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European Bank for Reconstruction and Development

TEA SECTOR REVIEW
AZERBAIJAN

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Foreword

Tea has a long tradition of cultivation in Azerbaijan, dating back to the end of the 19th century when the first tea plants were introduced in experimental plantations along the southern Caspian Sea coast. A symbol of hospitality, tea has also been an integral part of local culture and tradition for centuries, and the Azerbaijanis are now ranked as among the top tea-drinking people in the world.

In the 1930s, the first tea processing plant was built in Azerbaijan and tea gradually became a crop of industrial significance. By 1988, production peaked at 34.5 thousand tonnes of green tea leaves cultivated on an area of 13.2 thousand hectares. This accounted for about 8–10 percent of the demand for tea in the former Union of Soviet Socialist Republics (USSR) and up to 65–70 percent of local demand in Azerbaijan. Together with Georgia – the largest tea producer in the former Soviet Union – these two former Soviet republics accounted for over 95 percent of domestic production in the Soviet Union and the bulk of its domestic tea supply. In Azerbaijan, primary production and processing in 14 tea-processing and two packing factories also provided employment to about 65-70 thousand people.

However, structural changes following the collapse of the Soviet Union in the early 1990s led to a rapid decline in the Azerbaijani tea sector, due to the disappearance of the Soviet market and the transition from a command economy to a free market. In 2010, the total tea leaf output was less than 1 percent of peak production in the 1980s. Since then, interest in the tea sector has increased and production has grown, albeit modestly, in parallel with government efforts to diversify Azerbaijan's predominantly oil-based economy. In 2018, the Azerbaijan State Program for the Development of the Tea Industry was approved, with the objective to increase the tea productive area to 3000 ha and production to 8500 tonnes by 2027 — more than eight times the 2018 output.

In spite of a long tradition and accumulated know-how of tea production and processing, there is little doubt that investments in both technology and knowledge will be required for Azerbaijan's tea sector to grow in a successful and sustainable way. Production focused on efficiency and quality that is also mindful of the environment is critical to achieving this.

It is in this spirit that this joint sector review of the Food and Agriculture Organization of the United Nations (FAO) and the European Bank for Reconstruction and Development (EBRD) aims to provide a general overview of the Azerbaijani tea sector, with a focus on key sector aspects such as financial profitability, quality, international competitiveness and environmental sustainability. Ultimately, our hope is that this report will serve as a basis for informed policy and investment decisions to national and international stakeholders with an interest in this promising sector.

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The team of authors worked under the guidance and overall supervision of Dmitry Prikhodko (Senior Economist, FAO). The lead authors of the study are Ms Alexandra Sokolova (Economist, FAO) and Mr Boris Sterk (Economist, FAO). Substantial contributions were provided by Ms Ekaterina Krivonos, (Economist FAO), Messrs Jacopo Monzini (Senior Natural Resource Management and Climate Change Specialist, FAO) and John Snell (International Tea Industry Expert). The authors are thankful for the review and contributions by Mr El Mamoun Amrouk (Senior Economist, FAO and Secretariat of the Intergovernmental Group on Tea).

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Abbreviations and acronyms

BAU	business-as-usual
COP	cost of production
CSA	climate-smart agriculture
CTC	crush, tear and curl
EBRD	European Bank for Reconstruction and Development
ECMWF	European Centre for Medium-Range Weather Forecasts
FAO	Food and Agriculture Organization of the United Nations
FIRR	Financial Internal Rate of Return
GDP	gross domestic product
GHG	greenhouse gas
GFSI	Global Food Safety Initiative
GoA	Government of Azerbaijan
(I)NDC	(Intended) Nationally Determined Commitment
IGG	Intergovernmental Group on Tea
IPCC	Intergovernmental Panel on Climate Change
ITC	International Tea Committee. The industry's statistical record keeper
L&B	leaves and a bud. Refers to the plucking standard defined by the number of leaves harvested, plus the bud. The common standard for quality tea (black or green) is harvesting the two most tender leaves and the bud from a given shoot (2 L&B) and quality deteriorates as more, coarser leaves are harvested.
LCA	life cycle assessment
MAX	Maximum
MIN	Minimum
MRL	maximum residue limit (Agrochemical residues)
NPV	net present value
OECD	Organization for Economic Co-operation and Development
PA	pyrrolizidine alkaloids (secondary plant substances which may be genotoxic carcinogens)
R&D	research and development
RCP	Representative Concentration Pathway
SSC	State Statistics Committee of the Republic of Azerbaijan
TNC	Third National Communication to the UNFCCC
UNDP	United Nations Development Programme
UNFCCC	United Nations Convention on Climate Change
USAID	United States of America Aid

Executive summary

THE GLOBAL MARKET

Global tea production increased from 4 to over 6 million tonnes between 2007 and 2017 (See Figure E1). However, increasing tea consumption and production is mostly due to population growth in producing countries and not to consumption growth in high-value importing markets. After increasing for several decades, global tea trade has stagnated since 2010 at around 2 million tonnes per year, equivalent to around USD 8 billion (2018). Kenya is the largest exporter in volume terms (500 000 tonnes); however, China is the most significant one in value terms (USD 2 billion) and together with the other two major exporters – India and Sri Lanka – the four countries account for two-thirds of the global tea exports by value.

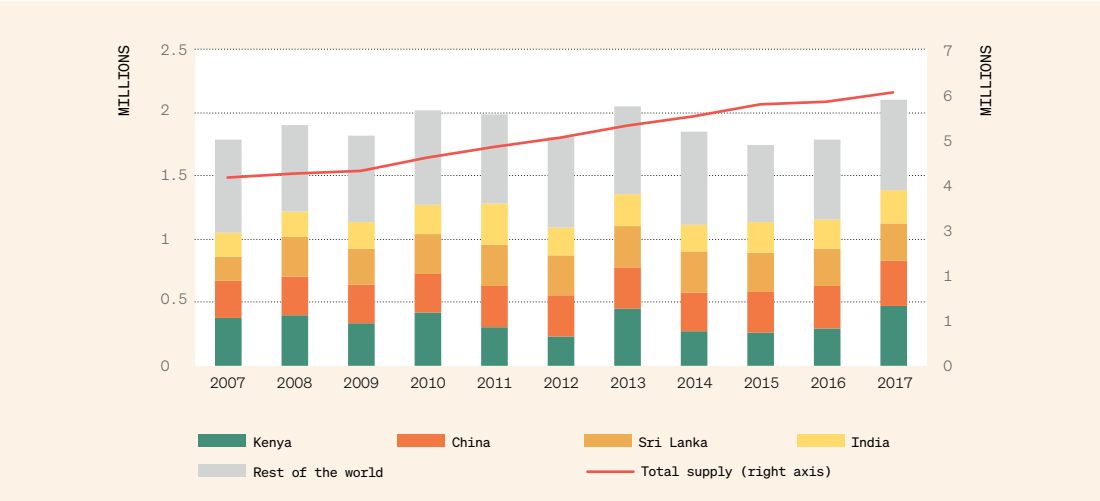

Figure E1
Evolution of global tea supply and exports (in million tonnes)

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/.

Growth in demand for and production of green tea is expected to reach 7.5 percent per year by 2027 and will stay considerably higher as compared to these of black tea, (2.2 percent per year for the same period).

In turn, the specialty[1] and the health and wellness[2] sub-categories are where the most growth is happening globally, with Europe and North American markets leading the way.[3]

1 Teas sold in counts of less under 40 servings per packet.
2 Those products that claim a functional effect on the body.
3 It has to be borne in mind however, that "tea" in this context, translates into anything that can be infused with hot water, other than coffee, cocoa and a few grain derivatives. Within these markets *Camellia Sinensis* ("real tea") is morphing from teabag cut material towards more leafy types (orthodox manufactured teas) and green teas but the largest increase is in the herbal sector, predominantly within the "functional" group of products in the health and wellness category.

In terms of price developments, the average FAO tea composite price (FAO, 2018) remained stable over the last decade until 2014 when there was a 5.3 percent decline, mainly due to the weakening of crush, tear and curl (CTC) tea prices. Prices recovered in 2015, reflecting the recovery in CTC prices offsetting the decline in orthodox teas as imports into the Russian Federation and the Near East fell due to weakened economic growth rates associated with lower world oil prices.

In the medium term, the projections suggest that supply and demand of black tea will be in equilibrium in 2027 at a price of USD 3.0 per kg. Prices over the last decade increased from an annual average of USD 2.39 per kg in 2008 to USD 3.15 per kg in 2017, with monthly peaks of USD 3.18 per kg, USD 3.00 per kg and USD 3.26 per kg, reached in September 2009, December 2012 and May 2017, respectively. The projections indicate a decline in nominal terms of 1.4 percent, while in real terms, prices would actually decline by an annual average of 3.6 percent over the next decade (Figure E2).

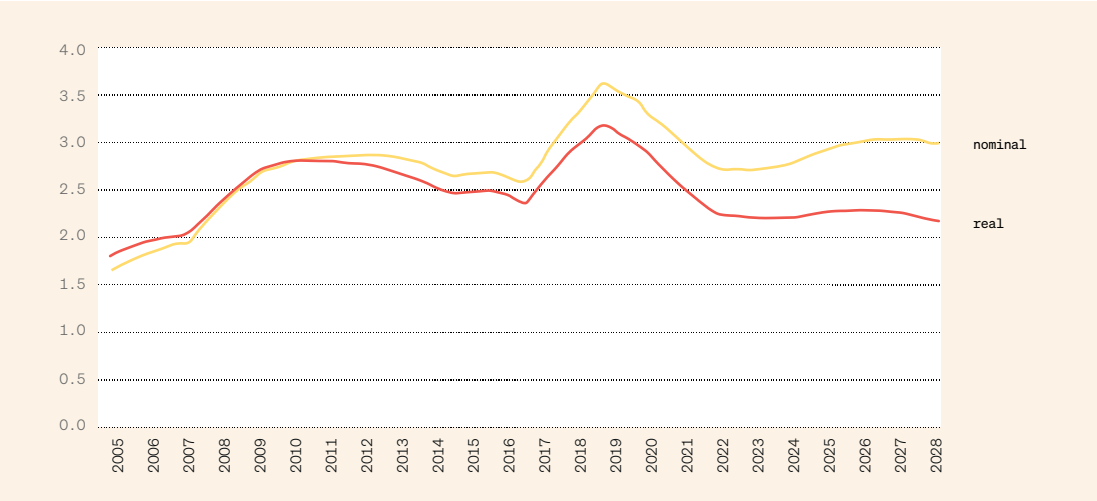

Figure E2
FAO Tea Prices (USD/Kg) baseline projections to 2027

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

The expected stronger demand for green tea and health and wellness teas, as well as for high quality in developed markets, suggests that these product categories should be areas of focus for the Azerbaijani tea industry in the next decade.

In fact, according to sector experts, it is likely that within a decade there will be a two-tier industry: one providing industrial grade tea (for extraction for bottled teas, decaffeination and less discerning markets) and another highly regarded handcrafted industry, providing relatively small quantities of expensive but high-quality teas. This fact suggests two possible main strategies for producers: to be a low-cost provider of industrial tea or to focus on producing high-quality tea in line with consumers' expectations.

KEY SECTOR TRENDS AND POLICY CONTEXT

Following the collapse of the Soviet Union, Azerbaijan's transition to a market economy and the loss of the Soviet market led to a rapid and drastic decrease in production, which reached a record low of 300 tonnes of green tea leaves in 2008 – a 99 percent decrease from peak production years in the 1980s. Since 2010, however, tea cropped area and yields have increased, partly due to government efforts to diversify the country's predominantly oil-based economy, reaching 900 tonnes from 1100 ha in 2018. Of these, 660 ha had reached full productivity levels, with the remainder expected to become fully productive 7 to 10 years from planting.

The Azerbaijan State Program for the Development of Tea Industry (2018–2027), approved by an executive order of the President of Azerbaijan, aims for an increase of the tea productive area to 3000 ha and sets a production target of 8500 tonnes by 2027. The new state support measures were approved in 2018 and became effective on 1 January 2020, providing a subsidy of AZN 700 (USD 410[4]) per hectare per year for the first 7 years from planting and AZN 240 (USD 140) per hectare per year thereafter (for new plantations established before 2019 the AZN 240 subsidy applies independently of the age of the plantation). These new subsidies aim at stimulating new tea plantations, which reach full productivity between 7 and 10 years after planting, and replace various agricultural input-specific subsidies, which had existed previously. Moreover, cooperatives of over 50 ha are entitled to an extra 10 percent on top of the mentioned subsidy amounts.

While our estimates suggest that the total subsidy value of AZN 4900/ha (US 2900/ha) over 7 years accounts for slightly less than 50 percent of the total required investment in a new tea plantation, risks to smallholder engagement in tea production are still high considering relatively low returns. With little access to microfinancing or any market other than the nearest tea factory (allowing for only modest margins) smallholders may very well not be able to fully benefit from the programme, furthermore, it may not produce the desired socioeconomic impact envisaged for rural populations.

PRODUCTION

Primary Production

Having reached a historic low of 600 ha in 2010, the tea planted area in Azerbaijan started increasing and reached 1100 ha by 2018, but this still represents less than 1 percent of the total cropped area. Of these, 660 ha were considered fully productive with the remainder being new plantations still to reach full productivity within years 7–10 from planting.[5]

4 An exchange rate of AZN 1 to USD 0.59 is assumed throughout this report (fixed since 2018 valid as of September 2021).

5 In major tea producing countries such as India or Sri Lanka, the tea plant usually reaches full productivity within 5 years from planting. However, due to the specific local agro-climatic conditions in Azerbaijan (a colder climate and an extended dry season), tea plants can take anywhere between 7 and 10 years to become fully productive, depending on variety, location and planting density.

As of 2018, the Lankaran and Astara districts accounted for 85 percent of tea productive area and 93 percent of green leaf supply in Azerbaijan. The 2015 Agriculture Census reported a total of 232 tea producers across the country, of which 13 were legal entities (companies) and the remainder were individual farmers. This is equivalent to an average farm size of around 4 ha. Around 80 percent of producers were small (under 1 ha), 15.5 percent were medium (1 to 20 ha) and 4.5 percent were large (over 20 ha). As reported by the Astaraçay company, it solely owns around 450 ha of the tea plantations, which represents over 40 percent of the current total tea area in Azerbaijan.

While there is no precise information available regarding the dominant type of producer in terms of total green leaf output, companies that also own processing factories are the most influential actors in the tea sector and have a key role in formulating prices for tea leaves.

