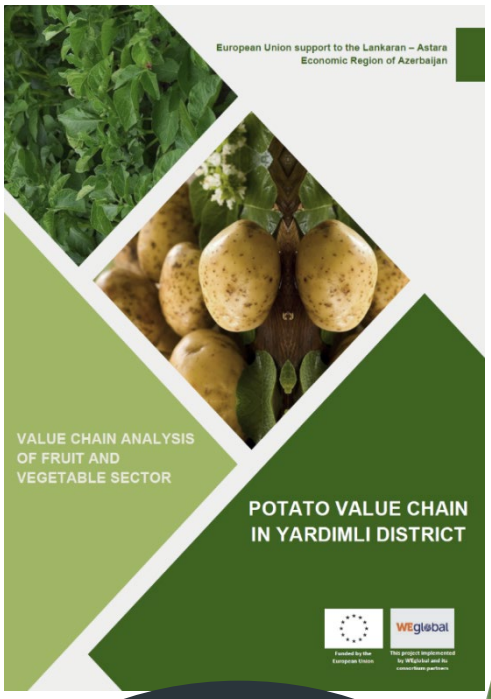
European Union support to the Lankaran – Astara Economic Region of Azerbaijan

2024

POLICY BRIEF ON FRUIT AND VEGETABLE VALUE CHAINS IN THE REGION

Funded by the European Union

This project implemented by WEglobal and its consortium partners



POLICY BRIEF ON FRUIT AND VEGETABLE VALUE CHAINS IN THE REGION

TABLE OF CONTENTS

FORWARD

The project reviewed seven fruit and vegetable value chains in the Lankaran-Astara Economic Region with a view to increasing the competitiveness of these value chains. These reports are available separately. From the analyses it became clear that there are urgent challenges that all value chains face in the region and in the country as a whole. If these gaps are not bridged, Azerbaijan's goal of diversifying the economy with agriculture as a growth area will not be accomplished.

It became clear that an overview of the sub-sector from an agri-business perspective keeping in mind global trends such as technological and climate change was needed. A method for comparing the diverse value chains looking at their economic, social, and environmental impact has been enunciated to understand which value chains are more important from an economic or socio-economic viewpoint. This method can be used to look across value chains to decide where the returns would be more and what type and amount of investments are needed.

The region has also been categorized into three agro-business zones with a focus on cluster development. This is also a useful tool for looking at the type of value chains that can be supported from a long-term perspective.

The note also provides a typology of value chains and of the horizontal and vertical linkages that need to be built and strengthened. The critical steps required to revitalize the fruit and vegetable sector in the region are enunciated at the end.

The report has been prepared by Tara Sharafudheen, Team Leader, EU4Lankaran Project. The following also contributed to the report: Jacek Weiserski, Senior International Expert and Anar Hatamov, Senior National Expert.

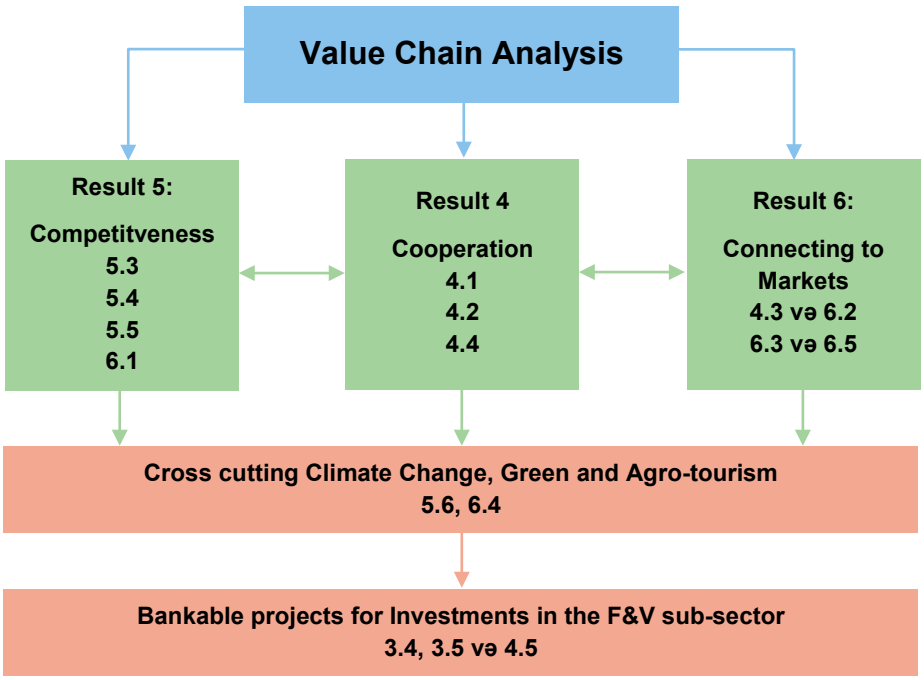
EU4Lankran Project Team

February 2024

1. INTRODUCTION

The EU4 Lankaran project is implemented in partnership with the Ministry of Economy and the Ministry of Agriculture of the Republic of Azerbaijan and funded by the European Commission. The project development objective is to support the Government of Azerbaijan's efforts to diversify the economy while promoting the balanced and economically sound development of the region. This is done through implementation of two key components. One, focusing on regional development through the development of District Development Plans for all six districts of the region. The second supports the development of the fruit and vegetable sub-sector, identified as an area of comparative advantage for the Lankaran-Astara Economic Region (LAER). The competitiveness of the sub-sector is to be increased, through strengthening value chains of important fruit and vegetable crops. Three aspects are seen as crucial in this regard: 1) the establishment of a modern collaborative network of value chain actors, 2) improving market access through better producer-buyer linkages and e-services and 3) as a driver of this cooperation, strengthening applied agriculture research and smart technology transfer between service providers and farmers. The analysis of select fruit and vegetable value chains in the region is the foundational aspect to achieving these results related to improvements in the food and vegetable sector in the economic region as illustrated in the diagram below Figure 1. The follow up steps to the value chain analysis of the six fruits and vegetables in the six districts of the region are stated here and elaborated in the last part of this report.

Figure 1: Analysis of Fruits and Vegetables Value Chain and Next Steps



Competitiveness: for improved competitiveness focused support will be provided for applied research and smart agricultural advisory services (AAS). An applied agricultural research program will be developed by networking research institutes, connecting them

to the private sector and implementing smart solutions for agricultural advisory services. The quality of fruit and vegetable production will thus to be improved and products to be exported will be of higher value. A climate change strategy and action plan will be developed to increase resilience, mitigation, and adaptation. *(Result 5).*

Cooperation: among value chain actors will be supported through modern cooperation hubs, for information exchange and evidence-based decisions related to production and marketing. This includes piloting and/or supporting formal and informal networks, and partnerships for service delivery and access to new ideas, markets, and modern technologies. Partnerships with the private sector are crucial to accelerate the adoption of innovative technologies. Community engagement, community-led advisory services and awareness campaigns are part of this effort. The capacities of relevant institutions, to facilitate stakeholder dialogue, support producers to expand markets through producer-buyer linkages, and for corporate branding of crops, and agri-food tourism will be strengthened. *(Result 4)*

Connecting to Markets: A marketing strategy will be developed to promote and expand the market for horticultural produce and for agri-food tourism businesses. At least six pilot regional corporate brands will be developed to increase competitiveness and expand the market for fruit and vegetable products. Market outlooks for the major fruit and vegetable crops will be prepared, A regional platform for sharing market information will be established. *(Result 6)*

Based on this effort, **bankable projects** for the fruit and vegetable sector will be developed to enable potential investors to identify agri-business opportunities in the region. *(Result 3)*

2. Analysis of Select Fruit and Vegetable Value Chains

Value chain analyses of select fruit and vegetable crops in each of the six districts of the region has been completed. A focused approach was followed to select fruit and vegetable value chains based on their regional and national importance including for exports, the uniqueness and importance of the local production system and agro-tourism opportunities. The main objective of the analysis was to identify the main actors and links within each chain and the gaps, needs and opportunities with a view to enhance the competitiveness and value-addition of the fruit and vegetable sector. In the second stage, on the basis of this understanding, build inclusive and efficient value chains by supporting horizontal and vertical linkages between the actors. The final beneficiaries of the technical assistance provided by the project are fruit and vegetable producers, agribusinesses, and rural citizens of the economic region (in particular youth and women) who will benefit by raising incomes and employment opportunities in the agriculture sector.

The terms of reference of the project required the selection of at least one produce per district with high development potential for analysis. Gaps and needs are to be identified, covering knowledge and innovation, capacity development, production technology and

quality, ability to reach end markets, food safety and other requirements. The ultimate goal is to get information about existing value chains and market opportunities to increase cooperation and competitiveness and use this knowledge to attract much needed investment into the sub-sector where it is most needed.

Value chain analyses of select fruit and vegetable crops which included SWOT analyses were conducted and findings elaborated, and recommendations made. A total of six separate reports encompassing seven value chains in the six districts of the region have been developed as follows:

1. The Mandarin Value Chain in Astara District
2. The Strawberry Value Chain in Jalilabad District
3. The Tomato Value Chain in Masalli District
4. The Lemon Value Chain in Lankaran District
5. The Potato Value Chain in Yardimli District
6. The Potato and Apple Value Chains in Lerik District

Value chains are not limited by district borders. For instance, citrus fruits like lemon and mandarin are cultivated in Astara, Lankaran and Masalli districts. However, the aim here was to look at the importance of the value chain to the district and its local and national importance. The possibility of branding was also a consideration and the produce had to have name recognition in the regional or national market or distinct aspects to enable branding and for exports be a high value product with rising demand. The choice of mandarin in the case of Astara was easy as the district produces 87 percent of the country's production. The Lankaran lemon has name recognition in the market and 37 percent of production takes place in the district though the district's share has fallen due to increased lemon production in Astara and other regions. Tomato is an important crop for Masalli district where you have small and medium farmers and one large company Azersun producing tomatoes. This was the only crop that was being commercially processed within the district. It is a valuable export crop for Azerbaijan. In the case of the mountain districts of Lerik and Yardimli potatoes are a key part of the subsistence economy, with the produce is sold after meeting the consumption needs of families. Apple is also a key fruit in Lerik with the possibility of achieving quality production. The crops studied have a regional or national market like potatoes, and apples in Yardimli and Lerik and lemon in Lankaran districts. In the case of lemon, 77 percent of the demand was met by imports so import substitution was possible. Three crops had export markets tomato in Masalli, mandarin in Astara and strawberry in Jalilabad district.

3. Why a Policy Brief?

This brief is not intended to be a summary of the six value chain reports. Instead, it seeks to provide an overview of the importance of value chains for regional development and agribusiness, the types of value chains including the ones that exist in the region, common gaps and needs among value chains in the fruit and vegetable sector in the region. It also looks at key trends impacting agri-food businesses globally including

volatility, complexity, traceability, and cross cutting issues disrupting the sector. The last includes technology and climate change which are transforming agriculture and value chains.

4. Link to national development goals of Azerbaijan and SDGs

The government of Azerbaijan aims to diversify the economy with a focus on agriculture, tourism, and logistics. The national development strategy seeks to shift to value added production in the non-oil sector for competitive and sustainable growth. Four of the five enunciated in “Azerbaijan 2030 National Priorities for Socioeconomic Development” link to the growth and development of agriculture value chains. These include, a steadily growing competitive economy; a dynamic inclusive society based on social justice; areas of modern innovations and competitive human capital; and clean environment and green growth. The value chain analysis speaks to all four of these goals. It seeks to build a competitive economy by increasing the viability and competitiveness of the fruit and vegetable sub-sector. Inclusive value chains are the focus here. As a follow up to the analysis it will support smart solutions for knowledge transfer and networking among value chain players and increase the skills of both the value chain actors and service providers to the value chain. It also focuses on environmental and climate change impacts and on greener and more sustainable agriculture. Value chains also play a crucial role in regional development by identifying and supporting the products that are competitive in a region.

