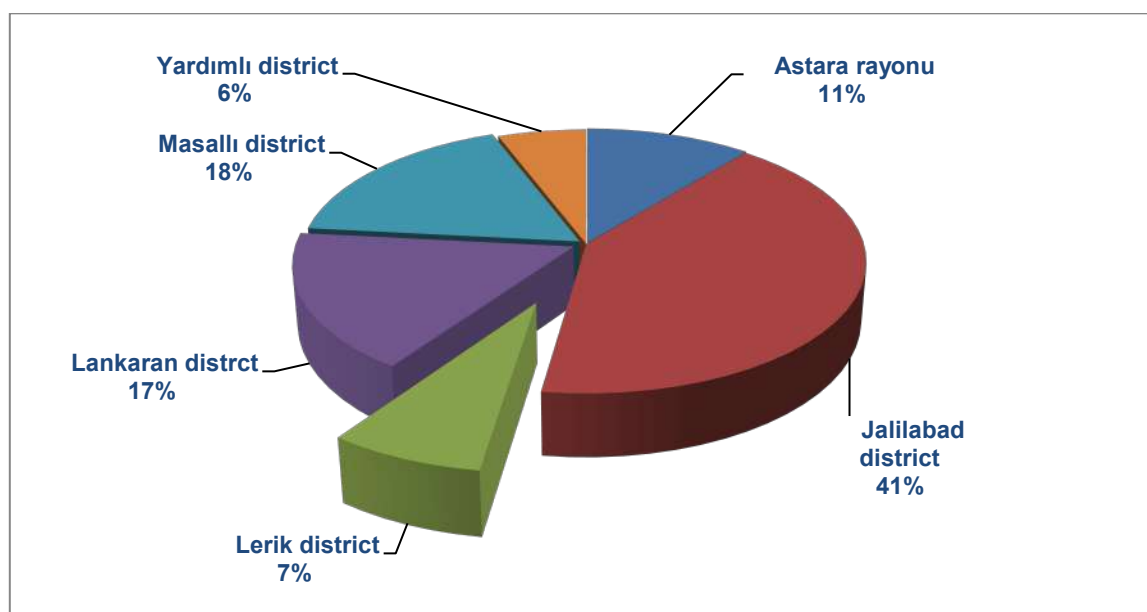


Chart 7. Agricultural output per capita by administrative districts of Lankaran-Astara Economic Region, 2021 (AZN)