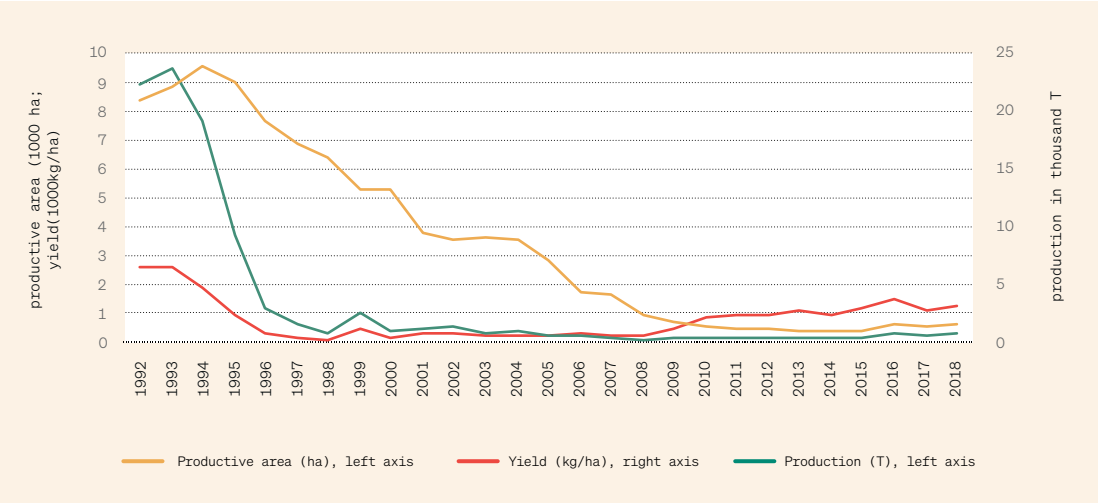

Figure E3
Azerbaijan – Key tea production indicators

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/.

As tea yields also depend on harvesting methods and decisions, tea production does not always closely mirror the evolution of the area under tea cultivation and yields ranged from 300 kg/ha in 2008 to 1.5 tonnes/ha in 2016. Green tea leaf production was at its lowest in 2008 at just over 300 tonnes, reached a peak in 2016 at slightly over 1000 tonnes and decreased again to 870 tonnes in 2018. Nevertheless, throughout this period, average tea yields have remained consistently lower than the world average of around 2 tonnes/ha (calculated weighted global average based on official FAOSTAT statistics).

It should be borne in mind, however, that contrary to many other crops the performance of the primary production of tea can hardly be assessed based solely on yields. In fact, plucking more leaves in one harvesting round will increase the harvest volume in tonnes, but it can have a significantly negative impact on quality and the total yield. While harvesting decisions are inherently local and need to be made on a case-by-case basis, they always

require a careful cost-benefit analysis of quality vs quantity in view of the local context (agro-climatic conditions, production costs and especially labour costs, prices, target markets). We examine such production issues in more detail in Chapter 3 (Production).

It also must be highlighted that, in spite of a long tradition of tea cultivation in Azerbaijan, tea is far from being a crop of primary economic significance. According to FAO estimates, even during peak production times, tea ranked behind a number of crops such as grapes, cotton and wheat in terms of its net value of production, ranking 10th in 1992 with a net value of production of USD 24 million[6] (compared to USD 347 million for grapes and USD 190 million for cotton). FAO's most recent estimates (2016) suggest a net production value of about USD 1 million which is well behind crops such as tomatoes, wheat, hazelnuts and other fruit and vegetables (Figure E4).

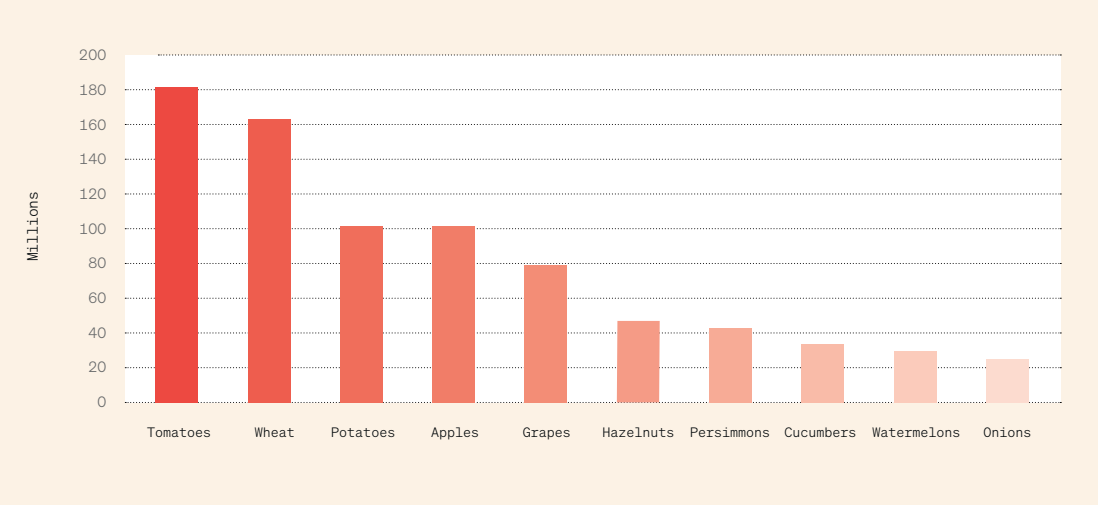

Figure E4
Top ten crops in terms of net annual value of production (2014–2016 average in 2004–2006 constant USD)

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/.

The net value of production per hectare for tea, although slightly higher than the average for the entire cropped area (USD 914/ha), is in fact lower than for most other crops grown in Azerbaijan. With a value of USD 1371/ha, tea ranks behind potatoes and is very far behind raspberries and tomatoes, which create five to seven times more value per unit of land according to these estimates. This is an important factor to bear in mind not only from an economic perspective, but also in terms of the impact it can have on farmers choices regarding land use, as it is also indicative of the overall financial profitability of the crop at the farm-level. This aspect is analysed in more detail in the Chapter 3 (Production).

6 In 2004–2006 constant USD.

Tea processing

Processing factories are often responsible for providing financing for plucking and green leaf transportation, before drying, withering, rolling, fermenting, sorting, blending and packaging tea.[7] Although during Soviet times more than 15 such factories were operating, only six to seven tea-processing plants are now operating in Azerbaijan. The largest tea processors in the market are Sun Tea Azerbaijan, Astaraçay, Yashilcay, and Zagatala with a production capacity ranging from 1 to 4 thousand tonnes per year (as a comparison, factories with a daily output of 0.5 tonnes in India are considered "mini-factories" while some are capable of processing up to 50 tonnes or more, equivalent to an average yearly output of 180 and 18 000 tonnes respectively). The newly established plants such as Astaraçay or Yashilcay use high-quality imported equipment (e.g. rollers, roast machines, dryers) for the processing of tea leaves, while the others mostly rely on old machinery from the Soviet period, which does not comply with current Global Food Safety Initiative (GFSI)/ hazard analysis and critical Control Points (HACCP) certification standards. The Soviet era tea factories are currently too large and are operating below their capacity, as domestic green tea leaf supply is now very limited. Around two to three processing factories collect tea from small- and medium-sized farmers while other factories use tea leaves from their own plantations. A majority of the tea processing companies have a well-defined marketing strategy and market their tea under their own brands, which they categorized as a high-, medium- and low-quality tea.

Tea quality ultimately depends on the quality of raw (green) leaf and processing methods. Processors play a key role in establishing farm-gate prices and ensuring that the green leaf input they receive is up to a good standard. However, our analysis shows deficiencies in the post-harvest handling of green leaf which leads to a deterioration of the final output (made tea).

Financial profitability

Crop profitability is a key factor influencing land use decisions by farmers. Our findings suggest that under current conditions tea is unlikely to be an attractive crop for farmers in the regions of Azerbaijan where its cultivation would be possible, considering competition from alternative crops. Under current production, processing and marketing practices such as business-as-usual (BAU), tea financial profitability for farmers is low. We estimate an average gross margin of about USD 570/ha for a fully productive tea plantation, which is lower than the profitability of oranges (around USD 5500/ ha) and even lower than the profitability of annual crops such as rice (which we estimated at around USD 2500/ha). In parallel, investments in a new tea plantation are significant and full productivity is reached, at the earliest, 7 years after planting. Therefore, risks for producers are also higher.

However, changes in existing practices can considerably improve tea profitability through a careful examination of improvement options on a case-by-case basis. Our analysis explores such options in several different production scenarios as well as for oranges and a small tea processing plant, looking at gross margins, net present value (NPV) and Fiinancial Internal Rate of Return (FIRR). The results of this analysis are summarized in Table E1.

7 For a definition of these terms, please refer to the glossary section.

Table E1
Financial benefits summary for tea under different scenarios and citrus

Model	Description	Margin		NPV		FIRR
		AZN/ha	USD/ha	AZN	USD	
M1	Tea: new plantation, BAU	965	569	-18 112	-10 686	-7%
M2	Tea: new plantation, focus on quality	6455	3808	3721	2196	7%
M3	Tea: new plantation, mechanization to produce green tea	7153	4220	1979	1167	6%
M4	Tea processing plant: own leaf	284 751	168 003	1 156 582	682 383	19%
M4bis	Tea processing plant: purchased leaf	222 601	131 335	1 896 154	1 118 731	81%
M5	Oranges: new plantation	9410	5552	-10 582	-6243	4%

SOURCE: Field data and authors' calculations, 2019.

In a scenario with a focus on producing quality leaves for black Orthodox tea and carefully balanced harvesting decisions, mixing plucking and mechanical harvesting depending on actual quality and condition of leaf in the field at a given moment, a gross margin of USD 3800/ha per year has been estimated.

In another scenario with a focus on producing leaves for green tea manufacture, the possibility for slightly higher reliance on mechanized harvesting methods could improve margins even further, with our estimates suggesting a gross profitability of about USD 4220/ha. The assumptions and methodology to produce these scenarios are outlined in Chapter 3. Nevertheless, under all scenarios, oranges appear to be more profitable than tea.

Tea production is extremely labour-intensive (and even more so in the case of top-quality tea production) and about 50 percent of tea primary production costs in Azerbaijan are now accounted for by labour. As an upper-middle income economy, Azerbaijan is therefore in a difficult position when competing with major tea producers, which are all lower-middle income countries where labour costs are significantly lower. This is also reflected in the average farm-gate price for tea in Azerbaijan which is invariably higher than most major competing origins (Table E2).

Table E2
Average green tea leaf farm-gate price

Origin	Price, USD /Kg
Georgia	0.30*
Azerbaijan	0.64**
Sri Lanka	0.57
India	0.10
Viet Nam	0.09

SOURCE: Authors.

*Average price for 20 percent of output at GEL 3 (USD 1.1) and 80 percent at GEL 0.35 (USD 0.13) depending on quality.

**Average price for 20 percent of output at AZN 1.4 (USD 0.82) and 80 percent at AZN 1 (USD 0.59) depending on quality.

Labour costs for plucking are the most important operating expenditure for tea farmers. Discussions on the options for reducing labour costs through the introduction of mechanization when relevant, and in parallel to improving leaf output quality, are also key to improving Azerbaijan's competitiveness *vis-à-vis* the main global tea producers. The current production costs for its manufactured tea (i.e. after processing) would make competition with Sri Lanka, India or Viet Nam difficult as these countries are generally able to produce higher-quality teas at a lower cost. However, this perspective may change, considering the changes in international prices and evolution of the cost production for major producers in the future.

Nevertheless, our analysis also shows that tea processing in Azerbaijan has the potential to be a very profitable undertaking (Figure E6), especially if processors are vertically integrated and have their own green leaf production (i.e. not buying from other producers or importing). In such a scenario (Scenario 4), a gross margin of over USD 168 000 is estimated for a unit capable of processing 60 tonnes of tea from 10 ha of its own tea. Profitability of tea processing is discussed in more detail in Chapter 2.

While our profitability estimates for different scenarios are only indicative – as profitability is ultimately farm-specific and depends on a number of variables – they suggest that there is significant potential for improving tea return margins through changes in production practices, by combining a lower reliance on manual labour and improvements in quality. While our models reveal that even with such improvements there will be more attractive alternative crops for farmers in tea production areas (oranges, persimmons, other fruit), tea can be produced by farmers as a part of the crop mix to diversify income and reduce reliance on only a few crops, especially in view of climate-related production shocks.

Quality and competitiveness

In this study, we evaluated the organoleptic qualities of several Azerbaijani teas, including major manufacturers against major import tea origins of a comparable quality and price. The origins taken into consideration were Ceylon (Sri Lanka), Assam (India), Kenya and Viet Nam.

Results show that Azerbaijani teas perform quite well with intrinsic characteristics such as sparkle, as compared to the two top import origins in Azerbaijan: Sri Lanka and India. However, the latter have better developed characteristics such as tea colour, body and impact. While Viet Nam is still the closest comparative tea, Figure E5 summarizes our analysis, providing a comparison between Azerbaijani teas and teas of import origin in terms of overall sensory quality assessment and estimated market price. The methodology for this analysis is outlined in Chapter 3.

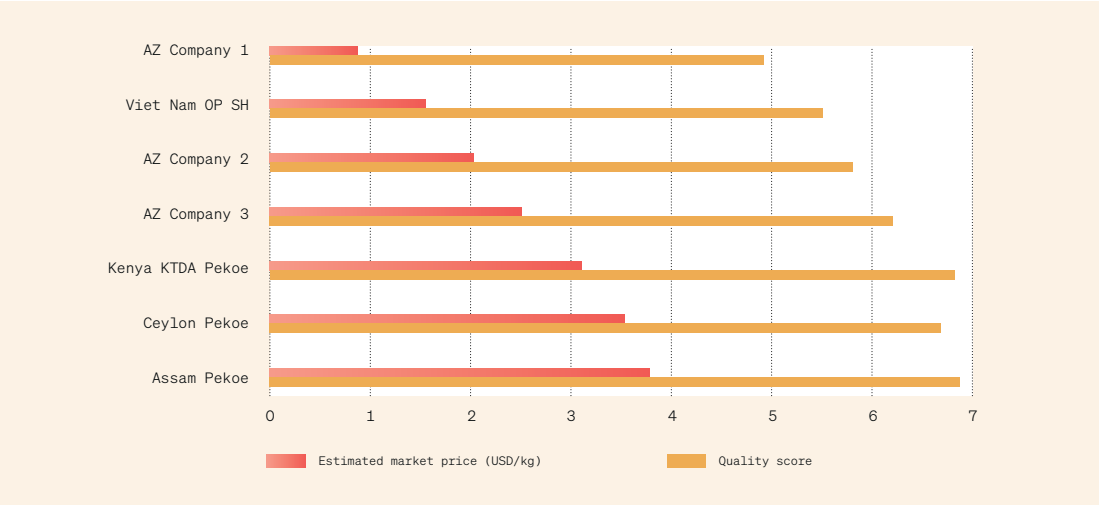

Figure E5
Azerbaijan tea quality and price in a comparative perspective

SOURCE: Authors.