The strengthening of value chains also contributes to the Sustainable Development Goals (SDGs). The specific goal addressed is SDG 2 Zero Hunger. It is in line with target 2.3 that seeks to double productivity while increasing incomes of small producers including through access to inputs, knowledge, finance, markets, and opportunities for value addition. It supports target 2.4 for sustainable food production systems and resilient agricultural practices that will increase productivity and production, maintain ecosystems, and adaptive capacity to climate change and natural disasters and improve land and soil quality. It also helps to achieve target 2.5 that seeks to maintain the genetic diversity of seeds; and 2.A that aims to increase investment in agricultural research and extension services and technology development.

5. Snapshot of Agriculture in the Azerbaijani economy

Agriculture remains a linchpin of the rural economy in Azerbaijan except in the Absheron and Nakchivan economic regions. It is the main income source for 47 percent of the population living in rural areas of the country. While contributing 4.8 percent of GDP it employed 35.8 percent of the working population and received 2.3 percent of investments in 2022. In the same year, agricultural land was 4.78 million hectares and gross agricultural output stood at 10.98 billion AZN. The share of plant growing in the output was 5.54 million AZN while animal husbandry contributed 5.45 million AZN.

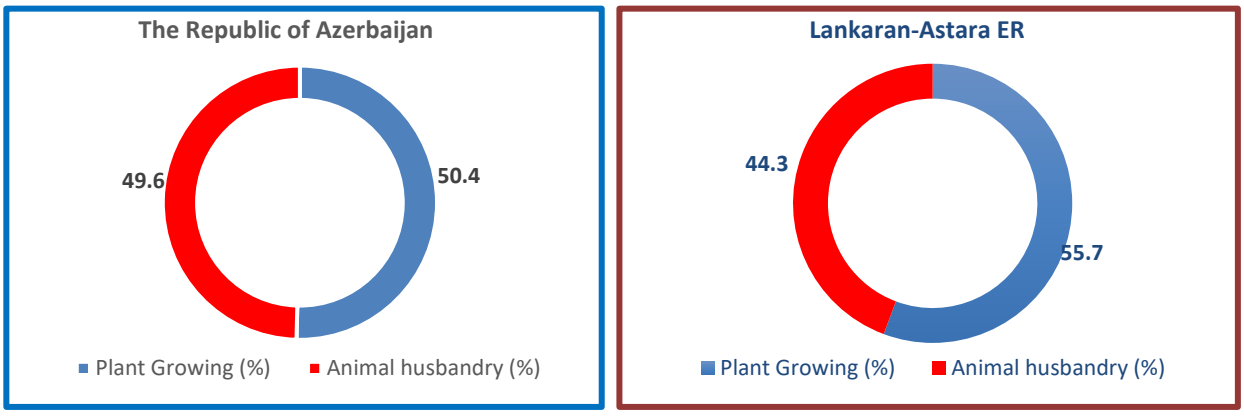
Government has a significant role in supporting the agriculture sector. Agricultural producers are exempt from taxes excluding land tax. They are eligible for subsidies for planting and for discounted agrochemicals and equipment and machinery that is either leased or sold. They are eligible for a discounted rate for agriculture insurance. preferential loans,and customs credit for most of agricultural and processed imports. The amount of subsidies and concessions allocated to the agricultural sector increased by almost 10 times in nominal terms and amounted to 450 million AZN in the five years between 2007 to 2022.

6. Brief Look at Agriculture in the Lankaran-Astara Region

Agriculture is the main occupation and source of income for most of the population in LAER. The region is mainly an agrarian zone with 47.5 percent of the total area or 288,096 hectares, suitable for agriculture. Of this arable land, 8.7 percent was covered by perennial crops, 5.6 percent was meadows, 32.4 percent pastures, and 53.3 percent was uncultivated 2022. Most of the sown area is under grain and legumes. In 2022, the gross agricultural output was valued at 999.72 million AZN, of which 556.431 million AZN (55.7 percent) was produced by plant growing, and 443.290 million manats (44.3 percent) by animal husbandry.

Agriculture accounted for more than 40 percent of total production of the Lankaran economic region in 2019. Although agriculture has the highest share in output in the region, it contributes only 15 percent to total agricultural production in the country. In general, the region is known for its citrus fruits and early vegetables along with tea and rice. A competitiveness analysis carried out in 2019 showed that fruit and vegetables formed the most competitive agricultural sub-sector with a revenue gain significantly higher than that recorded in other sectors. The sub-sector has high production and export potential. In 2019, Azerbaijan exported 628,509.58 tons of fruit and vegetables worth USD 605.82 million.

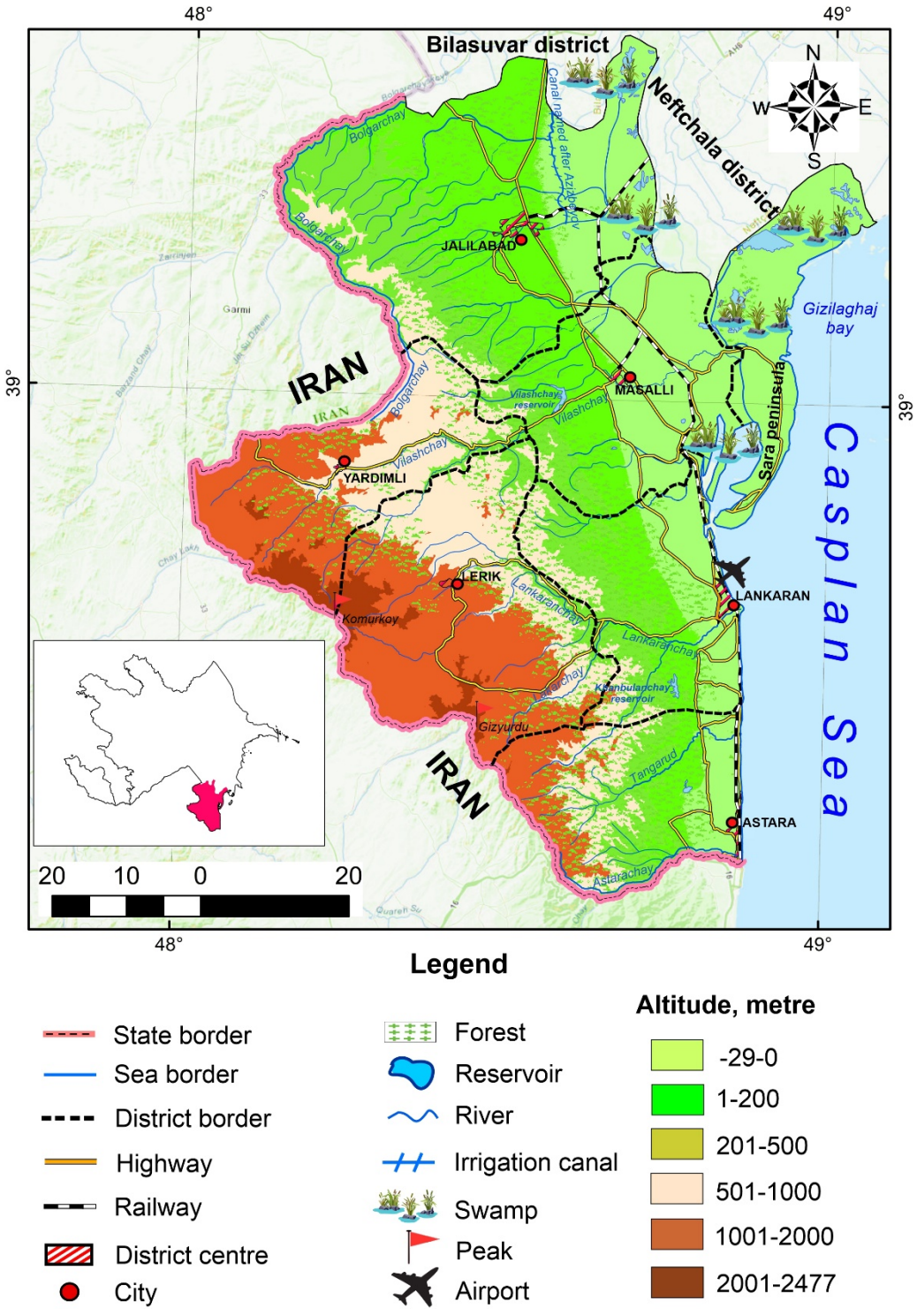
Figure 2: Total agricultural output in Azerbaijan and LAER, 2022 (percent)



Agriculture remains largely rainfed and consumed 88 percent of the water from natural sources in 2022. In 2019, around 15 percent of cultivable land was irrigated. The old canals connecting the reservoirs of the region with fields lack modern irrigation equipment

and technology and maintenance, leading to water evaporation with a notable loss of water, in particular during the summer. Due to reduced precipitation, the drying out of rivers or reduced water flows has been observed in recent years. Small producers owning less than 1 hectare, are predominant in the region. In Lerik and Yardimli districts and in the mountainous areas of Astara and Masalli districts, owing to the terrain, farm plots are in general smaller than in the plains.

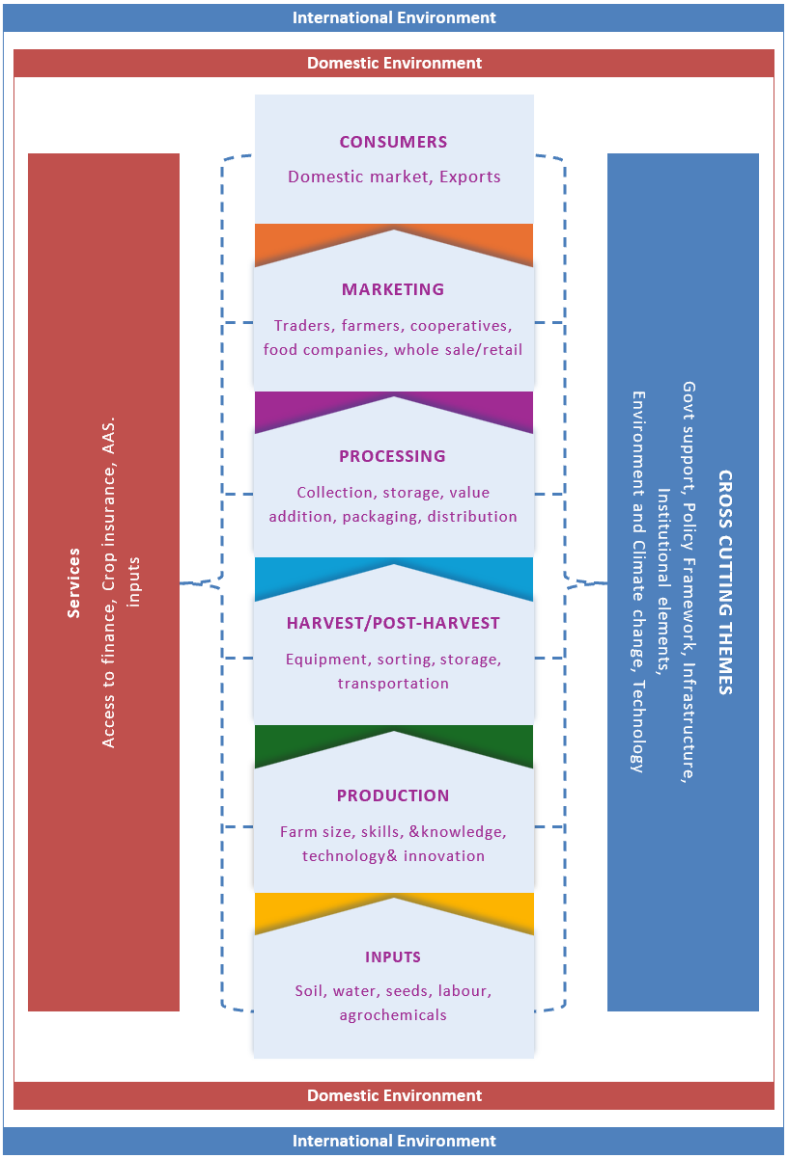
Map 1: Lankaran-Astara Economic Region



7. Definition of value chains and types of value chains

An agriculture value chain is defined as the full range of interlinked activities and actors that add value to a product while linking agriculture producers to processors and markets, and in the end to the final consumers. The key stages of the value chain include input supply (seeds, soil, water, agro-chemicals, labour), on-farm production, harvest, post-harvest, storage, sorting and grading, cooling, and packaging, local processing, industrial processing, storage, marketing, transport, and distribution to the end user. Even in remote areas farmers are connected to markets via value chains as they sell their produce in local markets or to traders at the farmgate. The value chain encompasses the formal and informal arrangements that allow coordination and collaboration across actors at different points in the chain. Each player in this chain adds value, and in return receives an economic rent. This vertical chain does not function in isolation, support services such as inputs, finance and advisory serves are provided by other actors. The value chain is also impacted by the enabling environment both national and global in which it functions.