Field visits suggest that manufacturers have adequate tea processing knowledge while the leaf in the field standards appeared reasonable. Nevertheless, improved coordination between producers and processors would help improve the quality of manufactured tea. The processors have a key role to play not only in ensuring that the green leaf is handled and processed adequately, but also in providing clear information and incentives on the quality of the input they need to receive, as it depends on factors such as the plucking method (manual, mechanized, sheer), the volume of leaves plucked per round, plucking timing as well as the post-harvest care of leaf.

In a number of cases, plucking of up to 5–6 leaves and a bud (L&B) were reported which already compromises the quality of manufactured tea. It is commonly accepted that to produce good quality tea a maximum of 2–3 L&B should be plucked per harvesting round.

It is also important to improve the producers' and processors' understanding of the importance of green leaf shelf life in post-harvest handling, as some producers reported delays of up to 36 hours before green tea leaves enter the factory and begin processing. At this point, the leaf is not going to produce a quality tea. Furthermore, factories often tell the smallholders when they will open and accept leaf, in order to ensure they receive enough leaf to process efficiently. This is problematic, as the waiting time causes the percentage of poor leaf in the field to go up, ultimately resulting in a lower quality of manufactured tea.

Environmental sustainability

Although not to the same extent as in other key tea production areas (i.e. Kenya, Sri Lanka, India and China), tea production in Azerbaijan is exposed and vulnerable to climate change. Recorded and projected changes may result in immediate adverse impacts on the potential expansion of the areas suitable for tea production, as irrigation is now a precondition to produce tea regardless of altitude. Therefore, the vulnerability of current production as well as of future expansion is something investors should carefully consider, taking into account increased water needs and increased exposure to new pests and diseases in the future. Interviews during field missions suggest that production is not currently facing pest and diseases problems, however tea producers and plant protection services need to be equipped to cope with such risks in case of pest outbreaks. Addressing the described bottlenecks will reduce the overall risk of cultivating tea and expanding its production. Therefore, tea expansion in the country will require parallel investments in research and development (R&D) to identify and "tailor" the best varieties as well as water management initiatives to prepare for possible adverse impacts, and to ensure that the irrigation required for tea cultivation will not have additional adverse impacts on water resources.

The environmental impact of current tea cultivation in Azerbaijan appears to be moderate for existing farms and moderate/high in the case of new plantations. Nevertheless, assuming there is or will be no land use change, the cultivation of tea is an effective way to protect mountainous soils from erosion and instability.

This notwithstanding, the overall impact of tea processing should be considered moderate/high due to the obsolete technologies and energy sources currently in use. Therefore, tea expansion in Azerbaijan may be possible assuming that: (i) irrigation is available at the same cost as for other crops; and (ii) the appropriate environmental safeguards are in place – from cultivation to processing – to limit, mitigate and/or neutralize emissions and other adverse environmental impacts. This point is of particular importance, as the expansion of the sector may cause possible conflicts with the current network of protected areas and national parks.

However, options to produce low-carbon or even carbon-neutral tea should be studied separately considering possible mitigation measures to sequester carbon dioxide from the atmosphere and reduce greenhouse gas (GHG) emissions at each level of the value chain, in addition to the related costs of certification and consumer willingness to pay for carbon-neutral tea.

CONSUMPTION

Growing tea consumption in Azerbaijan is a promising trend for the sector, with per capita annual consumption increasing from 1.6 kg in 2008 to 2.1 kg in 2018 (+31 percent). This currently places Azerbaijan among the top tea drinking nations such as the UK, Turkey or Morocco, where annual per capita consumption ranges between 1.5 and 4 kg.

Figure E6
Tea consumption in Azerbaijan

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

Increasing per capita consumption and demographic growth mean that throughout 2008–2018, total tea consumption in Azerbaijan increased from 13 to 21 thousand tonnes (+58 percent). With domestic production under 1000 tonnes, Azerbaijan relied on imported tea for over 96 percent of its domestic tea supply as of 2018. It has to be noted, however, that most tea is imported in bulk (85 percent as of 2019) with a significant share packed and branded in Azerbaijan and either sold domestically or exported – whether blended or not with tea of Azerbaijani origin.

Protecting the origin of Azerbaijan tea is important considering the evolution of consumer preferences both domestically and in key export markets. Currently, consumers are often led to believe that the tea characteristics they have become accustomed to are typical of Azerbaijani tea, while in fact the tea they are consuming is mostly imported. The enforcement of rules of origin or geographic indications coupled with parallel efforts to educate consumers about the unique characteristics of tea grown in Azerbaijan are a possible basis for the creation of more discerning tea markets, both domestically and in key export destinations.

While there is no data on tea demand elasticity in Azerbaijan, FAO estimates that global demand elasticity for black tea varies between -0.32 and -0.80, which means that a 10 percent increase in black tea prices leads to a decline in demand for black tea between 3.2 percent and 8 percent, revealing the relative inelasticity of demand for black tea.

TEA TRADE

Despite the drastic drop in tea production and the loss of the areas of production in the mid 1990s, Azerbaijan remained a net exporter of tea until 2015 mostly due to domestic blending and re-exports. This trend was reversed in 2016 and the country became a net importer. The main destination of Azerbaijani tea exports is the former Soviet Union countries. In particular, exports to Russia, Georgia, Ukraine and Kazakhstan accounted for more than 95 percent of total tea exports in 2018. On the other hand, Sri Lanka, Russia (re-export of packaged tea) and India account for 96 percent of Azerbaijan tea imports. Sri Lanka is by far the most significant import origin with a share of 88 percent.

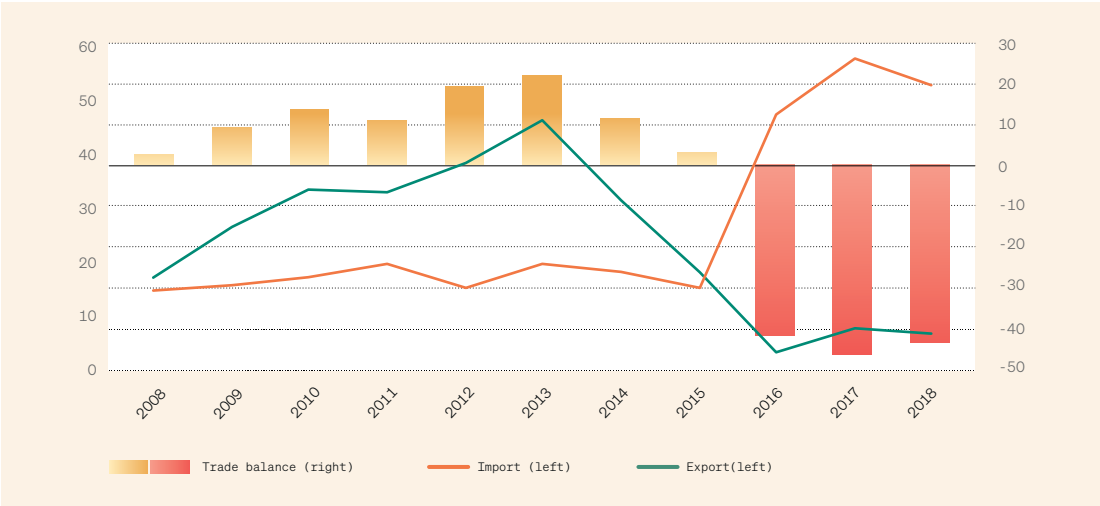

Figure E7
Import/Export (left) and trade balance (right) of tea (million USD)

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

Almost 84 percent of the tea exported from Azerbaijan is black tea packaged in tea bags and placed in boxes weighing up to 3 kg (in most cases ready for final consumption). In contrast, about 89 percent of imported black tea to Azerbaijan is in bulk in packages that exceed 3 kg. It is further blended, packaged and branded in Azerbaijan and then either sold domestically or re-exported, often raising uncertainty on the definition of Azerbaijani tea and its rules of origin.

On average, export prices in 2018 were about two times higher than import prices: USD 6.86/kg for exports and USD 3.84/kg for imports in 2018, indicating that the exported tea is mainly directed to the high-end market. It suggests that once packed and marketed as “Made in Azerbaijan”, tea imported from Azerbaijan has a certain appeal to consumers and is able to fetch prices higher than for packaged tea from competing origins (such as Sri Lanka or Kenya, Figure E8).

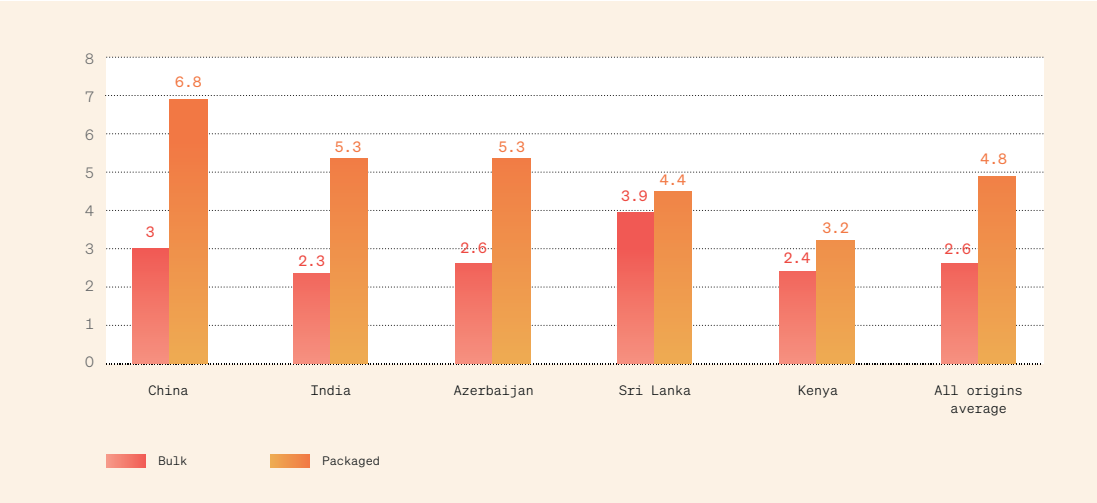

Figure E8

Average import price (USD/kg) in Russia for bulk and packaged tea

SOURCE: Trade Data Monitor (TDM). 2019. Cited 12 May 2021. www.tdmlogin.com/tdm/index.html.

SWOT analysis

The SWOT analysis in Table E3 summarizes the main strengths, weaknesses, opportunities and risks (SWOT) that the Azerbaijani tea sector is facing, as identified in the study.

Table E3
SWOT Analysis of tea production in Azerbaijan

STRENGTHS	WEAKNESSES
• Long historical association with tea. • Slow growth due to dormancy creates high polyphenol/ health quota and confers Azerbaijani teas unique organoleptic qualities. • Good internal tea production skillset. • Current governmental support for tea. • Large processing capacity. • State support and technical assistance available to support industry expansion. • Proximity to "traditional" CIS markets and high-value markets (European Union) for export. • Strong internal demand for tea.	• Highly inequitable supply chain (margins and pricing in the hands of the black tea processors) and packers. • Rules of origin not upheld so consumers cannot differentiate local tea from imports (in fact, consumers have been conditioned to import quality). • Current leaf style is not conducive to export-quality retail packs. • Need to improve production practices, especially at the harvesting and post-harvest stages to improve quality. • High labour costs.
OPPORTUNITIES	**THREATS**
• Opportunity for organic production as pesticides and chemical fertilizers are generally not used. • Development of GIs and voluntary quality/carbon labels. • Room to increase productivity of existing fields, match factory capacities to green leaf catchment, refine manufacturing process to mimic and therefore replace foreign teas in domestic black tea packs. • Unique clonal material and northerly latitude creates unique teas. Opportunity to make world-class quality leaf teas if market strategy supports. • Significant and growing domestic demand for tea.	• Loss of skillset with ageing population. • Land use competition by more profitable crops. • Return on Investment and financial profitability, even with government support, is not as attractive to farmers as compared to other crops. • Tea will mainly attract current processors limiting the economic impact on rural communities. • Risk of the introduction of new pests due to climate change.

SOURCE: Authors, 2021.

RECOMMENDATIONS

Reassess support to the tea sector in view of its potential (including for greening) and as compared to other alternative crops. Under the current support system, tea appears to be one of the few crops that receive substantial public support in Azerbaijan. The local tea varieties, long dormancy period and inherent tea processing skillsets mean that these teas could re-emerge as quality origins. However, agro-climatic conditions in the coastal areas of both countries allow for the production of a number of other crops that have a stronger comparative advantage internationally, and that are financially more attractive to local farmers. Our analysis suggests that the financial attractiveness of primary tea production for farmers in comparison with other such alternatives is limited. In addition, considering the international market situation whereby only a limited increase in demand for tea is expected in the next decade and real prices are expected to decrease, we suggest that equal priority be given to all crops considering their value-addition and employment generation potential. While we recommend that such a discussion be led by the relevant ministries in both countries with key tea sector stakeholders at the national and local levels, the below recommendations should be considered as options for improving the efficiency and international competitiveness of the tea sector of Azerbaijan, in view of expected global consumption trends.

Improve production practices of black tea. As per field visits, the following steps are seen as critical in improving the quality of current black tea manufacture:

I. maximize the quality potential of the first harvest (first flush) in May;

II. ensure that harvesting is taking place in line with standard international practice, as the reported harvesting of 5–6 L&B cannot produce any quality tea capable of competing on international markets;

III. consider options for reducing the cost of labour in tea production, through a careful analysis of the costs and benefits of partially mechanized harvesting for different types of tea. Producers in many countries successfully produce quality green tea using mechanical harvesting;

IV. ensure an adequate post-harvest handling of tea leaves by reducing the time between tea harvest and processing;

V. modernize processing methods and equipment, when necessary.

Consider the production of specialty teas (especially green tea). Although there is a thriving domestic market for black tea in Azerbaijan, the low yields and high labour costs (for hand plucking) make the primary input to production (green leaf) prohibitive, unless the focus is on the manufacture of specialty teas. In addition, the potential loss of rural labour in the future also demands a strategy that can work with mechanically harvested leaf which points towards green tea manufacture.

Support improved integration of the industry. There is evidence that government objectives to increase the productive tea area are manageable goals, albeit not necessarily considering the financial capabilities of smallholders. In order to support smallholder inclusion through a more equitable distribution of value added, further consideration should be given to state support in:

- promoting farmer-processor cooperation;
- tea farmers' participation in the revenues from tea markets linked to specific geographical location;
- organic and carbon emission certification schemes.

In particular, this could be centered around a field and factory cooperative framework that would see ownership and profit sharing from:

- scaling tea leaf production to processing capacities;
- central control of field practices and leaf quality;
- aggregating smallholder purchasing power for farm inputs including technical assistance;
- the ability for farmers to access credit, as part of a vertically integrated, higher-margin enterprise;
- considering limits on the state support provided to large vertically integrated companies in order to ensure wider socioeconomic inclusion.

Without such intervention, it is highly likely that the large production companies will eventually move further into production.

Strengthen standards, quality coordination and sample analysis. Protecting the reputation and ensuring the success of Azerbaijani teas both domestically and internationally would require continuous efforts to guarantee their quality and safety. The collection of regional samples for testing for chemical residues, pyrrolizidine alkaloids (PA) and pathogenic microbes is a strongly recommended first step to monitor key tea quality parameters and ensure the identification of adequate support policies and well-targeted government actions. The industry in both countries may also further benefit from increased understanding between farmers, processors and consumers on the main quality attributes and product grading. As the industry evolves, governments may consider developing national quality standards to protect the interests of farmers, producers and consumers by differentiating harvest timing and grading based on quality and sensory parameters.

Consider introducing rules of origin and geographical indications. For Azerbaijani teas to get the recognition they deserve – both domestically and in export markets – it is imperative that rules be enforced, which allow consumers to know the actual origin of the tea they are consuming. At present, a very significant share of tea marketed as Azerbaijani tea is, in fact, mostly constituted by imports. While both origins undoubtedly have some unique characteristics, this fact is preventing consumers from developing a knowledge of the local terroir and the specific organoleptic qualities of their teas. This is a critical requirement if Azerbaijani tea is to place itself as a national product in its own market. Key steps would include introducing

legislation differentiating value added tea products made from domestic grown tea vs other tea packaged in Azerbaijan and following EU regulations on control of pesticide residues, heavy metals and pathogenic organisms throughout the entire value chain: imports, domestic production and exports.

Anticipate food safety risks. Although compliance with stringent maximum residue limits (MRL) for agrochemicals in tea or the use of prohibited chemicals do not present an issue for tea producers in Azerbaijan, due to the current relatively low pest and disease pressure, food safety issues are on the agenda of regulators in key tea markets (especially the European Union). Considering that Azerbaijan is actively importing, blending, packaging and re-exporting tea, strict food safety controls would protect the reputation of the domestic tea industry and further increase the attractiveness/value in export markets in the long-term future. For example, options for GFSI certification and approval could be considered. This is not required for the internal market but will help for any export market considerations, including Russia where GFSI is taking hold.

Consider organic certification. If certification schemes and testing support the fact that Azerbaijani teas are chemical-free, then this would give a substantial marketing advantage that few origins can compete with; therefore, organic certification should be considered. Consumer demand for organic certified products is on the rise, especially within the specialty and green tea categories.

Support research. Considering the challenges posed by climate change, supporting research institutions would be critical, especially regarding (i) breeding new plant varieties adapted to local conditions and potential future risks; (ii) plant protection from pests and diseases; and (iii) knowledge transfer to producers. Adequate public support in these areas would ensure long-term industry sustainability.

Georgia and Azerbaijan in a comparative perspective

The present review of the tea sector of Azerbaijan was conducted in parallel to a similar study of the tea sector of Georgia under a joint FAO-EBRD project.[8] While the tea sectors of these two neighbouring countries share a number of similarities in terms of production practices and historical legacy, they also present certain key differences. Table E4 summarizes these similarities and differences based on the findings of the two sector reviews.

8 The aim of the EBRD-FAO project is to identify the country's potential to produce high quality and speciality teas, while sharing their findings from joint sector reviews that include options for developing the industry's sustainability.

Table E4

Comparative table of the tea sectors of Georgia and Azerbaijan

		GEORGIA	AZERBAIJAN
Key indicators			
Tea area (ha)	2018 planted/rehabilitated	1800	1130
	2018 productive	N/A	660
	Target	7000 rehabilitated	3000 total
Production (T)	Current (2018)	1700	900
	Current (2018)	N/A	8500
Yield (T/ha)	Current (2018)	≈1	0.8<1.4
	Target	N/A	2.8
Gross margins (USD/ha)	Baseline	420	1130
	Optimistic scenario	2250	3430
Alternative crops		Berries, hazelnuts, citrus fruit	Oranges, rice, tomatoes, subtropical fruit
Summary of similarities and differences			
Main similarities	· Historical legacy of tea production. · Currently producing almost exclusively black orthodox teas. · Good theoretical knowledge of the crop but widespread issues at the production level (especially in terms of harvesting practices and post-harvest care of leaf). · Unique tea organoleptic attributes but room for improvement in meeting international quality standards. · Strong potential for organic production. · Geographic proximity to traditional (CIS countries) and high-value (European Union) markets. · Currently limited economic significance of the tea sector. · Limited financial attractiveness of tea and presence of more attractive alternative crops. · Combined primary production with processing capacity can improve considerably the overall competitiveness of made tea production. · Current processing overcapacity and use of mostly outdated tea machinery. · High production cost in comparison to main tea producing countries (especially labour costs). · Issues with labelling practices and limited attention to rules of tea origin. · Presence of risks related to climate change that might require changes in agronomic practices. · Tea sector development mostly focused on the rehabilitation of old plantations. · Limited domestic tea consumption.		
Main differences		· Potential mostly in terms of exports. · Currently exports tea to a variety of markets. · Irrigation currently not required in most cases, but might become needed in the future due to climate change.	· Tea sector development mostly focused on developing new plantations. · Currently exports tea to a variety of markets. · Irrigation currently not required in most cases, but might become needed in the future due to climate change.

SOURCE: Authors.

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Chapter 1
Introduction

1.1 SECTOR OVERVIEW

The history of tea growing in Azerbaijan dates back to more than a century ago. Historical records show that tea production in the Lankaran district started at the end of 19th century as the area presents favourable climatic conditions for tea cultivation. Nonetheless, large-scale industrial tea production did not develop in Azerbaijan until the 1930s when the first tea processing plant was built in the Lankaran district. This was followed by the creation of large-scale tea plantations.

Throughout the Soviet era, the land allocated to tea by the government increased to satisfy growing domestic demand for the product and Azerbaijan became, together with Georgia, the main supplier of tea to the rest of the USSR. Production peaked in 1988 at 34.5 thousand tonnes of green leaves cultivated on 13.2 thousand hectares while the sector employed over 65 thousand people (including in 14 tea processing factories and 2 tea-packing factories). In the 1980s, Azerbaijan met about 8–10 percent of tea demand in the former USSR and up to 65–70 percent of local demand in Azerbaijan.

Due to the collapse of the Soviet Union in 1991, structural changes in the context of Azerbaijan's transition to a market economy led to a rapid and drastic decrease in tea production, which reached a record low of 300 tonnes of green tea leaves in 2008 – a 99 percent decrease from peak production years in the 1980s. Since 2010, however, tea area and yields have increased in parallel to government efforts to diversify the country's predominantly oil-based economy, reaching 900 tonnes on 1100 ha in 2018. Of these, 660 ha had reached full productivity levels, with the remainder expected to become fully productive 7 to 10 years from planting.

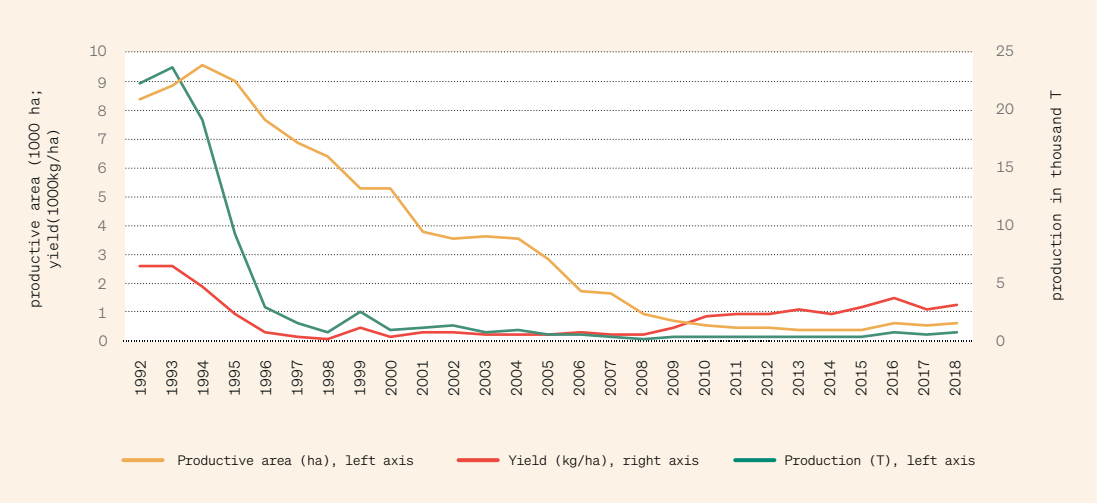

Figure 1.1
Azerbaijan – Key tea production indicators

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/.

1.2 THE ROLE OF TEA IN THE ECONOMY

Unlike Georgia, in Azerbaijan the decline of the tea industry that came with the fall of the Soviet Union led to the conversion of the tea areas to other crops, and most of the tea plantations were destroyed.

After the collapse of the Soviet Union in 1991, the newly independent Republic of Azerbaijan proceeded to the privatization of the former collective farms by allocating the land to rural families, in view of providing a base for the development of a commercially viable, market-driven farm sector. Subsequently, the land privatization program created some 870 000 neophyte family farms. Today the majority of agricultural producers are family holdings, representing 89 percent of total agricultural land (Figure 1.2)

During the 1990s, most of these new farmers had minimal agronomic knowledge, no access to advisory services or credit and had to face a collapsed centrally managed marketing system and deteriorating infrastructure. Most of the challenges that the Azerbaijani tea sector is facing today are related to this legacy and the structural problems that affect the country's agricultural sector as a whole.

At present, tea is far from being a crop of primary economic significance. Since 2010, agriculture, forestry and fishing has accounted for 5–5.7 percent of Azerbaijan's gross domestic product (GDP)[9] and, according to FAO estimates, primary tea production represented only 0.02 percent of the net value of total agricultural production in 2016, which is dominated by dairy (20 percent), meat (20 percent), cereals (15 percent) and various fruit and vegetables.

9 World Bank data.

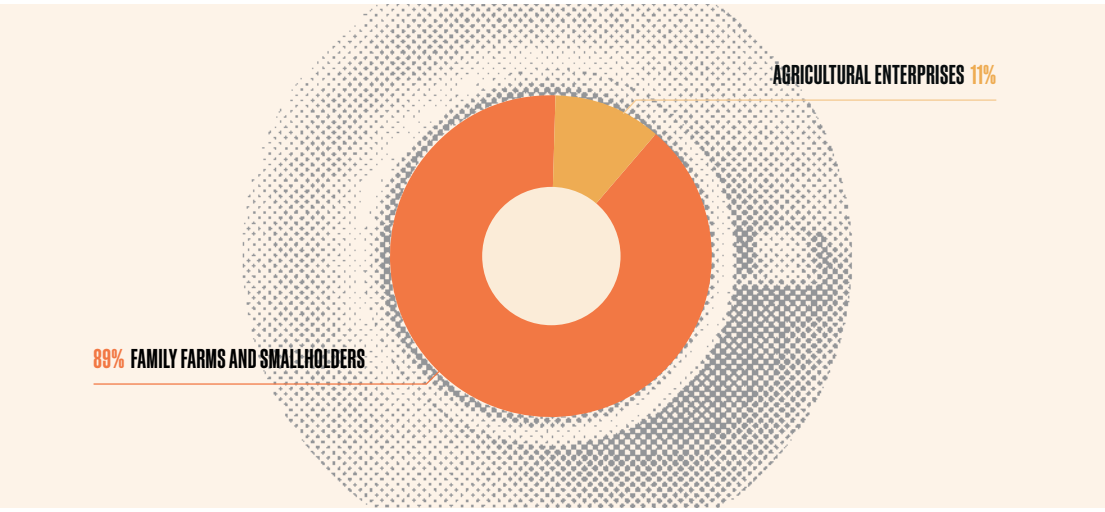

Figure 1.2
Holdings distribution by ownership

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2018. [online]. [Cited 12 May 2021]. www.stat.gov.az/.

According to FAO statistics, even during peak production times tea ranked behind a number of crops such as grapes, cotton and wheat in terms of its net value of production, in fact, in 1992 it ranked 10th with a net value of production of USD 24 million (compared to USD 347 million for grapes and USD 90 million for cotton).[10] FAO's most recent estimates (2016) suggest a net production value of about USD 1 million, which is well behind crops such as tomatoes, wheat, hazelnuts and other fruit and vegetables (Figure 1.3).

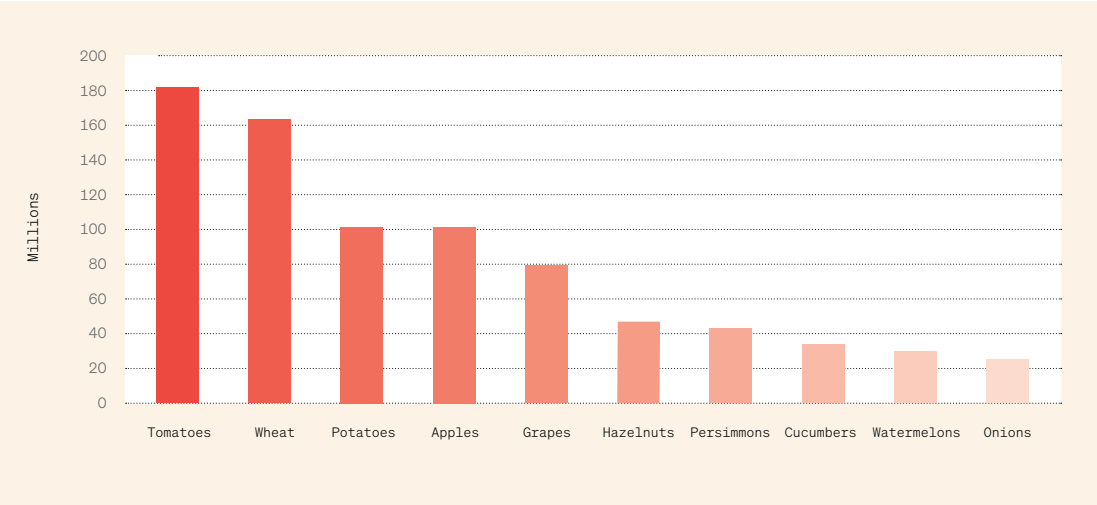

Figure 1.3
Top ten crops in terms of net annual value of production (2014–2016 average in 2004–2006 constant USD)

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/.