Figure 3: Model of fruit and vegetable value chain



8. Types of value chains

In evaluating value chains we can distinguish between different spatial scales, namely regional, national, and global. This classification provides a differentiated and nuanced understanding of the spatial dimension in value creation. The support systems and policies needed for regional and national value chains will be different from that required for competitive global value chains. In the typology of value chains, besides the spatial characteristics, the degree of integration and inclusiveness of the value chain are also relevant.

8.1. Short Value Chains: have fewer actors and links and are defined by geographical and economic and often social proximity. This is when the producer sells direct to the consumer or to a trader at the farmgate. The produce is then sold at the local market directly by the farmer or by the trader at the regional market. Often when selling direct, a relationship of trust is built between the producer and customer. Short value chains have a lower carbon footprint and the freshness of the produce when it reaches the end user is higher. The potato and apple value chains in Lerik and the potato value chain in Yardimli districts are short value chains since the output is mostly sold in the nearest regional market which is Lankaran in the case of Lerik and Masalli for Yardimli district or to relatives.

***8.2. Extended Value Chains*:** cover greater distances and multiple actors and links. They also have a range of service suppliers and can extend beyond national boundaries in the case of export commodities. In the value chains analyzed, the strawberry value chain in Jalilabad, the value chain for mandarin in Astara district and tomato in Masalli district are part of extended value chains. The produce is sold in the national wholesale market in Baku and exported to Russia and other countries.

8.3. Global value chains (GVCs) span several countries and often continents with actors and links spread globally. GVCs could have producers in one country, processors in another and consumers in a third country. For instance, wheat produced in Australia and Russia, could be processed into noodles in China and sold worldwide.

8.4. Integrated value chains: are those where a single company fully covers all stages of the value chain. The value chain could be national or international. Unilever has tea estates and processing facilities in Kenya, blends and packs the tea in Europe before selling it as Lipton and Brooke Bond brands globally. This is a fully integrated GVC. In Masalli district, Azersun Holdings has an integrated value chain as they grow tomatoes on their farms, harvest the produce and process it at their cannery in Lankaran and then distribute the products locally via their chain of Bazaarstore supermarkets and also export the products to Russia and other countries. These value chains do not involve small farmers. In India the Amul milk cooperative owned by 3.8 million small milk producers in the state of Gujarat, collects milk, processes it into different products, markets and distributes it via refrigerated trucks to consumers through a chain of franchised distributors across the country. They also export their products to 60 countries.

***8.5. Inclusive value chains*:** seek to link small farmers into existing or new value chains. They also support small producers in obtaining greater value from the chain, either by increasing efficiency or by carrying out upstream and more value-added activities like processing. The EU4Lankaran project aims to support inclusive value chains in the region by focusing on integrating small producers into their respective value chains. This is because small farmers, the majority of farmers in the region are at a disadvantage in accessing value chains. They receive a fraction of the price paid by the consumer even when there is no value addition through processing in the value chain. They have no bargaining power and lack access to information regarding markets and innovations. Farmers often need support to participate in the value chain and derive benefits that would increase incomes and prosperity in their communities and lead to equitable economic growth. The project aims to do this by encouraging cooperation between farmers and between actors along the value chain through building modern collaboration hubs for exchange of information, and innovations.

9. The importance of value chains

The value chain approach considers the role of existing chain actors, supporting actors, and the policy environment. It allows us to look at current challenges in a value chain, as well as the opportunities for improving the efficiency of the value chain and the benefits for economic development and everyone involved. Analyzing a value chain – identifying its challenges, weakness, and strengths – can help to identify new income-generating opportunities. From a farmer's perspective, being part of a well-functioning value chain can bring greater income. Participating in a value chain brings farmers not just higher prices but more stable and predictable incomes. Well-functioning markets and value chains can attract young people to agriculture and/or persuade them not to leave rural areas by offering better ways to earn money. Being a part of a value chain can help a farmer learn new skills and adopt improved practices. Instead of piling vegetables in crates and trucking them to a trader or market, farmers can earn more money by doing basic processing on the farm. Even cleaning and grading produce can make a difference. Washing and packaging lettuce or tomatoes and delivering them to a local store or supermarket can earn a higher price. Peeling and cutting fruit can be an effective way of getting into the growing market for ready-to-eat food products in urban areas.

10. Main links and actors

Value chain business linkages are the transactions between value chain actors. Linkages are vertical when the transaction takes place between operators at different stages of the value chain. Essentially, vertical business linkages are contracts between sellers and buyers of intermediate and final products. Another type of vertical business linkage is the delivery of services such as transport or maintenance and repair services. The value chain map visualizes such business linkages by arrows connecting the operators with each other and with the service providers. By contrast, horizontal linkages refer to

transactions between actors or enterprises operating in the same chain link – the collaboration between producers is one such horizontal link.

10.1. Horizontal linkages

Horizontal linkages, the cooperation between actors in the same stage of the chain offers scale economies through joint purchasing of inputs and services, and/or production and marketing to get better prices and access more markets with larger volumes (producer groups). Horizontal cooperation for business purposes takes place at the micro level. It can be informal or formal. Informal cooperation is usually the norm in less developed value chains. In informal linkages transactions are based on verbal agreements. Informal cooperation can later lead to more formal forms of cooperation. Informal collaborations include producer groups, and information sharing networks using social media. Farmer cooperatives are formal commercial and legal entities that require experience of prior cooperation and greater financial commitment. Producer groups or cooperatives regulate their internal cooperation through a business contract as well as by binding the members of the cooperative venture through a relationship of trust. Often successful producer groups evolve into cooperatives once trust is established, and the benefits of collaboration are evident.

Farmers need to be well organized to compete in an increasingly demanding marketplace. Joining a farmer organization or cooperative is a necessary step for small scale farmers who want to increase their income and capture more value in the value chain. Unlike individual farmers, farmer organizations have the resources to build relationships with different links in the value chain, both locally and further afield. Farmer organizations help individual farmers by aggregating produce from a number of producers, buying bulk inputs at lower prices on farmers' behalf, and giving farmers access to farm support services. Through their size, co-operatives have enough market power to raise the prices received by individual farmers and ensure that farmers receive a steadier, more secure income. Many farmer groups also include savings and loan schemes for their members. These schemes help farmers not just with income smoothing in the off-season, they also learn financial literacy and to keep records, which are essential to improve their incomes and businesses.

There are several such horizontal networks that pool complementary skills and risk sharing. These can be formal or informal groups ranging from WhatsApp groups to community groups, producer organizations, cooperatives, and business associations. The only such informal cooperation in the region at scale was seen in the strawberry value chain in the region. Building informal and formal groups among farmers in Lerik will for example enable them to: get better inputs at a good price, rent machinery together at lower costs, negotiate better sale prices, due to larger volumes, reduce costs of transportation, exchange experiences and knowledge, access advisory services and adapt technology better. So far, some farmers cooperate to hire a truck to take their produce to markets, other than that no formal or informal groups exist in the district.

10.1.1. Business associations

Farmers or value chain players benefit from pursuing solutions to common problems together. A business association can consist of both horizontal and vertical players. An association of horizontal actors would be a citrus growers association and of vertical players could be a citrus growers and exporters association. However, in vertical associations the interests of both groups may not always coincide. To promote their collective interests and get access to public support services, enterprises form associations at a scale that goes beyond the local level. Again, this purpose can be achieved informally in rather loose networks or short-lived working groups or by formal associations. Formal associations include second-tier federations of cooperatives and business associations. Apart from advocating for their interests, associations provide services to members. Within the value chain service providers and input suppliers can have their own associations. The Seed Growers Association is one such association in Azerbaijan.

Figure 4: Types of Horizontal Linkages

	Microlevel Chain Actors	Macrolevel Chain Actors
Informal Associations	Producer group	Networking Group Working Group
Formal Associations	Cooperatives	Business Association Professional Group

10.2. Vertical linkages

Starting from short-term and opportunity-based exchanges at one end, players at different stages of the value chain can enter into more diversified exchanges including information exchange, logistical arrangements, embedded services and coordinated quality control. The intensity of exchanges may not relate to product value. Some high-value products and investment goods change hands in spot markets, while relatively low-value agricultural products may be traded through contract farming.

The transactions on *spot markets* or bazars (also called “wet markets”) are informal and short-term. Both suppliers and buyers can easily switch between partners as the standard quality can be met by many producers.

Auctions and *commodity exchanges* mainly offer spot market transactions, but also enable trade in “commodity futures”, that is, contracts on the delivery of a particular amount of a commodity at a particular price at a future date.

Forward contracting may use verbal arrangements but most of the time includes written documents specifying the goods and the transaction details, such as prices and time of delivery. Repeating contracts lead to regular contracting in a long-term relationship. This provides security and reduces transaction costs for both parties.

Contract farming is an arrangement in which a company or buyer establishes a long-term relationship with producers. The company clearly specifies the product and the technology to use. An *out-grower scheme* is the contract of a large estate with neighboring farmers. Contract farming and production in particular stand out as a key linkage solution for inclusive development. By cooperating closely with a strong buyer, small farmers gain access to markets. In return, the larger partner secures supplies and has more control over the raw material. Contract farming is a system, in which agricultural processing companies procure raw material from farmers. These can be private firms, farmer cooperatives as well as public agencies. The contract is a written agreement between an “off-taker” who buys produce from groups of farmers who produce a specified quantity of a crop in a particular quality and at previously agreed prices.

The solution benefits both sides. The off taker provides inputs, technical advice, and credit while the farmer sells exclusively to the buyer. Contract farming can be of great benefit for small farmers who would not be able to invest in high-value production on their own. It provides them with a secure market, access to technology and even short-term finance. In turn, the off taker determines the production methods and thus secures control over a consistent supply in quantity and quality. Care should be taken to see that the contract is equitable and that the farmer is not at a disadvantage.

In Jalilabad district, informal contract farming exists with small farmers getting support from and selling to a large farmer and cold storage owner like the Fadek community which has 350 small scale strawberry farmers. They supply their produce to a large farmer and exporter with a cold storage who informally contracts farmers within his group and buys their produce for export. He also supplies inputs like seeds and plastic mulches at a reasonable price and also advances funds. He also ensures the quality of the produce,

More advanced vertical linkages are clusters, where players need to closely cooperate with the agricultural and horticultural research institutions and advisory services operators and private sector companies.