10 In 2004–2006 constant USD.

In terms of its financial productivity per unit of land (see Figure 1.3), the net value of production per hectare for tea albeit slightly higher than the average for the entire cropped area (USD 914/ha), is in fact lower than for most other crops grown in Azerbaijan. With a value per ha of USD 1371, tea is ranking behind crops such as sugar beet and potatoes and is very far behind raspberries and tomatoes, thus creating five to seven times more value per unit of land. This is an important factor to bear in mind not only from an economic perspective, but also in terms of the impact it can have on farmers choices regarding land use. This aspect is analysed in more detail in the section on financial profitability.

In terms of trade, Azerbaijan has been a net importer of tea since 2016, exporting USD 9.5 million worth of tea in 2019 while importing USD 55 million. The largest export markets for Azerbaijani tea are Russia and Turkey, but in both cases, tea imports from these countries are actually larger than Azerbaijan's exports to them.

Concerning tea's contribution to employment, while there are no statistics specific to the tea industry (either related to primary production or processing), the limited area and current factory output combined with the seasonality of production concentrated in five months suggest that the overall contribution to employment of the tea sector is limited. It may, however, have a more tangible role to play at the local level, in the Astara and Lankaran districts, by providing a few hundred additional seasonal jobs during the harvesting season in parallel to the many other crops grown there.

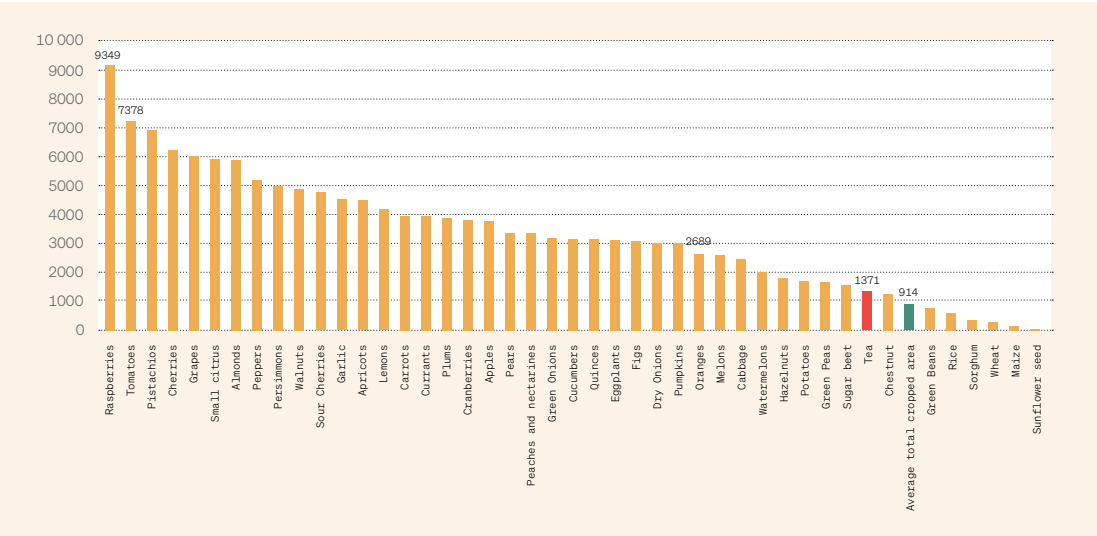

Figure 1.4
Average annual net value of production in 2014–2016, USD/ha, 2004–2006 constant prices

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/ and author's calculations.

1.3 STRUCTURE OF THE TEA VALUE CHAIN

The tea value chain in Azerbaijan can be broadly divided into four categories of actors:

1. farmers/primary producers
2. processors
3. retailers
4. consumers

Below, we outline the specific role that each category of actors plays in the value chain and its main characteristics, while Figure 1.5 summarizes the existing relationships between various actors.

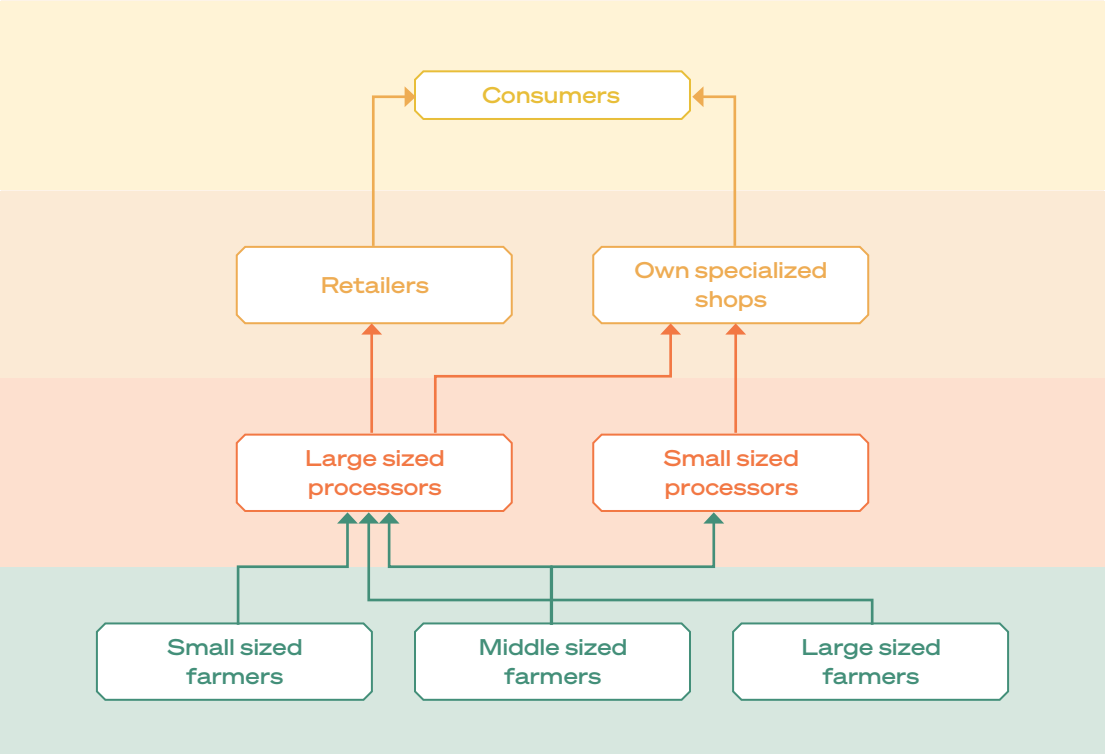

Figure 1.5
The Azerbaijani tea value chain

SOURCE: Authors.

1 **FARMERS.** Small-sized tea growers (under 1 ha) sell their products directly to processing plants based on standard contracts signed at the beginning of each year. According to the contract, farmers can also get a prepayment to compensate the share of their operation costs. On the other hand, medium-sized tea growers (mostly between 1 and 20 ha) either sell their raw product to processing plants or supply directly to the processing plant that they own. The large sized farmers (mostly over 20 ha) however, usually have their own processing plant. The harvested tea leaves have to be transported to processing plants in the same day of harvesting to avoid a deterioration in quality. Quality control is performed in tea factories, which allows for identifying the price of the collected tea. The quality control is usually limited to visual checks. However, field visits suggest that there might be limited quality differentiation at the factory level, with the share of tea considered as "best quality" by factories often reaching 90 percent or more.
Usually, tea growers pluck out all the leaves from a bush, in order to get high quantities without considering the quality of the leaves (usually no more than two or three leaves and a bud (L&B) should be picked to produce good quality tea). The fixed price paid by producer to farmer for the best quality tea is AZN 1.4 per kilogram, whereas for the second-best quality tea is AZN 1.0 per kilogram. It should also be noted that the 5 percent of the collected tea leaves are considered to be waste.

In parallel to this widespread system, some factories have decided to focus on high quality green tea leaves (namely, two L&B) and pay farmers AZN 3.0 per kilogram. While there are no middlemen between farmers and tea processing factories, tea factories are in control of pricing. In fact, tea prices are determined by a number of so-called "representative factories" and there is little clarity on what principles these prices are established. Most tea farmers use manual labour (especially women) to cultivate, fertilize, harvest and irrigate their land.

As reported, the two most significant problems faced by tea producers, particularly the smaller ones, are: (i) limited access to finance; and (ii) low prices set by processors.

In the end of 2017, with the support of the Ministry of Economy, the Tea Producers and Exporters Association was established which aims to facilitate the production of tea and to promote the "Made in Azerbaijan" brand internationally. Since 2020, however, the association appears to be largely inactive.

2 **PROCESSORS.** Processors are the most influential actors in the tea sector as they determine tea leaves prices. Tea processing is also the stage of the value chain where most of the profit from tea production is captured as our estimates show (Figure 1.6).

Drying, withering, rolling, fermenting, sorting, plucking, blending, and packaging are carried out by the processing factories. Although during the Soviet times more than 15 tea processing plants were operating, nowadays there are only 6–7 tea processing factories operating in the tea growing regions of Azerbaijan.

The largest tea processors in the market are Sun Tea Azerbaijan, Astara Tea, Yashilcay, and Zagatala Tea with their production capacity ranging from 1 to 4 thousand tonnes per year (relatively modest in size compared to large factories in India or Sri Lanka, the largest of which are capable of outputs of 50 tonnes and more per year). The new established plants such as Astaraçay

or Yashilcay use high-quality imported equipment (e.g. roller, roast machine, dryer) for the processing of tea leaves. Some of the factories use old machinery from Soviet times which do not comply with state-of-the art technology. Most tea factories currently in operation are too large for considering the current limited green tea leaf supply in Azerbaijan.

The produced final goods are either exported by processors/retailers or sold domestically via retailers. Around 2–3 processing factories collect tea from small- and medium-sized farmers whereas the rest use tea leaves from their own plantations. The majority of tea processing companies have a well-defined marketing strategy and produce their own brands, which usually correspond to three broad quality categories (high-, medium- and low-quality tea).

While it is impossible to assess the quality of the entire Azerbaijani tea production, field visits by tea quality experts to a representative medium-sized factory suggest that around 60 percent of the output could be considered low-quality tea (with an average retail price of AZN 9 or USD 5.3/kg). Another 25 percent could be considered medium-quality (average retail price of AZN 19 or USD 11/kg) and the remaining 15 percent of volumes could be considered high-quality (average retail price of AZN 150 or USD 90/kg). Of course, prices are only indicative and variations can be significant between different producers and brands.

3 **RETAILERS**. Retailers play an important role between processing factories and the final consumers. Retailers, including small shops, supermarkets, hypermarkets, restaurants, cafes, tea houses purchase tea from processing plants and sell it to final consumers. Some of the large-sized processors have own small retail outlets operating either in the tea production districts or in Baku.

4 **CONSUMERS.** Most consumers purchase their tea directly from retail shops. It is worth noting that consumers in Azerbaijan have a preference for domestic brands, but many are not aware of the fact that in spite of the higher price, a lot of teas branded as Azerbaijani are in fact mostly made of imported primary material. Final household consumers usually exhibit a preference for tea in small packages (50–100 grams). Unlike Georgia, the overwhelming share of tea consumption is taking place within households.

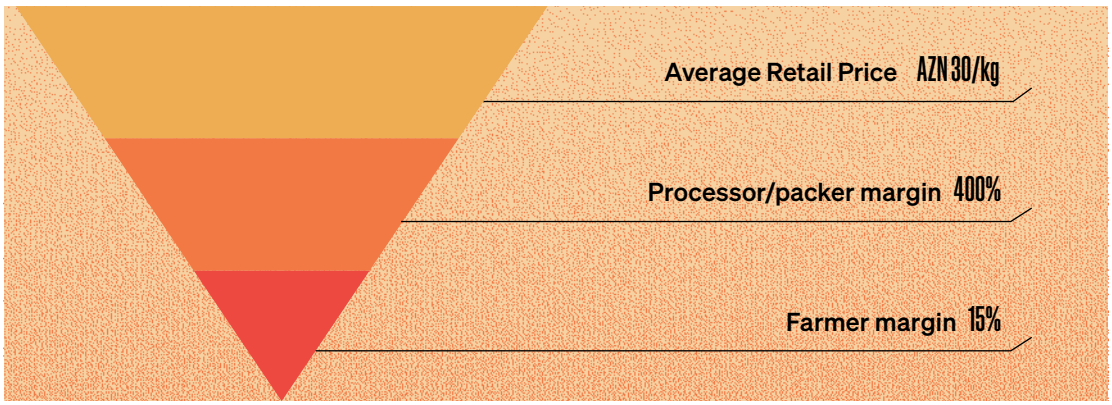

Figure 1.6
The imbalanced margin tree
SOURCE: Field data, 2019.

Chapter 2
The global market

2.1 KEY TRENDS

Global tea consumption and production has grown by almost 50 percent in just 10 years (2007–2017, Figure 2.1). However, this growth in consumption is predominantly due to the population growth and a per capita consumption increase in producing countries (China, India) and not in developed, high-value consumer markets. Of course, this is not to say that there is no increasing interest for higher-quality products in producing countries (see Box 2.1) but it remains much more limited than in markets such as the European Union, United States of America, or Canada.

Figure 2.1
Global tea production – volume in million tonnes (red) and net value of production in billion USD (orange)*

*Based on farm-gate prices. For further information on the methodology for calculating this figure, please see at http://fenixservices.fao.org/faostat/static/documents/QV/QV_e.pdf.

SOURCE: FAO. 2021. FAOSTAT. In: FAO. Rome. Cited June 2021. www.fao.org/faostat/en/

Per capita consumption levels in tea producing countries have increased over the last decade, albeit not significantly in most cases, except for in China and India where collectively their contribution has been substantial. From 2007 to 2016, per capita consumption declined in traditional tea consuming countries in Europe by 17 percent, while per capita consumption in Africa and Asia accelerated. Countries with massive increases in per capita consumption include China (128.6 percent), Turkey (25.9 percent), Indonesia (26.6 percent), Pakistan (35.8 percent), Malawi (565.2 percent), Rwanda (110.2 percent) and Libya (39.8 percent). Tea consumption in Libya, Morocco, Afghanistan and China, reached, 2.23 kg per person, 1.89 kg per person, 1.60 kg per person and 1.52 kg per person in 2016, respectively. The per capita average consumption for the United States of America, a coffee dominated country where tea is among the fastest growing beverage markets today, is on the rise at 0.40 kg per person in 2016, from 0.36 kg per person in 2007. Major declines have been registered in the Netherlands (-39.7 percent), Poland (-33.5 percent), United Kingdom of Great Britain and Northern Ireland (-23.0 percent), Ireland (-17.2 percent), France (-23.6 percent) and Russian Federation (-12.4 percent) (FAO, 2018).

Almost exclusively, market promotion in producing countries was based on the health benefits of tea consumption. Tea health benefits are leading the product's immersion into modern American culture and other emerging markets. Research efforts towards empirically supported evidences for health implications of tea consumption need to be strengthened further.

New growing markets are also building on product innovations and diversification into new segments of consumers. The bulk of the tea consumed in the United States of America today is iced tea at a consumption rate of 85 percent, but hot tea has been growing in popularity. Tea popularity is being driven by the Millennial (1981–1997) and Baby Boomer (1946–1964) generations. Ready-to-drink (RTD) tea consists of 48.6 percent of the market, with loose leaf (specialty) teas consisting of 17.5 percent of the market. These two market segments both experienced large growth rates, while other market segments (instant, bagged, pod) are experiencing stagnant levels of growth.

Other factors that could expand tea demand significantly over the next decade, but which have not been factored into the projections as data is not completely available, would be the innovative developments from non-traditional players in the retail and service sectors. The demand for tea has accelerated due to the ongoing retail revolution and the growing investment into tea education bringing new clientele to know more about tea, where it is sourced, the benefits of drinking tea, and how to properly brew it. Due to this, loose leaf tea has seen a new relevance in the United States of America. Promoting tea culture-based market development and immersion in the cultural identity of societies across the world should be one of the strategies to sustain and expand consumption.

On the supply side, the tea plant (*Camellia sinensis*) is highly sensitive to changes in growing conditions. Hence, commercial growing of tea is geographically limited to a few areas around the world, which are at risk under climate change. Therefore, an expected supply response to expanding demand may not be as easy as it has been in the past, given the possible constraints to the availability of suitable land.

Within retail, discrete groups of similar or related products are said to belong to a "category". However, within the tea category, there are well defined sub-categories that are gradually being elevated to their own category, including "specialty" (teas sold in counts of less under 40 servings per packet) and "health and wellness" ("specialty" implies products claiming to have a functional effect on the body).

These two "tea" sub categories are where the majority of growth is happening globally, with Europe and North American markets leading the way. However, "tea" in this context translates to "anything that can be infused with hot water, other than coffee, cocoa and a few grain derivatives" and within these markets *Camellia Sinensis* (or "real tea") is morphing from teabag cut material, to more leafy types (orthodox manufactured teas) and green teas. The largest increase is in the herbal sector, predominantly within that functional group of products in the health and wellness category.[11]

From an economic perspective, "health and wellness" is the most valued by consumers and at the same time, green tea also commands a premium over black tea (Figure 2.2)

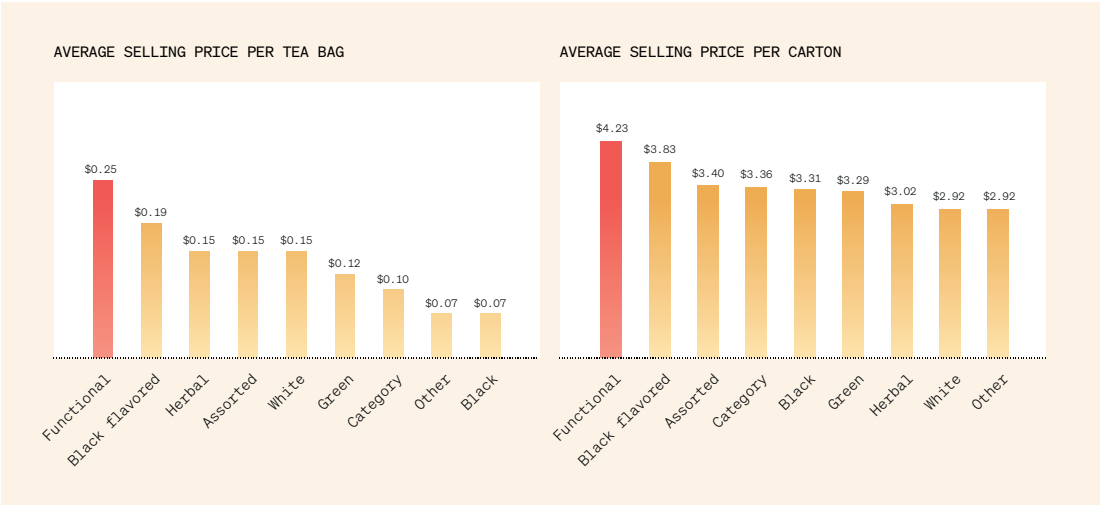

Figure 2.2
Nielsen 2018: Retail channel, tea category, segmentation and value

SOURCE: Nielsen, 2018. Market Track. Canada National All Channels – 52 weeks to October, 2018.

11 For further information, see: Bolton, D. 2019. Twinings Overtakes PG Tips as UK's Best-Selling Brand as Black Tea Consumption Slides. In: Worldtea News. https://www.worldteanews.com/Insights/twinings-overtakes-pg-tips-uks-best-selling-brand-black-tea-consumption-slides

BOX 2.1

MARKET DYNAMICS IN CHINA AND INDIA

China

China is starting to import different types of tea as the burgeoning middle class looks to escape tradition. As wealth increases, the appetite for better green tea increases and the Chinese population now consumes a much larger percentage of its own production than before.

Regarding RTD (bottle teas): the appetite is on the rise throughout Asia, requiring expansion of extraction facilities for concentrates and instant powders, the building blocks for production. These start with a raw material requirement, which consumes tea into a separate category, soft drinks.

Experimentation with different teas (driven by international brands) has led to an increased demand for black tea imports from India and Sri Lanka, predominantly.

India

Like China, a burgeoning middle class is experimenting outside the norms of traditional Chai and buying from different channels, specifically grocery where portion controlled, higher value formats are found.

Population growth and the difficulties for India to meet international standards of the maximum residue limit (MRL) and social welfare has resulted in the production industry focusing on internal demand and markets whose import criteria are less stringent.

2.2 MARKET STRUCTURE

Unlike many commodities, tea does not have a futures exchange and, apart from a small swap operation,[12] there are no formal hedging mechanisms other than long term physical contracts.

Most tea is sold through open outcry auctions (based in major production origins) on a weekly basis, and is very much a reflection of the supply and demand within the industry. As such, when these centres record lower prices, this usually indicates an oversupply situation, as has been the case for the last 4 years. Table 2.1 illustrates the individual average prices for the major auction centres of Sri Lanka (Colombo auction), India (Kolkata auction), Indonesia (Djakarta auction) and Kenya (Mombasa auction).

As production reactions to consumer trends (away from crush, tear, and curl (CTC) and towards Orthodox) generally lag, there is a risk of oversupply of mediocre qualities when the demand is increasingly looking for quality from the sector. As a result of this mismatch, since 2015 prices have dropped significantly (Table 2.1).

12 Plans to bring tea swap to India. In: *The Economic Times*. https://economictimes.indiatimes.com/markets/commodities/news/plans-to-bring-tea-swap-to-india/articleshow/68715213.cms

Table 2.1
Auction hammer prices, average quality tea bag grade black teas 2015–2019

Origin	Manufacture	2015 FOB US/Kg	2019 FOB US/Kg	% change
Sri L anka	Orthodox	2.88	2.71	(5.9)
India	CTC/Orthodox	2.50	2.28	(8.8)
Indonesia	Orthodox	1.98	1.56	(21.2)
Kenya	CTC*	2.89	1.85	(36.0)

*Kenya is fast accelerating orthodox leaf manufacture (1MMKg to date) but this is not represented in these figures.

SOURCE: Weekly auction prices FOB – 2022. https://vanrees.com/market-information/weekly-auction-prices/.

The oversupply of mediocre to low quality tea can be attributed to a number of factors including among others: (i) infilling (the process of increasing field densities by adding bushes to fields already planted with tea); (ii) replanting fields with high yielding clones; and (iii) the planting out of new areas of tea, particularly in Africa where in the last 5 years there have been three record crops and the market has been on a steady slide for the majority of offerings. Despite this, governments in East Africa in particular, see it as politically expedient to support smallholder growing of more tea. Furthermore, from an agronomic point of view it is almost certain that as yields increase quality will suffer, particularly during seasons with good rains and heavy flush conditions. Moreover, as prices slide farmers will react by choosing more volume as opposed to quality; for example, in Kenya this scenario is more evident than in other countries (Box 2.2).

The pressures on quality continue as increasing labour costs perpetuate the need to mechanize in almost all sectors, and until the further optimization of mechanical methods is achieved, the delivery of poorer quality leaf is to be expected in the future .

BOX 2.2

DETERIORATION OF QUALITY DRAGGING TEA PRICES DOWN IN KENYA

Excerpt from 'Daily Nation' (Kenya), 8 October 2019

"...the low quality of teas grown in the country is hurting the prices fetched by the commodity in the international markets, according to industry players.

Kenya's black tea is among those with the lowest asking price at the Mombasa Weekly Auction, according to the East African Tea Trade Association (EATTA), compared to Rwandan tea, which has among the highest markups. This has mainly been blamed on mass production by Kenyan farmers at the expense of quality.

"We are more focused on volumes than quality. Rwandans are very particular on quality. We need to focus more on quality than volumes," EATTA chairman Gideon Mugo said.

While a kilo of Rwandan tea can fetch an upward of USD 6.30 (Sh 654.19) at the auction, Kenyan tea is currently attracting an average USD 2.05 (Sh 212.87).

It had dropped to USD 1.76 (Sh 182.76) in July, the lowest in the last five years, compared to USD 2.26 (Sh234.68) per kilo in a similar period last year...."

According to tea sector experts, it is likely that within a decade there will be a two-tier industry: one providing industrial grade tea (for extraction for bottled teas, decaffeination and less discerning markets) and another high quality hand produced industry, providing relatively small quantities of expensive but exquisite teas. This is not a prediction but rather a forecast of the rate of change already underway. To illustrate these dynamics the Nielsen market track data in Table 2.2 illustrates the clear decline in regular black and increases in smaller packs and loose tea in developed markets (North America is used as a proxy).

This suggests two possible main strategies for tea producers globally in the mid to long-run: (i) either to be a low-cost provider of industrial tea; or (ii) to focus on producing quality in line with consumers' expectations.

Table 2.2
North American market winners and losers by category, 2017 to 2018

	Market share in percent	Percentage growth
Specialty	61.4	+3
Regular	34.2	-1
Loose	4.4	+19

SOURCE: Nielsen Market Track, Canada National All Channels – 52 weeks to October 13, 2018.

2.3 PROJECTIONS TO 2027

In the next section of this report, we examine FAO global tea market projections until 2027 as presented during the last Intergovernmental Group (IGG) on Tea session in May 2018. These medium-term projections were generated by the FAO World Tea Model, which is a partial equilibrium dynamic time series model.[13]

2.3.1 Production

To 2027, world black tea production is projected to increase by an annual growth rate of 2.2 percent to reach 4.42 million tonnes, reflecting major increases in China, Kenya and Sri Lanka (Figure 2.3). The expansion in China would be significant, as its output should approach that of Kenya, the largest black tea exporter, underpinned by strong growth in domestic demand for black teas such as *Pu'er.*

World green tea output would increase at an even faster rate of 7.5 percent annually to reach 3.65 million tonnes, again reflecting an expansion in China where green tea output is expected to more than double from 1.53 million tonnes in 2015–2017 to 3.31 million tonnes in 2027. The expansion is expected to result from increased productivity rather than an expansion in area, through replanting of higher yielding varieties and better agricultural practices. Viet Nam is also expected to substantially increase its production of green tea with an average annual growth rate of 6.8 percent despite ongoing quality issues which affect the price and exports earning of the country.

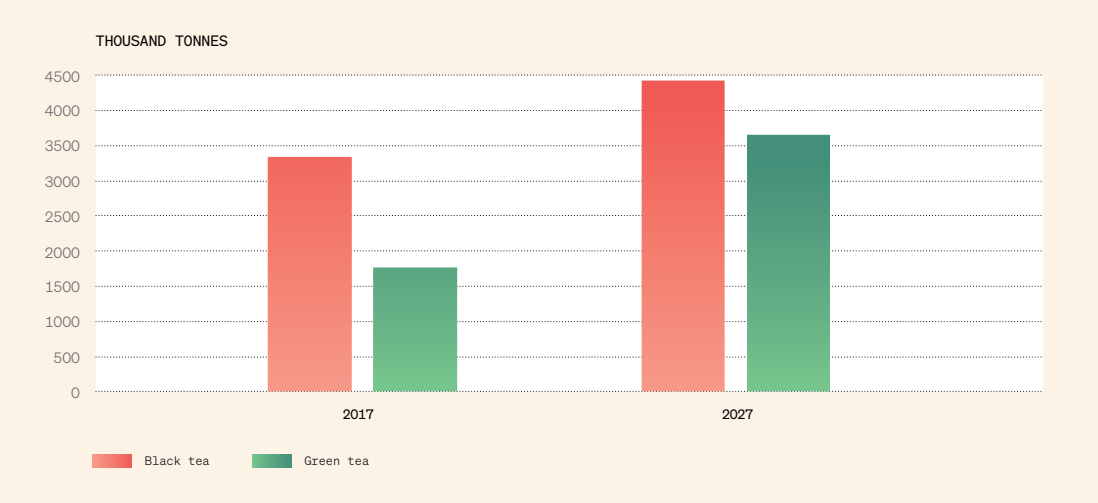

Figure 2.3
Actual and Projected Production: Black Tea and Green Tea

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/

13 Details of the model can be found in document CCP: TE 10/22 available at: www.fao.org/docrep/meeting/018/K7538E.pdf.

2.3.2 Consumption

As for mid-term projections of tea consumption: for non-tea producing countries net imports were used as a proxy for consumption; for producing countries actual domestic consumption was used. Data on green tea consumption were not complete and therefore, it was difficult to make any meaningful projections.