Table 1: Horizontal relationships within the value chains in LAER

Actors	Description of the Relationship
Input suppliers	Supply of agricultural services is mainly through the subsidized seeds and agrochemicals from the Agroleasing Company. There is less competition and subsequently less quality of service. The state does not purchase extension services to cover the gap between the number of public providers and farmers.
Between farmers	In Jalilabad the Fadak community enables cooperation among farmers. However, farmers do not tend to unite themselves in cooperatives or associations, which would improve their cooperation in various fields, such as sharing of knowledge, pooling of assets, joint procurement, and marketing, etc. In Yardimli and Lerik cooperation is limited to occasionally sharing the transportation costs of taking produce to the market.
Between intermediaries (wholesalers or retailers)	Numerous intermediaries (collectors, sorters) operate in the region during the harvesting period with regard to exportable commodities. There is competition among the intermediaries, who offer farmers similar prices and quality. As for the processing of non-standard (low-quality) tomatoes, there is one large company Azersun operating in this field which can influence pricing in its favor as there is no competition from other commercial processors.
Storage owners	There is a lack of storages. In the strawberry VC there are cold storages owned by large farmers and there is no direct cooperation among the facility owners though they form an informal group to address common issues faced by them.
Exporters	The strawberry value chain has large farmers who are cold storage owners and exporters. However, there is no cooperation between them as far as exports are concerned so that larger volumes could be sold together, and better prices and greater market penetration of export markets obtained. The Strawberry Producers and Exporters Association intervened to speed up customs clearance at the border by developing a green channel for exporters.
Processors	Azersun Holding has a canning factory in Lankaran that processes tomatoes. There are some other smaller commercial processors like Krystal LLC in the Gunsvelli Agropark in Jalilabad. The processors do not cooperate, as for instance smaller processors producing products for the larger processor. There are also smaller processors supported by ABAD, the agency to support family businesses, as is the case with tomatoes in Masalli and home processors who supply to small local stores.
Retailers	There are numerous retailers in the region, from open markets to mini-markets, and supermarkets. Prices are relatively high in the latter. There is competition and no cooperation among them.
Consumers	There is no cooperation between consumers and no channels that offer consumer advice or rating of products except in the case of online shopping. There are no companies offering reliable consumer reviews.

Table 2: Vertical relationships within value chains in the region

Actors	Linkages
Suppliers of inputs and farmers	Farmers believe that access to agricultural products and services should increase. The quality of inputs like seeds and agrochemicals often does not correspond to the price. Obtaining technical advice from qualified providers that is accessible and affordable regarding cultivation and maintenance remains a challenge for the region. State Agriculture Development Centers and the Regional Training Center are good institutions, but they are unable to provide service to all farmers as there are few providers and many farmers who need support. Competition for workers is felt during the harvesting period in the strawberry value chain in particular. However, there are contractors who organise and supply labour from other districts.
Between farmers and intermediaries	Relationships between farmers and intermediaries are noncontractual and informal. Most farmers do not have firm relationships with intermediaries and sell their produce to different intermediaries who offer good prices. Strawberry value chain has both horizontal and vertical linkages where the large farmer also acts as the intermediary buying and exporting the produce of the smaller farmers in the network
Between intermediaries and exporters	Intermediaries and exporters have a contractual relationship, with both sides trying to fulfil the terms of the respective agreement. Intermediaries normally collaborate with several exporters simultaneously. In the strawberry value chain the large farmer plays the role of intermediary and exporter.
Between processing and canning plants Between farmers and processors	There are very few processing and canning plants in the region and there is no cooperation among them. There is no contract farming between producers and processors. Azersun in Masalli grows tomatoes in their own farm and produce is processed in their cannery.
Between intermediaries and retailers	The form of this relationship depends on the retailer type. Trade on the open market is usually based on informal agreements, while relationships with supermarkets are contractual.
Between retailers and consumers Between retailers and farmers	The bazars have many customers and are located in urban areas. Market prices are lower than in other retail stores, which is a decisive factor for a certain customer segment. Some consumers also believe that food purchased in local bazaars is more natural and healthier. Supermarkets offer customers a comfortable environment for purchasing food. Accordingly, the prices are higher than in bazars. Supermarkets usually have a different target audience which is willing to pay higher prices. However, there is no attempt to educate the consumer regarding local produce. Retailers buy via intermediaries and not directly from farmers.

11. Key factors and trends impacting the agri-food sector globally

Global agribusiness in 2019 was valued at USD 40.09 billion and is predicted to reach 54.65 billion in 2025 with a compounded annual growth rate of 5.3 percent. It remains a growth factor in a troubled global economy. The strong growth drivers are population increase, urbanization, and the rise of the middle classes. Food security also now tops government agendas. At the same time, the sector is facing the challenges of climate change, rapid technological innovation, and new demands for traceability. This is resulting in increased volatility, complexity, and scrutiny throughout agriculture value chains. The agribusiness environment is inherently volatile for while demand is predictable, supply is erratic, due mainly to the vagaries of the weather. With increase in the impacts from climate change, greater weather-driven volatility can be expected as average temperatures increase and rainfall decreases. The growing demand for convenience foods and new tastes are also creating opportunities for the food processing sector.

To respond to these challenges greater collaboration both up- and down-stream between players in the value chain is needed. The extent and structure of that collaboration will be crucial to better outcomes. Options may include vertical integration at one end of the spectrum right through to relatively loose relationships at the other end. Besides cooperation between private players, greater collaboration between the private and public sectors is required for market intelligence, agility, and risk management.

New markets and customer segments are emerging. The Food and Agriculture Organization (FAO) forecasts that overall food demand will increase by 1.1 percent per year between 2006 and 2050, or by 70 percent for the whole period. This demand is primarily fueled by Africa, mainly due to an expansion in population, and Asia due to both population and GDP growth. For Azerbaijan and the economic region to be competitive policy makers and value chain stakeholders have to factor in these global challenges and drivers of growth and look at new emerging markets.

12. Greening the Value Chain

Agriculture is highly climate sensitive and Azerbaijan with 36 percent of its workforce in agriculture and 47 percent of population in rural areas is vulnerable to climate change. Climate change impacts the entire value chain from inputs, to production, to how food is processed, transported, and consumed. For the entire Lankaran-Astara economic region it should be noted that climate change exposure and sensitivity indexes are lower than in other regions of Azerbaijan, but adaptive capacity is overall low. If this is improved, then the climate change vulnerability index for the region can be reduced. (Climate Change Vulnerability Index Report, EU4Lankaran). Examining long term trends in temperature, rainfall, and river flows in the region, reveals a rise in temperatures, reduction in rainfall and lower water flows as rivers in the region are fed by rainfall. There are clear implications for agriculture in the form of reduced water for irrigation, less

predictability in weather patterns and an increase in new pests and diseases. All these factors were highlighted by farmers during focus group discussions for the value chain analyses. Climate projections suggest that temperatures will continue to rise, and this rise will be accompanied by a decrease in rainfall and more frequent extreme weather events. The impacts felt on every aspect of the value chain are illustrated in Figure 5 below.

Figure 5: Impacts of climate change on the fruit and vegetable value chain

Inputs	Production	Processing	Marketing	Consumption
				
Reduced seed quality Inability of seeds to be climate resilient Less water Soil degradation	Increase in pests and diseases. Lower yields Crop damage from pests and diseases and extreme weather events	Lower quality of product Reduced volume Spoilage	Delays in transport due to damages to road infrastructure from extreme weather events Product losses Higher transportation costs	Reduced food availability Higher prices
Less income				

In recognition of the increased risk and uncertainty, climate resilience has to be integrated into policies and strategies related to agricultural value chain development. The farming community and the private sector are key stakeholders in these processes. The climate challenge requires mitigation and adaptation to build climate resilience along the value chain as laid out in Table 3.

Table 3: Developing Climate Resilient Value Chains

Climate Change	Seed companies	Finance	Extension	Farmers	Traders	Food companies	Retailers
Mitigation and adaptation measures	Research into reduced water and heat tolerant crops. Climate resistant seeds	Lower interest rates for adoption of climate resilient measures. Agri-insurance	Education of farmers on climate smart agriculture Real time Weather information Early warning systems to mitigate impact of disasters. Weather based forecasting of pests and diseases	Choice of climate resilient crops Water efficiency and conservation Rainwater harvesting systems Climate resilient infrastructure	Changing production and trade patterns Sensors for temperature and humidity for storage facilities	Short supply chains Carbon labeling Reduced carbon footprint Climate proofing of facilities Improved packaging	Short supply chains Carbon labelling Reduced carbon footprint

Box 1 Building climate resilience into lending to farmers

Financial services are a key enabling factor for climate risk management for the actors involved in the rice value chain in Uganda. The Centenary Bank, a commercial bank, offers better interest rate on loans for value chain actors who implement particular climate risk management strategies, for example by promoting or using seeds that are tolerant to drought. The bank also benefits from their clients having stable incomes, which leads to less defaults. The Equatorial Seed Company another partner promotes climate resilient seeds and works with dealers to educate farmers on the need to use climate resilient seeds.

Climate risk assessments and climate services need to be built into the agricultural value chains. The Government needs to support the climate proofing of fruit and vegetable value chains in Azerbaijan by providing early warning systems, weather forecasting and forecasting of pests and disease breakouts based on weather patterns. Climate resilient public infrastructure needs to be built in terms of roads, storage, and production facilities. The role of extension or advisory services in increasing awareness and providing the techniques and technologies for climate smart agriculture is important. To mitigate risks the use of social and agricultural insurance by farmers and processors has to increase. Government needs to popularize agriculture insurance in Azerbaijan by making it a part of subsidy packages and educating farmers about the benefits of using agriculture insurance. Water conservation, rainwater harvesting through reservoirs and tanks and efficient

use of water resources should also be encouraged. Seeds and seedlings that are adaptable to changing weather conditions should also be popularized and made available to farmers.

13. Digitizing agriculture value chains

Technological advances, particularly in plant genomics and information and communications technology (ITC) are creating several new possibilities for agriculture. Countries and companies are investing in research and development for better seeds, biotechnology, plant breeding and genetic engineering, plant production, fertilizers, equipment, machinery and food manufacturing, packaging, and logistics. China and US are leaders in this field. Collaboration between public and private sectors is growing, with several initiatives to increase the level of public-private partnerships for digital agriculture. These developments have ramifications throughout the value chain:

Advances in IT are transforming both the way in which information flows along the value chain and how transactions are conducted. For input suppliers, it is driving a new wave of innovation, for example with bioinformatics and seeds and precision agriculture. For farmers the adoption of mobile telephony facilitates access to better information on crop prices and weather conditions, and financial resources and products such as credit and insurance. It is having an especially strong impact on small farmers by redressing some of the information asymmetries they suffer from, allowing them to improve the efficiency of their transactions. In the case of food companies and retailers, social media has become an integral part of their marketing strategies and engagement with customers. For the consumer IT drives the need for increased traceability.

IT not only impacts individual stages in the value chain, but also integrates them by tracking the progress of crops and related food products from production to consumption, providing the information needed for traceability. Another example is the increasing integration of seed production and crop protection, are partly due to advances in biotechnology, and the growing need to take a 'systems' view of production.

Table 4: The impact of technology on fruit and vegetable value chains

<table>
<tr><th rowspan="2">Value Chain Segment</th><th rowspan="2">Input providers</th><th colspan="3">Farmers</th><th rowspan="2">Traders</th><th rowspan="2">Food Companies</th><th rowspan="2">Retailers</th></tr>
<tr><th>Planting</th><th>Growing</th><th>Selling</th></tr>
<tr><td rowspan="2">IT applications</td><td rowspan="2">Bioinformatics crop genetics.

Smart irrigation</td><td>Seed quality

Crop insurance.</td><td>Agronomic advice

Weather information</td><td rowspan="2">Crop prices.
Connecting directly with customer
Identifying buyers
Market access
E commerce
M commerce
Social media</td><td rowspan="2">Traceability

Logistics</td><td colspan="2" rowspan="2">Social media engagement with customers

Traceability</td></tr>
<tr><td colspan="2">Precision agriculture</td></tr>
</table>

While the benefits of IT are being felt throughout the agri-food value chain, its application is becoming more sophisticated. Applications have moved from first generation, general information on crop prices and weather, to more customized and transactional applications, such as crop insurance and full-service platforms. Azerbaijan with an educated and digitally savvy population needs to harness IT better to support value chain players especially small farmers to be competitive in the agri-food sector. Catching the technology and innovation wave would allow Azerbaijan to leapfrog and avoid being left out of this revolution.