Black tea consumption is projected to grow at 2.5 percent annually to reach 4.17 million tonnes in 2027 (Figure 2.4), reflecting the strong growth in consumption in producing countries, which should more than offset projected declines in traditional tea importing countries. The largest expansion within the five top producing countries is expected in China where an annual growth of 5.9 percent is projected over the next 10 years. African countries are expected to show higher growth in their consumption with Rwanda leading (9 percent) followed by Uganda (5 percent), Kenya (4.4 percent), Libya (4.4 percent), Morocco (4.2 percent), and Malawi (4.2 percent). Moderate growth rates ranging between 2 and 3.5 percent are expected in other tea producing countries such as Bangladesh (3.1 percent), India (2.2 percent), Sri Lanka (3.3 percent), Tanzania (1.8 percent) and Viet Nam (2.0 percent). Lower consumption growth rates are expected in western countries with UK consumption projected to be negative as black tea struggles to maintain consumers' interest amid growing competition from other drinks including coffee. Only Germany (1.4 percent) and Poland (1.3 percent), followed by the Netherlands and France (both at 0.6 percent) are expected to have consumption growth rates higher than the region`s average of 0.2 percent.

Major factors contributing to the expansion in consumption in tea producing countries are the growth in per capita income, the increased awareness of the health benefits of tea consumption and the product diversification process attracting more customers in non-traditional segments including young people. The rapid growth of black tea consumption in China is due to the popularity of brick teas, such as *Pu'er*, which are heavily promoted for their health benefits.

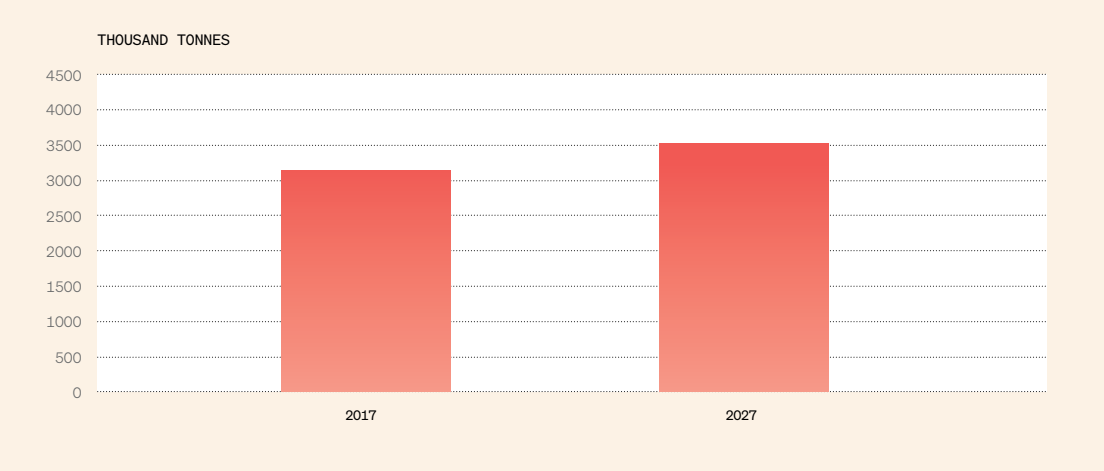

Figure 2.4
Actual and projected consumption: Black Tea

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

2.3.3 Exports

Black tea exports are projected to reach 1.66 million tonnes in 2027 (Figure 2.5), however the growth rates projected for Africa's tea-producing countries are weak (0.91 percent). Kenya maintains the lead with an average annual growth rate of 2.89 percent. Asia's exports growth rates are negative with an average decline of 0.7 percent, Viet Nam being the exception with a positive growth rate of 2.6 percent. Nonetheless, by 2027 export volumes for Asia are projected to reach 840 623 tonnes as compared to 711 816 tonnes for Africa. Major exporting countries are expected to remain the same, with Kenya being the largest exporter followed by India, Sri Lanka, Argentina, Viet Nam, Uganda, Tanzania, Rwanda, Malawi, and China.

World green tea exports are projected to grow by 5.0 percent annually to reach 605 455 tonnes by 2027 (Figure 6.5). China is expected to continue to dominate the export market, with an export volume of 416 350 tonnes, followed by Viet Nam at a distant second with 148 493 tonnes, Indonesia with 12 889 tonnes and Japan at 10 445 tonnes. Japan and Viet Nam are expected to be leading in terms of green tea exports growth rates, respectively at 9.3 and 9.0 percent, more than double compared to the growth rate expected for China (4 percent) for the next decade.

Figure 2.5
Actual and projected exports: Black Tea and Green Tea

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

2.3.4 Prices

In terms of price developments, the average FAO tea composite price remained firm over the last decade until 2014 when there was a 5.3 percent decline, mainly due to the weakening of CTC tea prices. Prices recovered in 2015, reflecting the recovery in CTC prices offsetting the decline in orthodox teas as imports from the Russian Federation and the Near East fell due to weakened economic growth rates associated with lower world oil prices.

In the medium term, the projections suggest that supply and demand of black tea will be in equilibrium in 2027 at a price of USD 3.0 per kg. Prices over the last decade increased from an annual average of USD 2.39 per kg in 2008 to USD 3.15 per kg in 2017, with monthly peaks of USD 3.18 per kg, USD 3.00 per kg and USD 3.26 per kg, reached in September 2009, December 2012 and May 2017, respectively. The projections indicate a decline in nominal terms of 1.4 percent, while in real terms, prices would actually decline by an annual average of 3.6 percent over the next decade (Figure 2.6).

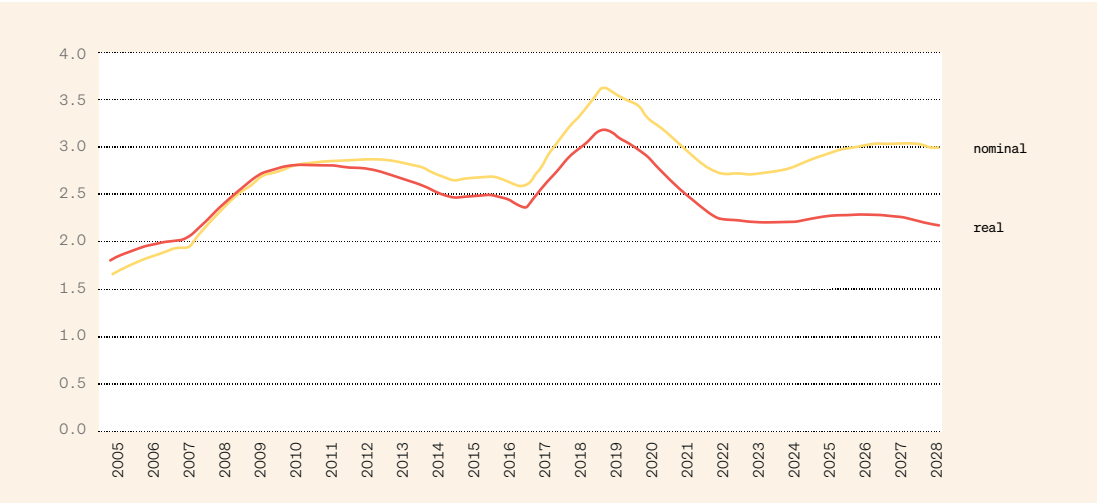

Figure 2.6
FAO Tea Prices (USD/Kg) baseline projections to 2027

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

Price developments in 2017 indicate the delicate balance between supply and demand, and the need to maintain this to achieve sustainability. For example, assuming that output increases a further 5 percent, the impact on prices would be quite dramatic: a nearly 40 percent decline over the next 10 years reaching USD 1.96 per kg in 2027 (Figure 2.7).

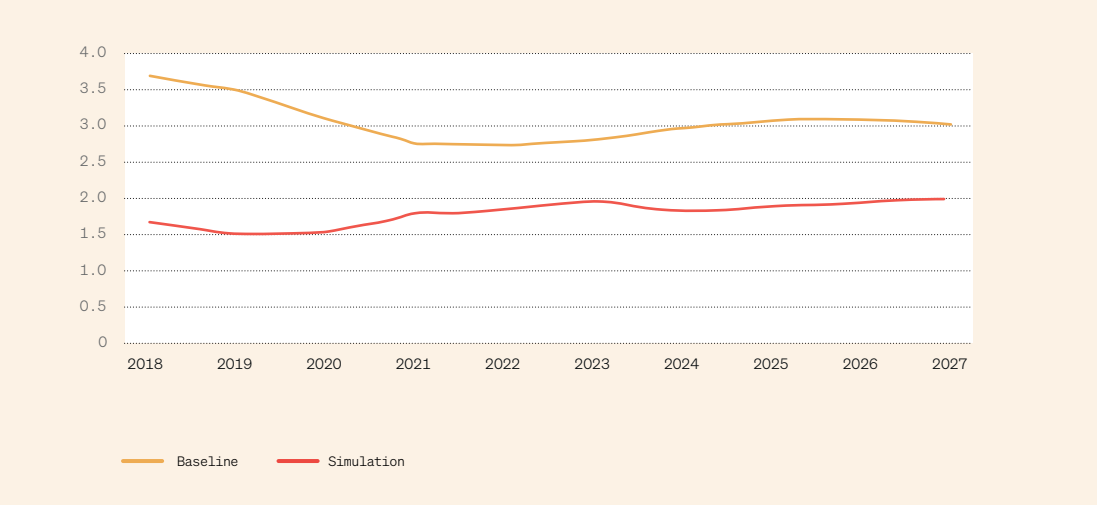

Figure 2.7
Effect on prices of a 5 percent production increase over the baseline

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

On the contrary, if the reactions to the rising per capita income in major emerging and developing countries and the growing awareness of tea health benefits were to stimulate consumption, for instance by 5 percent more than the baseline, then prices could on average be 8 percent higher for the decade, reaching USD 3.20 per kg in 2027 (Figure 2.8).

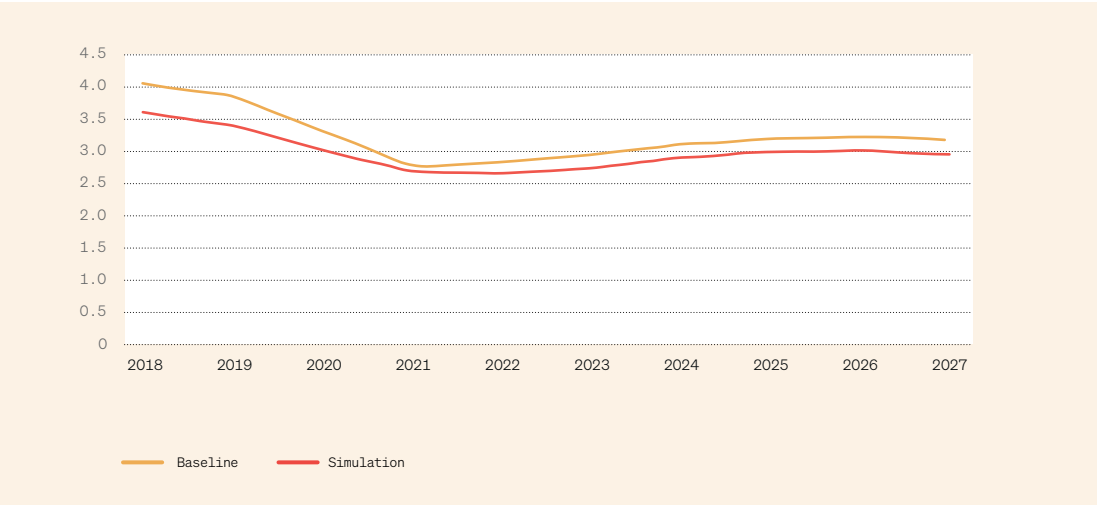

Figure 2.8
Effect on prices of a 5 percent consumption increase from the baseline

SOURCE: FAO, 2021. FAO Intergovernmental Group on Tea. Tea Secretariat. In FAO. Rome. Cited June 2021. https://www.fao.org/markets-and-trade/commodities/tea/en/.

In light of this, the IGG on Tea recommends that stakeholders be cautious *vis-à-vis* the world tea economy, and strongly advises they focus their efforts on stimulating demand and avoid overreacting to periodic price hikes.

For example, the IGG on Tea suggests there is scope for increasing per capita consumption in producing countries, as they are relatively low compared to traditional import markets. It considers imperative to understand and address the ongoing decline in consumption in the traditional market in Europe. Diversification into other segments of the market, such as organic and specialty teas, should be encouraged accordingly and the health and wellness benefits of tea consumption be used more extensively to promote consumption in both producing and importing countries. However, while targeting potential growth markets, recognition of and compliance with food safety and quality standards are deemed essential to address the gap between the growing volume of exports and the declining exports earnings for some countries.

2.4 THE POTENTIAL EFFECTS OF CLIMATE CHANGE

Climate change is already having a significant impact on certain tea producing origins. The monsoons in India are lasting longer, and humidity levels in the main growing region of Assam are higher leading to an increase in pests and diseases, which have been combated by the increased use of agrochemicals. In Kenya, desertification is the main issue with the Nandi hills and the Sotik highlands, where tea climates are becoming fragile, while Kericho's rainfall patterns are more erratic and landslides more common. Much focus has been spent here with the Ethical Tea Partnership, in conjunction with GIZ (Deutsche Gesellschaft fur Interrnationale zusammenarbeit GmbH) and IDH (The Sustainable Trade Initiative).[14]

In Sri Lanka there is less definition to the quality seasons now, the traditional Uva (Eastern) and Dimbulla (Western) quality periods, which are created by the Monsoon winds and are erratic at best, due to the increased rainfall and cloud cover that comes with these events. Consequently, there has been less seasonal year-to-year price variability for the last 5 years.

As a result, it is becoming harder for quality tea manufacture at scale and increasingly difficult to produce within import legislative parameters including MRLs and pyrrolizidine alkaloids (PA) (Specific to Europe) in major tea producing countries across the world.

While such developments might create opportunities for tea exports from Georgia, especially as the country is currently able to produce tea, in most cases it should be borne in mind that, without the application of pesticides, climate change also presents risks for the Caucasus region in terms of the introduction of new pests. These issues are explored in more detail in the chapter on Environmental Sustainability.