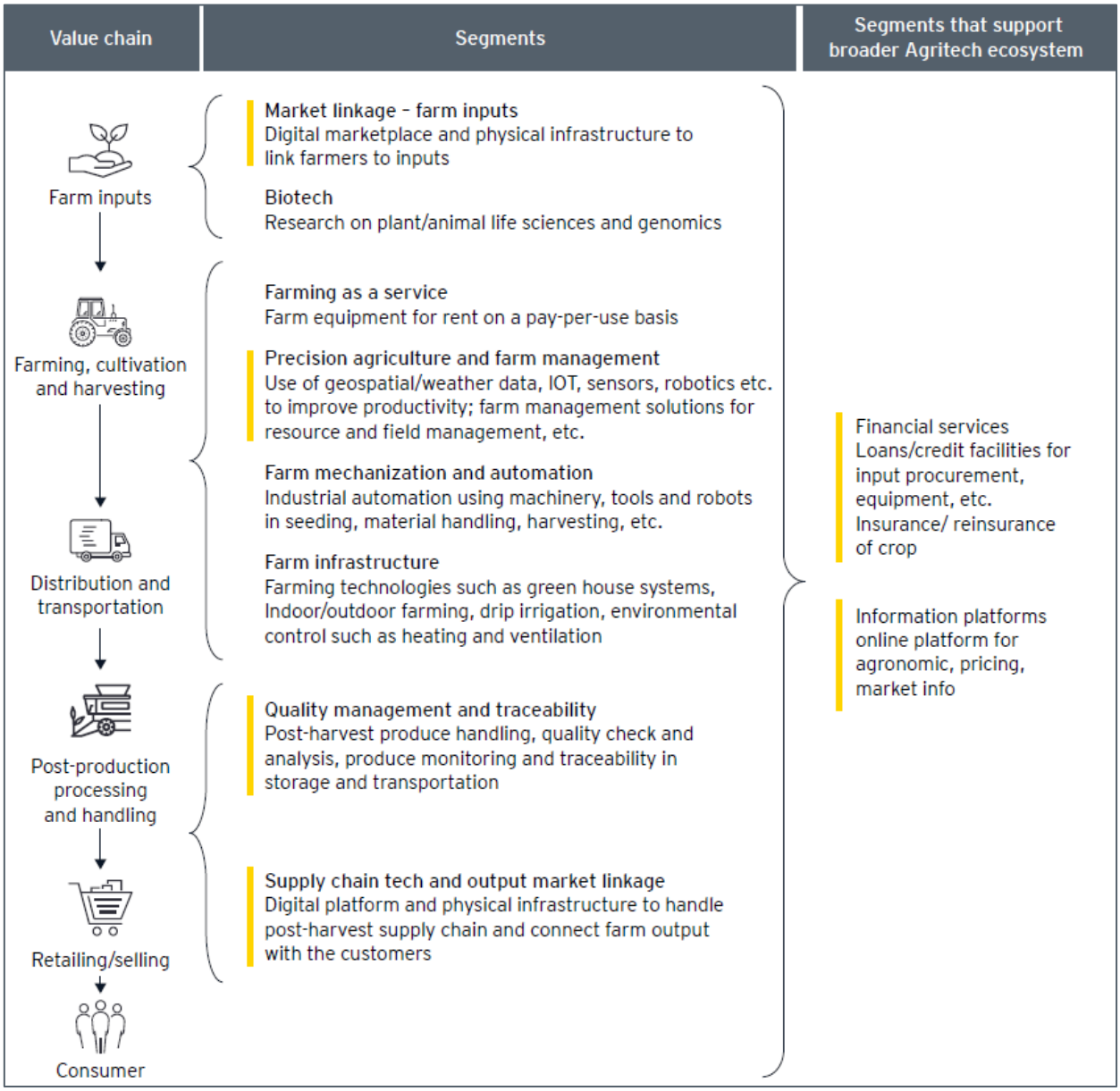
13.1. Agriculture start-ups are revolutionizing agribusiness value chains

Agri-tech, or digital agriculture, is the application of technology and digital tools to agriculture and agri-food value chains. It encompasses a wide range of technologies, including automation, biotechnology, biochemicals, remote sensing, Internet of Things (IoT) sensors, drones, and big data digitization and data platforms, data analytics, artificial intelligence, machine learning and software as a service (SaaS). Many of these technologies are becoming more universal and affordable. Several companies are harvesting agri-tech to disrupt the way agriculture is being practiced with technology-based solutions like offtake marketplaces, storage and transportation services, and agriculture advisory services.

Agri-tech can be used to improve efficiency, increase yields, reduce costs, and boost profits and sustainability. It has become increasingly important as demand for food increases and climate change becomes a threat to food security. The global agri-tech market was valued in 2022 at USD 22.14 billion. The market is projected to grow at a compounded annual growth rate (CAGR) of 13.1 percent between 2022-2032 to reach USD 25.87 billion in 2032 (Spherical Insights)

Agri-tech can be applied across different stages of the value chain. Technology to facilitate input market linkages supported with robust physical infrastructure network. Improvements in yield through precision agriculture addresses the production stage. Others include digitizing records for farm management, quality management and traceability. It can support market linkages through efficient digitized post-harvest supply chains and provide access to credit and insurance. In the supply chain food sensing technologies can be used for food safety, quality, and traceability; IoT for supply chain transparency and traceability; blockchain-enabled traceability; and big data analytics are also being utilized for meeting the tastes and needs of consumers.

Figure 6: Impact of technology on agri-food value chains



The advantages provided by agri-tech include:

Increased efficiency and productivity of farming operations by producing more food on the same amount of land or/and through less inputs. For instance, automated irrigation systems reduce water wastage by monitoring soil moisture levels using smart sensors, allowing for more precise water conservation and management.

Improved data acquisition and analysis allows for better decision-making and to identification of areas for improvement. Climate change resilience can be increased through predicting yields and detecting early signs of stress in crops to take preemptive action.

Reduced labor costs through automation while increasing operational efficiency.

Box 3: Farm Management Startup

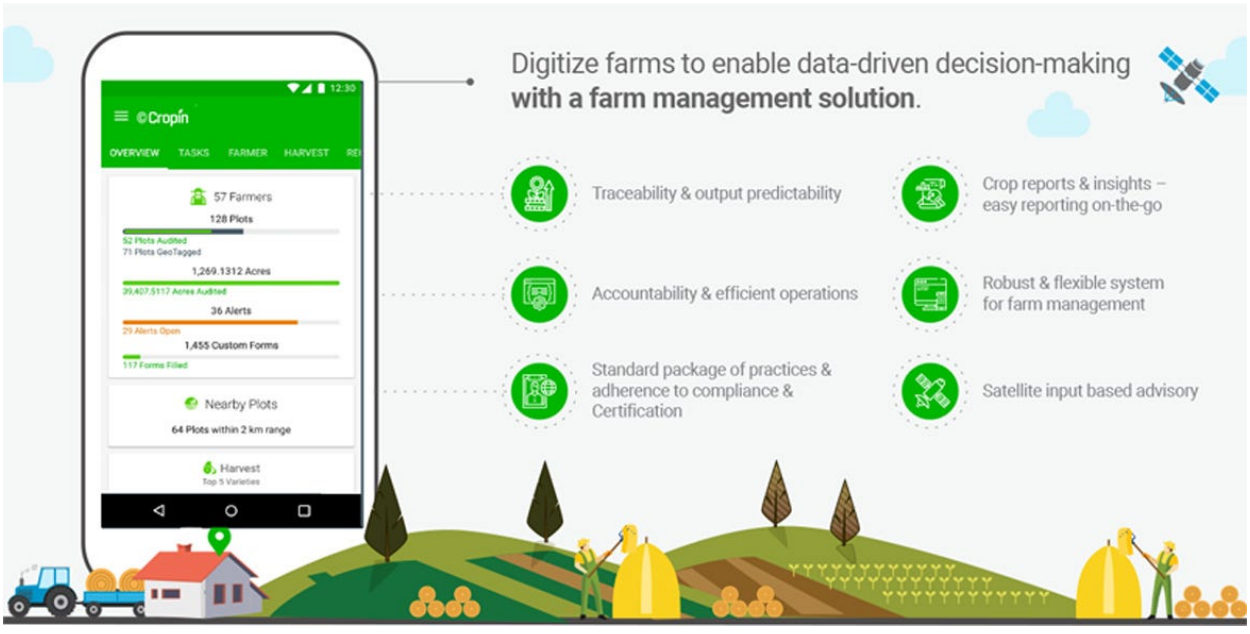
eAgronom: Founded in 2016, this Estonian startup helps farmers reduce the administrative load through one of the largest farm management software solutions in Europe. eAgronom helps over 1,500 agribusinesses (covering over a million hectares of land across Europe) to achieve higher yields and income with technology and consultancy services. It has also developed a farming-based carbon credits platform to transform the voluntary offset market and accelerate the transition to net zero.

Lower environmental impact through precision farming practices by reducing emissions from agricultural machinery and pesticide runoff into rivers or groundwater sources. By using satellite imagery and remote sensor data to map fields down to individual plants, farmers can apply fertilizer only where and when needed.

Greater awareness and transparency in the supply chain through real-time visibility from production to delivery to end user. Transparency helps producers meet customer demands more efficiently while providing traceability should issues arise. Consumers get accurate information for informed buying decisions.

Agri-tech also has potential drawbacks. The high costs of setting up and maintaining agri-tech systems can be prohibitive for small farmers. However, start-ups are offering this support as a service. There is currently a lack of standardization, specifically standard data architecture, across agri-tech systems, making it difficult to compare products or transfer data between them. There can be over dependence on technology. If an automated irrigation system fails without recovery mechanisms, crops could suffer. According to a 2022 McKinsey survey, 43 percent of farmers interviewed were focused on trying new products to increase yield. If these challenges can be overcome, agri-tech can help mitigate climate change and food insecurity.

Figure 7: Smart Farm Application for Smart Farm Management by Croppin



13.2. Agri-tech start-ups in Azerbaijan

The number of agri-tech start-ups are limited in Azerbaijan. Most start-ups are concentrated in Baku the capital city, with consumer applications predominant among them. A number of start-ups are in the food delivery business.

Dr. Agro a company based in Baku, is providing online agri-tech solutions for farmers from 2020 by using both traditional and precision methods. The user-friendly website and app version offers a multifunctional platform that includes budget calculation and planting programs for more than 30 plants, disease alert notifications, acquisition of Normalized Difference Vegetation Index or NDVI imagery with the help of Unmanned Aerial Vehicles (UAV) or drones, monthly notifications regarding field activity, climate data in the field, and personal consultancy are also offered. Their Android and IOS applications help farmers find answers to their questions on planting and plant protection.

Mybostan, a start-up based in Baku founded in 2017 is an online marketplace connecting local farmers to local consumers. It offers poultry products, dairy products, honey, herbals and nuts, and dry fruit products from various farmers.

14. Food and vegetables value chains in LAER

In this section we look at the common issues facing fruit and vegetable value chains in the economic region based on the findings from the value chain analyses**.**

A Spatial Approach to Value Chains in the Region

The Lankaran-Astara economic region, has distinct and varied socio-economic and agro-climatic sub-regions that cut across the six districts. The crops cultivated and the agricultural practices adopted within these sub-regions are different. Three broad agro-economic zones for value chain and cluster development can be identified within the region. This categorization is based on agro- climatic conditions, economic and agricultural development and comparative advantages in cultivating agricultural crops. The three different zones are:

A Subtropical Zone covering Lankaran and Astara districts and parts of Masalli district. The soil and climate are conducive to the cultivation of subtropical fruit and vegetables. This is the only region in Azerbaijan that has this competitive advantage. The zone is strategically located near the North-South Transport Corridor and has access to the east-west Alat-Baku-Astara highway from the Iranian to the Georgian border. There is intensive production of citrus fruits, tea and rice. Cultivation of vegetables, cereals and animal husbandry are of secondary value. This zone can be developed as a **Sub-tropical Cluster** largely focusing on citrus fruits but also incorporating other sub-tropical fruits like feijoa, kiwi and new ones like guava for example.

A Lowland Zone made up of Jalilabad and Masalli and parts of Lankaran district, dominated by the Lankaran and Mugam lowlands, and extensive marsh lands in Jalilabad. The elevation goes from -28 to 803 meters. The zone particularly in Jalilabad

district is characterized by intensive and commercial farming. The main fruit and vegetable crops are high yielding potato and tomato (both open field and in poly tunnels) as well as strawberry. Application of innovative technologies in horticultural production is seen here more than in the other zones. The only agro-park in the region is located in Jalilabad district. Local producers have developed good relations with market operators in Russia and there are significant exports of strawberry to Russia. This zone could be developed as an **Agriculture Innovation Cluster** with a focus on **high value commercial agriculture** for export.

A Mountainous Zone that comprises Lerik and Yardimli districts and contiguous mountainous areas of Astara district. The elevation ranges from 400 to around 2,400 meters. The climatic conditions and terrain are not suitable for intensive agriculture or horticulture. Highland pastures and meadows are suitable for animal husbandry which is the major agricultural output and source of income for farmers. Arable plots are fewer and not easy to cultivate. Horticulture is often a backyard crop, and thus not eligible for subsidy. Rainfed agriculture is practiced with most of the rain falling in the autumn and winter at the close of the agriculture season. There are no local markets in Lerik and Yardimli districts. For Lerik farmers the nearest market in Lankaran is 52.4 kms away. From Yardimli to the nearest market in Masalli is 52.6 km. Astara farmers also have to come down to Astara city to sell their produce. However, the unique natural environment with its distinct beauty enables production of crops in ecological and traditional ways and a focus on agro-tourism. This zone could be developed as the **Ecological Produce and Agro-tourism Cluster** specializing in ecological food products that have higher price despite lower volumes and agro-tourism.

The approach is a useful conceptual tool while making decisions regarding value chain development, and related investments. In terms of support to value chains the mountainous zone has short value chains, with small production volumes with the possibility of developing high value organic crops, the low land zone has more commercial agriculture with larger volumes and the sub-tropical zone has export oriented production.

15. Comparing the value chains in the economic region

The value chains studied can be compared on the three dimensions of sustainable development; their economic potential, social benefits, and environmental impact to evaluate their importance for the socio-economic development of the region. This analysis can help identify the interventions and investments needed to support each value chain. Not all value chains have the same economic potential. However, even those with less economic potential could be important from a socio-economic perspective. These aspects are important for investors who focus on Economic, Social and Governance (ESG) investments as is the case for the impact investing community.

Economic potential: includes the growth potential of a value chain. Economic growth is a necessary precondition for sustainable development. The value chain needs to have the

potential to generate additional revenues either through greater volume or higher value products for value chain actors to increase their income. The market demand for the product and its competitiveness based on product differentiation are the other factors in assessing growth potential.

Social benefits: of a value chain are greater if, it is important for smallholders and self-employed micro entrepreneurs and a source of livelihoods for less skilled, low-income people. The basic criterion is the potential of a value chain to generate income for small farmers and to create business opportunities for small and medium enterprises and jobs for low-skilled laborers. The question is whether the products and markets and the structure of the value chain enables the inclusion of poor people. The value chains that offer opportunities for increased income for small farmers should be supported in particular in areas that have disadvantages in terms of connectivity to markets even where the economic potential may not be that high.

Environmental impact: of the value chain includes its ability to pollute the environment, susceptibility to the impacts of climate change, and the opportunities offered to be part of the green economy through green services and products. The value chains studied were assessed on three dimensions, economic, social and, environmental impact first without assigning any weights. These assessments are only indicative, and more data will need to be gathered for a deeper analysis. The results are provided in Table 5.

Table 5: Economic, Social and Environmental Impacts of Value Chains in LAER

	Strawberry	Mandarin	Tomato	Potato	Lemon	Apple	Total
	Score**	Score	Score	Score	Score	Score	Score
A. ECONOMIC							
Unmet local and export market demand	3	2	2	1	3	1	14
Future growth prospects	3	2	2	2	2	1	12
Prospects for value addition	2	1	3	2	2	1	11
Competitiveness-product differentiation and branding	2	2	2	3	2	1	12
Score for A	10	7	9	8	9	4	
B. SOCIAL							
Jobs for youth and women	3	3	2	2	1	1	12
Importance of the crop for family budgets	2	2	2	3	2	2	13
Impact on the community	2	3	2	3	2	2	14
Score for B	7	8	6	8	5	5	
C.ENVIRONMENT							
Impact of Climate Change	1	2	2	1	2	2	10
Impact on pollution through use of resources	2	2	2	2	2	2	12
Opportunities for greening	2	2	2	3	2	2	13
Score for C	5	6	6	6	6	6	
Overall score (Out of 30)	22	21	21	22	20	15	

Scores for each indicator are assigned based on their positive impact, a score of 3 indicates higher impact, 2 medium and 1 low. In the case of pollution, the lower score is better as it denotes less negative impact. For economic growth potential and future growth prospects we look at the ability to meet local and export market demand and the global market outlook for export crops. The global fresh strawberry market was USD 19.06 trillion in 2022 and according to Business Insights, the market is projected to touch USD 32.64 trillion by 2031, at a compounded annual growth rate or CAGR of 6.16 percent during the forecast period. Market growth is driven by the demand for healthy foods in particular after the pandemic. Innovations in technology and techniques of cultivation are also helping to expand the production and market share of strawberries. Vertical farming, hydroponics, and controlled environment production in greenhouses make the fruit available year around without the constraints of seasonality. This allows the market to meet the demand in the off season.

Given that tomatoes are the second largest vegetable produced globally and the fact that a quarter of the fresh tomato production is used for processing, the tomato processing industry is among the main players in the global food industry. The global fresh tomato market was estimated at USD 207.17 billion in 2024, and is expected to reach USD 261.41 billion by 2029, growing at a compound annual growth rate or CAGR of 4.76 percent during the forecast period (2024-2029). The global market for processed tomato products has grown steadily reaching 46.9 million tons in 2023. The MARC Group, a leading market research company predicts that the market will reach 63.3 million tons by 2032[1] This is a compound annual growth rate of 3.3 percent during 2024-2032. Global mandarin and clementine market was 5.5 million tons worth USD 5.8 billion in 2020. In the case of lemon, the possibility of import substitution is high as a major part of domestic demand close to 80 percent is met through imports.

Strawberry scores highest on the economic dimension with a score of 10 followed by tomato and lemon both at 9. Mandarin scores lower as it has lower value addition possibilities. Potato in Yardimli and Lerik came next with scores of 8 and 7 followed last by apple in Lerik with a score of 4. The latter is because it has low ability to meet unmet demand and lower growth prospects as volumes are less and there is low product differentiation. Potato and mandarin got the highest scores on the social dimension. Potato is an important crop in the mountain districts as it is a vital part of the subsistence economy and is grown for own consumption. Mandarin is a valuable crop for Astara district with a number of farmers involved in the production and a valuable source of income for farmers. Next came the tomato value chain which is also an important crop for small producers in Masalli followed by strawberry and lemon.

On the environmental dimension all the crops had a relatively low score. The lowest was strawberry which is highly sensitive to changes in the environment. All the crops are impacted by climate change in particular rising temperatures and water shortages. In

[1] Tomato Processing Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2024-2032", MARC Group

terms of greening potato and apple in the mountain districts have the possibility to be cultivated with less use of agro-chemicals as environment-friendly products.

Table 6: Economic, Social and Environmental Impacts of Value Chains in LAER Weighted Score*

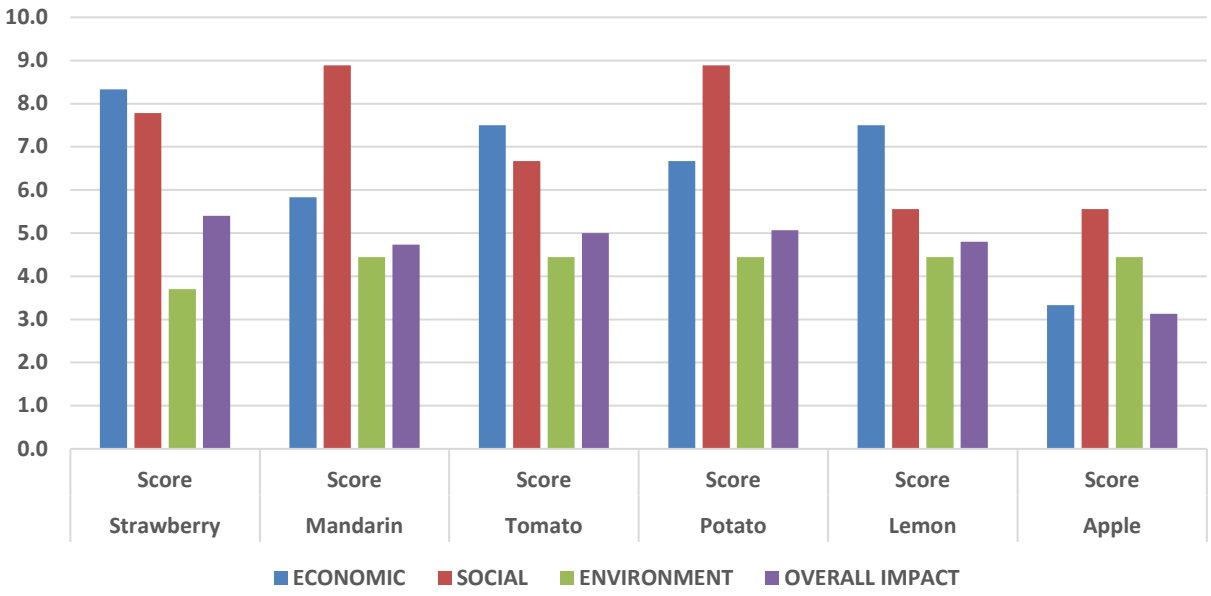
	Strawberry	Mandarin	Tomato	Potato	Lemon	Apple	Total Weights
Indicators	**Score****	**Score**	**Score**	**Score**	**Score**	**Score**	
A. ECONOMIC							
Unmet local and export market demand	1.5	1	1	0.5	1.5	0.5	6
Future growth prospects	1.5	1	1	1	1	0.5	6
Prospects for value addition	1	0.5	1.5	1	1	0.5	5.5
Competitiveness is there a product differentiation possibility of branding	1	1	1	1.5	1	0.5	6
Score for A	**5**	**3.5**	**4.5**	**4**	**4.5**	**2**	
B. SOCIAL							
Jobs for youth and women	0.9	0.9	0.6	0.6	0.3	0.3	3.6
Importance of the crop for family budgets	0.6	0.6	0.6	0.9	0.6	0.6	3.9
Impact on the community	0.6	0.9	0.6	0.9	0.6	0.6	4.2
Score for B	**2.1**	**2.4**	**1.8**	**2.4**	**1.5**	**1.5**	0
C. ENVIRONMENT							0
Impact of Climate Change	0.2	0.4	0.4	0.2	0.4	0.4	2.8
Impact on ENV pollution from use of resources	0.4	0.4	0.4	0.4	0.4	0.4	2.4
Opportunities for greening	0.4	0.6	0.4	0.6	0.4	0.2	1.8
Score for C	1	1.2	1.2	1.2	1.2	1.2	
Overall score	8.1	7.3	7.5	7.6	7.2	4.5	

*Weights used: Economic=50percent, Social =30percent, Environment =20percent. **Based on the score H=High (3), M=Medium (2) and L=Low (1)

The analysis was repeated with weights assigned to each dimension. Economic factors were assigned a weightage of 50 percent, social, 30 percent and environmental factors 20 percent. The results are given in Table 2. Both the strawberry and potato value chains have the highest overall impact with scores of 22 each, followed by mandarin and tomato with 21 and lemon with 20. In terms of economic impact strawberry has the highest score of 5, followed by tomato and lemon with a score of 4.5. Potato followed by mandarin has the highest social impact. Environmental impact is more or less uniform across the value chains. Strawberry again comes on top as the most important crop from an economic perspective, followed by potato, tomato, mandarin, lemon, and apple. Apple has the lowest score under both scenarios. The weighted scores were converted to a scale of 0-10 and the resulting scores are shown in Figure 8. Potato and mandarin have the highest overall impacts. The economic impact is the highest for strawberry value chain. The

analysis indicates that mandarin, tomato, strawberry, potato, and lemon are important crops for the region's economy in terms of their economic and social impact.

Figure 8: Benefits of the Value Chains (Scale 0-10)



When looking for investments, strawberry offers the highest return. It also has the most collaboration amongst producers. It would need a higher level of investment in the form of freeze dry technology and cold storages that allow for storage for a longer period than the existing cold storages. Then comes tomato which has a higher return from processing. The region needs investment in processing facilities to take advantage of the global growth of the processed tomato market. This is followed by lemon which has a high possibility for import substitution. Then comes mandarin which is a significant export crop as fresh mandarin but has less possibility of value addition through processing. Here investment in cold storages is important as the subsidy provided means that there are several orchards that are yet to produce fruit and mandarin production is set to increase in the future.

The institutional dimension of value chain development is also important. This determines the rules of the game that shape market outcomes and allows value chain actors to make use of the opportunities offered by the market.

16. SWOT Analysis of Fruit and Vegetable Value Chains in LAER

The SWOT analysis of the seven value chains is provided below. They are based on the analysis prepared for each crop along with stakeholders during focus group meetings in the districts.

Table 7: SWOT Analysis of Fruit and Vegetable Value Chains in LAER

STRENGTHS	WEAKNESSES
• Tradition of cultivation of the local crops in local natural environment and microclimates • Growing horticultural plants with limited use of agro-chemicals that allows for producing ecologically clean crops in Lerik and Yardimli districts. • Good access to necessary infrastructure: asphalt roads connecting several villages and main district towns of the region. • Local spot markets can be accessed via asphalt roads in Lankaran, Masalli and Jalilabad • State agricultural advisory system present in each district. • Effective cooperation among strawberry producers (Jalilabad) based on solid principles of cooperation between local growers. Nine producer groups with a larger farmer with cold storage who is also the coordinator of fresh fruit production and exporter	• Overaged, low-yield trees (apple, mandarin) produce low volumes with large percentage share of non-standard fruits. Poor quality seeds (potato). Farmers often do not know the varieties they cultivate. The lack of standard varieties of good quality is a problem for branding. • Lack of soil testing resulting in the nutrients needed not being applied in required quantities for the soil to be amended. Or too much fertilizer is used destroying the fertility of the soil and contaminating water sources. • Significant problems with access to water for irrigation. • Weak agricultural knowledge and innovation among small producers, including about good agricultural practices and pest management. • Low productivity due to the factors listed above. • The small size of plots inhibits intensification and expansion of horticultural production. • Numerous subsistence farms with low volume, production quality and income generation. High transportation costs for low quantities of produce to regional markets, for small farmers in Yardimli and Lerik districts, leading to sales at low prices at the farmgate. • Access to finance is limited, lack of specific agricultural loan products both by banks and lending institutions. Lack of guarantee funds providing joint collateral for small producers or potential agri-business. Absence of mobile banking services and digital payment systems. Lack of buyer and suppliers' credit to fund the value chain. • Lack of cold storages, sorting, calibrating and packaging equipment • Lack of processing facilities for all crops except tomatoes which are processed at one cannery in Lankaran and another in Jalilabad • Export markets are not diversified, over dependance on the Russian market. However, even here penetration is not enough and is limited mostly to wholesale markets • Absence of farmer cooperation and collaboration for scale economies and greater bargaining power • Shortage of knowledge and experience of effective marketing through brands, certification of local products, and geographical indicators • Mountainous districts of Lerik and Yardimli without local spot markets • Access roads to the remote fields, especially in mountainous areas of inferior quality, limiting the movement of produce to markets. • Shortage of agricultural advisory services to help local growers improve production and income through knowledge and innovation. • Low penetration of technology and lack of agriculture startups using agri-tech • Limited adoption of agri-insurance to mitigate risks

OPPORTUNITIES	THREATS
• New investment in climate resilient and highly productive varieties of seeds and saplings • Investment in storage and processing • State subsidies programmes that are favourable for production of sub-tropical crops (Lankaran, Astara, Masalli) and agri-business development support measures • Opening of new export markets • Active promotion of fresh and processed food at exhibitions and fairs at both local, regional, and national levels presenting the distinctive, features and values of products from the Lankaran-Astara region • The options for consumption and processing of the produce as fresh and processed goods: tomato: paste, sauce, dried, juice; strawberry frozen fruit, jam, sauce, mousse, juice; potato: chips, starch, ethanol; apple: sauce, mousse, juice, alcoholic beverage ; citrus fruits: jam, juice, marmalade, and canned segments. • A dynamically developing tourism sector, especially in the mountain and coastal areas of the region, attracting visitors who want to buy ecologically clean, fresh fruits and vegetables with unique features (taste, biological values) • The internationally recognised certification systems widely implemented in agri-food sector with impact on farm production. • Agricultural/horticultural producers' cooperation by organising value chain cooperation hubs, and specialised producer groups. Establishing networks of collaboration between producer-research-agribusiness applying modern solutions for increase of yield and quality products. • Foundation of the horticultural research activities in the region through networking of the agricultural institutes and Ganja Agricultural University focused on researching subtropical fruit growing and commercialisation of crops into efficient value chains. • Branding of local produce to create competitive products and access markets. • Accelerate the adoption of technology and innovation to overcome pain points in the value chains. • Climate smart agriculture	• Spread of new pests and diseases as a result of climate change • Negative impact of natural disasters (hail, frost, flood and drought, etc.) on crops • Threat of water insecurity. Inappropriate management of water resources. Significant shortage of modern, effective and resource saving irrigation systems and water conservation and rainwater harvesting systems. • Low quality and lack of certification lead to an inability to enter new markets in the EU and GCC. • Unfair competition and weak reaction of public inspectors to the breach of rules in the marketplace like imported lemons being sold as Lankaran lemons. • Limited use of agri-tech by players in the value chains even as technology is disrupting agriculture. • Low adaptive capacity to climate change.

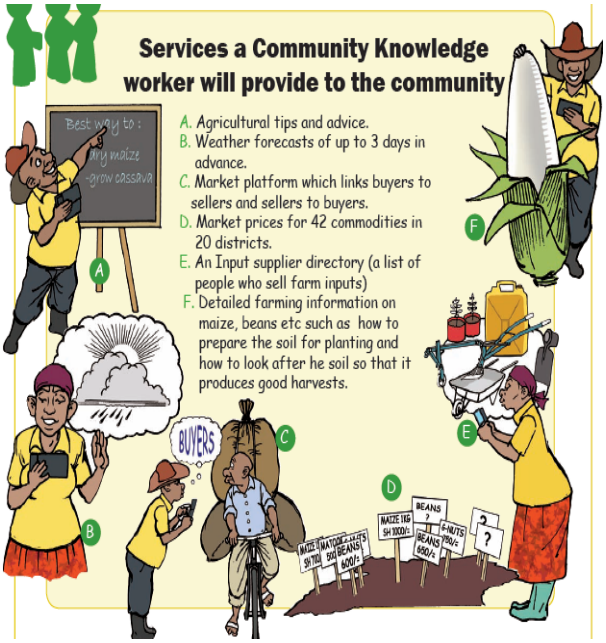
17. Policy and support measures needed

The three Cs, which were highlighted: increase in competitiveness, cooperation and connecting better and smarter to markets is fundamental for changing the fruit and vegetable value chains in Azerbaijan and in the economic region.

Smart knowledge dissemination and innovation for competitive agribusinesses: This is a pre-requisite for modernisation of production and increases in productivity: Both agricultural advice (service provisions and applied research) and the commercial development of value chains at the producer level are necessary. These are the challenges that need to be continually addressed, improving the methods of using digital technologies in the dissemination of innovations and the continuous upgrading of the skills of service providers. Currently there are visible gaps in the Agricultural Knowledge and Innovation System that need to be systematically and methodically filled and minimised. The ratio of advisory service provider to producers is too low. The current system is not set up to support value chains. The providers including staff of the SADC or the RTC are not equipped with agribusiness skills.

Box 3: Community Knowledge Worker (CKW)

A farmer-to-farmer extension service that involves local networks of farmer peers serving as information intermediaries for last mile advisory services. They use smartphones and other ICTs to reach farmers with agricultural (livestock management, agronomic practices for crops), weather (seasonal and daily forecasts), and market price information. Their smartphones connect to a remote server called Salesforce, which provides access to real time agriculture, market price, and weather information. CKWs operate in Africa (Ghana, Kenya, and Uganda), Latin America (Colombia and Guatemala), and Asia (China, India, and Indonesia). CKWs are complemented by government's district extension officers and national or regional help desks/call centres where farmers can speak directly to experts. The approach supports two-way information flows between farmers and experts. This feedback loop helps to update information in the apps.



Agriprenuership: Farmers have to be agripreneurs to be successful participants in modern value chains They need to understand that they are part of a business where they produce and sell their produce. For this they need to have the necessary financial, digital, and business literacy to be able to survive and prosper in today's volatile, and complex agri-food markets. Training in agripreneurship needs to be extended to all farmers in the value chain.

Accelerating the spread of agri-tech: Technology is revolutionizing the way agri-food value chains are being managed to reduce information asymmetries, increase efficiency and climate resilience along the whole value chain, reach markets more easily with direct interface with the end user. Azerbaijan needs to work on several levels to catch this wave and be competitive. At the level of the government support systems need to be in place

and each stage of the value chain needs to be digitized as discussed in the section above. An Agri-tech Cluster needs to be created in the region with a supportive ecosystem in terms of Fabrication or Fab Labs which allow for design and testing of prototypes in particular for food processing, support should be provided in terms of mentoring from successful agri-tech companies like Dr Agro in Azerbaijan and international startups. The success of countries like US, those in Europe, China and India where governments have created a start-up ecosystem with successful uptake from agriculture-based start-ups could be studied and best practices adopted. An Agri-tech Accelerator and angle and venture capital financing should also be developed. Start-ups that have tested their ideas and prototypes successfully in the field should be assisted in scaling up.

Better cooperation among the value chain actors: Horizontal farmer cooperation is fundamental for more inclusive and sustainable fruit and vegetable value chains: Producer organizations are key to successful value chains in fruits and vegetables. Small farmers can strengthen their positions in the value chain only through coming together as elaborated in the section on horizontal linkages. The successful cooperation model of farmers in the strawberry value chain should be studied further and lessons learnt should be used to first strengthen this cooperation but also for this model to be adapted for other value chains in the region.

Box 4: The Power of Cooperation

MFarm is an agriculture services and technology company–financed in part by Novastar Ventures–that provides an SMS- and web-based commodity exchange for the five million smallholder farmers in Kenya MFarm agents recruit and support smallholder farmers, in part by aggregating and coordinating collection of produce. Transparency, quality control, and disintermediation helps smallholder farmers improve their agricultural practices, achieve higher prices for their produce, and pay lower prices for agricultural inputs through MFarm's "Groupon" buying model, thereby increasing their incomes.

Vertical links along the value chain also need to be strengthened for the flow of information along the value chain. Farmers need to communicate with traders to know market demands in terms of what varieties are marketable and what quantities are needed. Traders who function as intermediaries also need to exchange information between themselves and exporters and between exporters and farmers. The establishment of a regional Citrus Growers and Exporters Association and a Strawberry Growers and Exporters Association in the region would also be useful. **Cluster development** can be considered for a Strawberry Cluster in the region covering Jalilabad, Masalli and Lankaran districts. A Citrus Cluster can also be formed covering producers, traders and warehouse owners and potential processors in Lankaran, Astara and Masalli districts. Cluster development requires the close partnership of academic institutions for instance the Lankaran State University, the regional branches of the national research institutes, and producer organizations and private sector players including traders and processing units.

Marketing and Branding of Regional Produce: Buyers are getting more sophisticated about their food choices and the marketing of fruit and vegetable produce needs to cater to these demands. Supermarkets can take advantage of these trends to educate potential customers and encourage the consumption of local fresh fruits and vegetables. The nutritional profile of these foods should be available to highlight these healthy choices.

Sellers and marketers of fresh, whole produce often benefit from marketing partnerships. This means working with other businesses to pair fresh fruits and vegetables with cooking equipment, seasonings, and complementary recipe ingredients to increase sales for all of the products included in the promotion. The Lerik apple value chain analysis highlights the case of a producer who pairs fresh apple with home maid cottage cheese in one basket. This can be a gift basket of local produce for local tourists as well.

Branding is important to create differentiation in a competitive market. A brand is the identity and message that makes a product stand out from competitors that sell similar products or services. The goal of branding is to earn space in the minds of the target audience and become the option of choice. A branded product usually commands a higher price in the market. However, this is only possible if the standard and reputation of the brand is maintained. Care should be taken so that other produce is not sold under the same name. For instance, imported lemon from Iran is sometimes sold as Lankaran lemon which commands a higher price in the market.

The region was the vegetable and fruit basket of the country famous for its early vegetables and fruits when the country was a Soviet republic. Recreating the image of local fruit and vegetable products of Lankaran – Astara Region e.g. Lankaran citrus, Lerik apple, Astara mandarin, Yardimli potato, Masalli tomato, Jalilabad strawberry in the market is a much-needed step. The process of branding will require market research and will take time and effort which the project will support as part of the next steps. Just creating a brand is not enough the right pitch aimed at target audiences has to be made, and a marketing strategy implemented. Even more crucial will be to maintain the reputation of the brand by ensuring quality and preventing copycats from using the brand. Farmers should also be introduced to ICT enhanced marketing as e-commerce, m-commerce and other trading platforms and social media.

Access to finance as a critical component for food security: An estimate by the World Bank states that global food demand will increase by 70 percent by 2050 and at least $80bn in annual investments throughout value chains will be required in response. Access to agri-finance remains limited for value chains in Azerbaijan. Farmers are constrained by a lack of seed capital, poor financial literacy, unaddressed sector-specific needs, lack of collateral, exclusion from the banking system, and long distance to financial service providers. Lerik, Yardimli and Astara all have only one branch of the Kapital Bank and they do not lend to farmers. Current financial systems are not geared to finance the shift to sustainable agriculture and agri-food industries.

Financial and business literacy is a pre-requisite for farmers to understand the benefits of financial products and how they should be used in a responsible manner. Agri-finance products tailored to all participants in the value chain should be developed. Farmers need low collateral and interest loans with flexible payment terms to adjust to the need for income smoothing till the harvest can be sold and loans repaid. Suppliers and buyers' credit are the ways that agricultural value chains finance production. The supplier lends inputs on a credit basis with payments made when the harvest comes in kind or cash. Buyers in the case of contract farming provide funds and inputs to farmers to ensure the contracted production. An intermediary has to pay the farmer at the farmgate but receives payment from retailers and exporters often a month or even three months later. Funding should also be available to input suppliers, traders, and buyers in the value chain. Only in one case in the Fadak Strawberry Producer Group was contract farming seen with inputs including plastic mulch, seedlings being provided at discounted prices by the farmer/cold storage owner and exporter and the contracted produce stored and exported by the same farmer.

Fintech solutions are offering farmers last mile access to credit and insurance and digital payments. These digital financial solutions need to be made more easily available to farmers in particular in districts with limited access to formal financial institutions.

Box 5: Use of Geo-Data for agri-finance and insurance

ICCO Terrafina, using geo-data in Ethiopia as a credit assessment tool tracks the costs of agricultural performance and revenues and analysis the risks for financial institutions. The human interface is important as loan officers translate the information to farmers. The GeoBancoverde app has digitalized environmental loan monitoring for smallholder finance in Latin America where the lack of spatial information about farm plots enables fraud and also practices that damage the environment. Geo-referencing of farms and assessing environmental aspects is done using satellite imagery of that area with data transferred from a mobile phone to a bank's central server. The benefits include credit risk and fraud reduction, and acceleration of the credit process. This also allows online monitoring of the farm area during the whole credit life cycle. Satellite imagery has also been used to assess damages after natural disasters for agri-insurance payments.

State subsidy schemes substitute for the scarcity of commercial loans and limited small farmer savings for investment. With numerous small fruit and vegetable producers the region's agricultural economy depends on available subsidies. However, most smallholders grow their crop in backyards that are not eligible for subsidies. These farmers have to make do with subsistence farming. There is a need for a tailored subsidy line devoted to intensification of production by these producers.

A Credit Guarantee Fund should also be established for small fruit and vegetable producers and small and medium agri-food enterprises, who are interested in commercial bank loans.

Agricultural and rural infrastructure financing facility is also needed to finance the funding of agricultural and rural infrastructure in the regions. This can take the form of an Agriculture and Rural Development Bank or a dedicated fund.

Land management should be ensured through an agriculture land bank to ensure that arable lands are well maintained. There are large tracts of agriculture land that are not used in the district that often lack access to water or easy road access. These lands can also be made attractive to investors from land poor countries with road and water access.

investment attracting mechanisms and incentives to be enhanced by identifying opportunities that add value to the final product as cold storage, sorting, grading, pre-packing etc. facilities (see Table 8). As a result of the underdevelopment of high-quality production, post-harvest resources and market infrastructure, the analysed value chains requiring urgent actions for the benefit of majority of local growers are primarily citrus fruits (including subtropical crops), apples, and tomatoes.

Cold storages and processing plants are necessary for perishable products such as fresh strawberry, and not yet analysed crops with potential such as feijoa that has special nutritional value, sweet cherry and pears that are popular fruits.

Table 8: Value addition and state of value chains in the region

Stage	Value addition	State of Play	What needs to be done
Enabling environment	Startups using ag-tech.	No start-ups in the region Few start-ups focused on agriculture	Agriculture Start-ups Accelerators and Angle and Venture Capital finance
	Finance for agriculture	Limited private finance for all value chain actors	Special credit, and insurance products available via fintech State Bank or Fund for Agriculture and Rural Development Agriculture and SME Credit Guarantee Fund
	Rural infrastructure	Poor connectivity	Rural Infrastructure Fund
Inputs and services	Soil quality	Lack of soil testing	Digital Soil Health Cards
	Smart irrigation	Scarcity of water	Smart irrigation, Water conservation and efficiency
	High quality climate resilient seeds	Climate resilient seeds not available	Biotechnology for genetic research and seed development
	Right agrochemical use	Access to quality products limited. Lack of knowledge regarding use	Biological methods Access to good quality products
	Skilled labor	No skilled labour	Skilled human capital Digital literacy
	Last mile agricultural knowledge systems	Low service provider to farmer ratio	Digital tools and community-based service

Stage	Value addition	State of Play	What needs to be done
Production	Agro-technical care, Risk mitigation against weather related disasters	Support is limited. Agri-insurance not utilized	E-advisory service community knowledge worker e-agri-insurance
Post-production storage and logistics	A network of modern warehouses, cold storages, and intelligent logistics chain	Lack of storage facilities	Climate smart warehouse infrastructure, Solar energy cold storages
Processing	Modern climate proof processing facilities	Only a couple of facilities and none for the bulk of produce	Modern and climate smart processing facilities
Markets	Domestic	Lack of markets, connectivity, and access to markets	Better infrastructure, quality and standardization of produce, branding and marketing
	Export	Reliance on one market	Diversification and value-added export of processed goods
	Agriculture as a business	Lack of knowledge regarding marketing and business	Agripreneurship through financial, digital, and business literacy

18. The EU4Lankaran Project follow up steps

The project will take follow-up steps to enhance the three Cs: competitiveness, cooperation, and connection to markets for the value chains studied.

Competitiveness will be supported through developing a dynamic applied agriculture research network in the region that brings together the Lankaran State University(LSU), the regional stations of the Fruit and Tea Growing Institute and the Vegetable Growing Institute, the Vocational Schools in Lankaran and Jalilabad, the Pedagogical institute in Astara and private sector agribusinesses and producers and business associations. Demonstration plots and Field Days will be organized. Apple demonstration plots are being started in Lerik district with the support of the Fruit Growing Institute in Guba to test cultivars of apples that are best suited to the district. Potato cultivars are being introduced and monitored for development of seed potatoes and scaling up in Lerik and Yardimili district with the support of the Vegetable Growing Institute. Preliminary discussions have been held to organize a Sub-tropical fruits Department at the College of Agriculture and Engineering, LSU and to develop partnerships with institutions in Turkey.

An advisory services network will be created for the region and an association of agricultural advisory service providers created. A cadre of frontline community knowledge leaders will be created to offer basic agronomic advisory. They will be connected to the second line of advisers from the State District Agriculture Centers and Regional Training Center and for more technical assistance to the regional stations of research institutes.

Smart solutions will be devised for agriculture advisory services that bridge the gap between provider and producer. Digital technologies and social media will be used starting with WhatsApp groups. The project has already created such groups in Lerik and Yardimli districts for apple and potato farmers. Mentoring will be provided by the Key Experts in the project for horticulture and agri-business advice.

Cooperation will be enhanced where they exist both horizontally and vertically to strengthen value chains. Producer groups for apple producers in Lerik district and for potato farmers in Yardimli district have already been formed. A Citrus Growers and Exporters Association will be supported.

Connecting to markets: the produce studied will be branded with the help of the Small and Medium Enterprises Development Agency (SMEDA) and ABAD the organisation supporting family businesses. These include Lerik potato for which the genetic pool has been identified and seed potatoes are being developed by the Vegetable Growing Institute, Lerik apple for which new commercial varieties have been introduced by the project. The other brands will be for Lankaran lemon, Astara mandarin, strawberry in Jalilabad and tomato in Masalli districts. Marketing strategies and outlooks will be developed.

Cross cutting issues will be handled through a climate change strategy and action plan for the region which will also look to preserve biodiversity and natural resource management and enhance the green economy. A Climate Change Vulnerability Index has been developed for the region and the report will be shared shortly. In addition, the green tourism potential of the region will be enhanced as well as pilot measures put in place for agro-tourism in the region.

Developing bankable projects for investments: Based on the value chain analyses which have identified gaps in investments in the value chain, as enumerated steps will be taken to develop bankable projects. Here the district diagnosis reports, and development plans will also be referred to.

Investments will be enhanced in three ways. Grants will be provided by the UNDP implemented project under the EU4Lankaran umbrella based on needs identified by the value chain analyses for each value chain producer group. Medium sized investments will be funded through a partnership with bilateral aid agencies like Turkish International Cooperation Agency, and the Korean International Cooperation Agency for example. Larger long-term financing will be through approaching IFIs and the EU Economy and Investment Fund. Outreach will also be made to investors both domestic and international.