14 A study was produced to forecast impacts on production areas and set about positive programming to combat the effects. For further information see Ethical tea partnership. 2022. [online]. www.ethicalteapartnership.org/supporting-farmers-to-overcome-the-impacts-of-climate-change/

Chapter 3
Production

3.1 KEY PRODUCTION INDICATORS

With an area of just over 1000 ha, tea represents less than 1 percent of the total cropped area in Azerbaijan. Tea plantations are mostly concentrated in the southeast, along the Caspian coast, where the climate and soil conditions are favourable for tea growing. As of 2018, the Lankaran and Astara districts accounted for 85 percent of tea productive area and 93 percent of green leaf supply in Azerbaijan. Some very limited production (a few hectares) is also occurring in the Zagatala and Masalli districts.

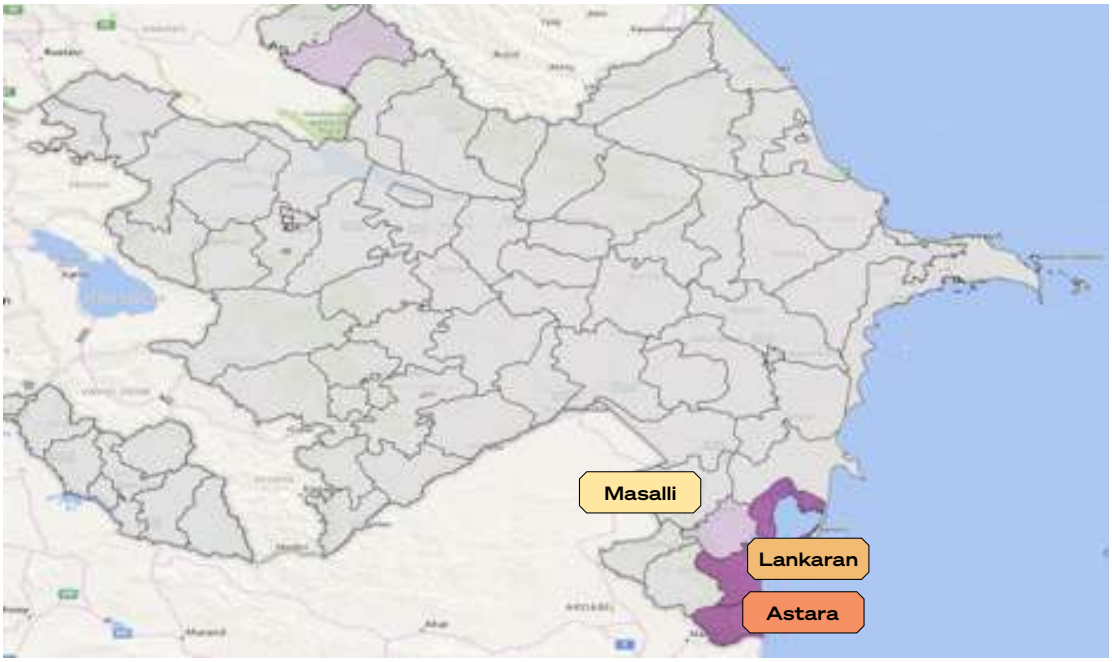

Figure 3.1
Tea producing regions in Azerbaijan

SOURCE: Author's own elaboration based on information from the State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

As indicated in Figure 3.2, the total area allocated to tea decreased until 2010 when it reached an all-time low of 587 hectares. However, since 2011, an upward trend has been observed with the area under tea cultivation reaching 1100 hectares in 2018.

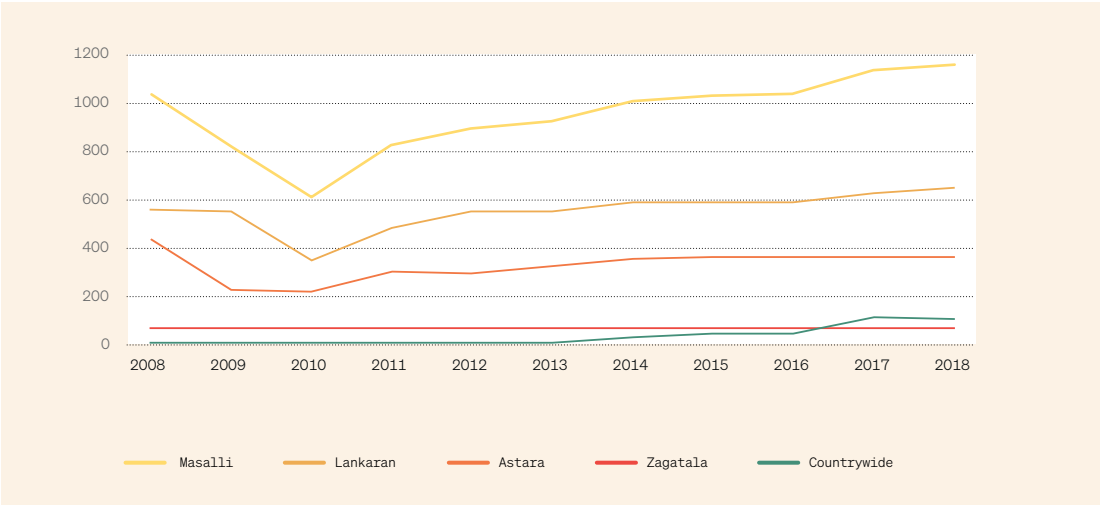

Figure 3.2
Tea planting areas between 2008–2018 (in hectare)

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. [online]. [Cited 12 May 2021]. www.stat.gov.az/

With a production of just about 870 tonnes in 2018, Azerbaijan ranked 39th out of 50 tea-producing countries globally.[15] Total green tea leaf production increased from 320 tonnes in 2008 to 1000 tonnes in 2016 (Figure 3.3), which can be attributed mainly to a growth in yields.

In contrast to the main tea producing countries of the world (Sri Lanka, India, Kenya, China), where tea leaves harvested almost all years round, tea leaves in Azerbaijan are harvested during May-September, in two or four separate rounds depending on weather conditions. Usually, up to 50 or 60 percent of green tea leaves are harvested in May whereas the rest is harvested throughout the summer until September.

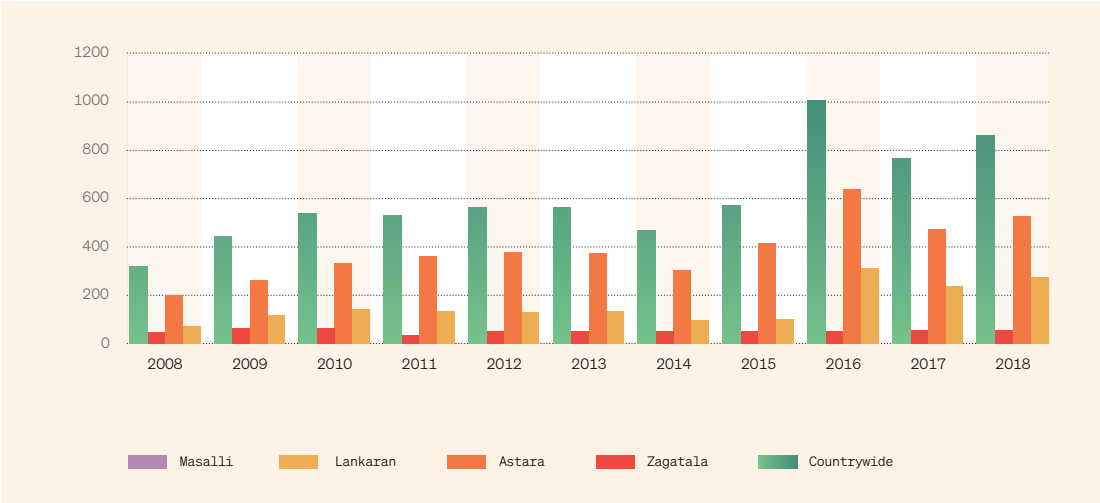

Figure 3.3
Production of green tea leaves between 2008–2018 (in tonnes)
SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. [online]. [Cited 12 May 2021]. www.stat.gov.az/.

Countrywide average productivity of tea leaves has been growing significantly over the last decade. In particular, although the productivity of tea leaves was about 320 kg per hectare in 2008, it increased more than three times and reached 1.1 tonne/ha in 2018 (Figure 3.4). Despite this increase the average productivity of tea in Azerbaijan is still well below the world average, which is about 2 tonnes/ha. Reasons for this lower productivity include inadequate fertiliser use, poor tea cultivation and harvesting techniques as well as a lack of water-saving and efficient irrigation equipment. In addition, in some areas, low productivity is highly related to the old age of bushes and changes in precipitation frequency and volumes.

15 Data from FAOSTAT.

Nevertheless, field visits showed that clones developed at the Institute for Tea and Tropical Crops are capable of yielding up to 5 tonnes/ha so planting out Azerbaijani clones, of course subject to achieving acceptable results in terms of final leaf quality, is a very promising avenue to consider in improving both the productivity and quality of Azerbaijani tea.

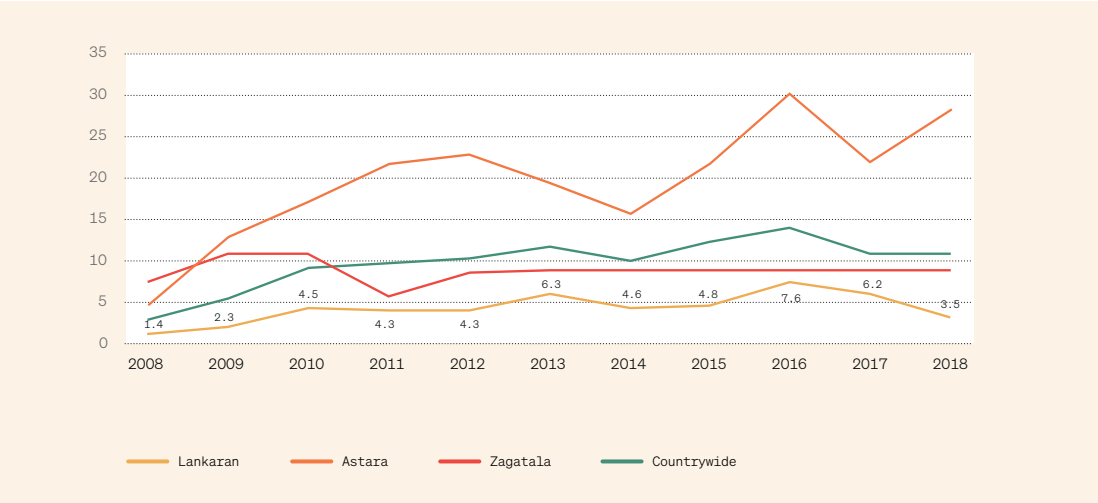

Figure 3.4
Productivity of tea plantations between 2008–2018 (centner per hectare)*

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. [online]. [Cited 12 May 2021]. www.stat.gov.az/.

*Centners are the standard unit of measurement for weighing agricultural production in Azerbaijan. One centner is equivalent to 100 kg or 0.1 tonne.

Tea productivity varies considerably across regions with an average yield of 2.8 tonnes/ha registered in the Astara district in 2018, compared to only 350 kg/ha in the Lankaran district, which is three times lower than the national average.

3.2 TYPOLOGY OF FARMS

According to the 2015 Agriculture Census conducted by the State Statistics Committee of the Republic of Azerbaijan (SSC), there were 232 tea producers in Azerbaijan, of which 13 are legal entities whereas the rest are physical persons. While there is no commonly accepted typology of small-, medium- and large-sized farmers or tea producers in Azerbaijan, throughout this study we refer to farms of 1 ha or less as small, to farms between 1 and 20 ha as medium and to farms larger than 20 ha as large. Nearly 80 percent of tea producers consist of farms of less than 1 hectare (small sized farmers) (Figure 3.5), 15.5 percent of tea farms range between 1 and 20 hectares (medium sized farmers) and only, 4.7 percent of tea farms can be categorized as large, with an area of more than 20 ha. Around 30 percent of small farms are currently not in use and are therefore not considered productive.

Based on 2018 SSC statistics, 58 percent of the productive area under tea has reached full productivity the remaining 42 percent are relatively recent plantations that are not yet fully productive. As there is no data collected on the productivity level by type of farm (either by size, type of ownership or legal status), it is difficult to estimate which type of tea producers are dominating the market in terms of total green leaf output.

Concerning the current expansion of tea area under the tea development programme, field visits show that the vast majority of new plantations are developed by existing large producers with industry sources stating that over half of the current area of 1100 ha belongs to large farms. The current level of support to new farms does not seem to be attractive enough to smallholders who, instead of investing in new plantations, often prefer to sell their land to the large producers and processors. This issue is explored in more detail in the following section.

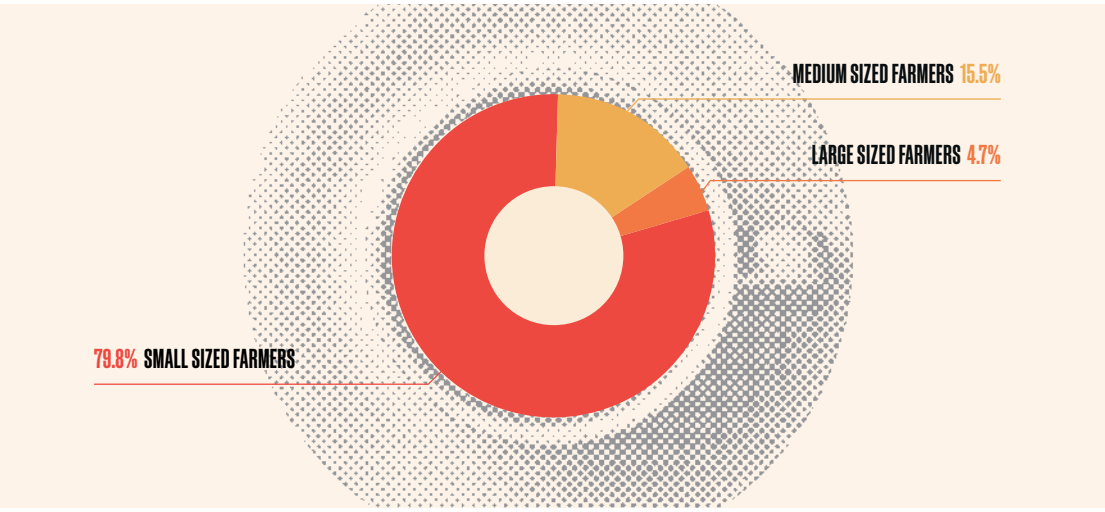

Figure 3.5
Size of tea growing farmers

SOURCE: Agricultural census. 2015. In: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. [online]. [Cited 12 May 2021]. www.stat.gov.az/.

3.3 AGROCLIMATIC CONDITIONS

Azerbaijan is situated at the northern edge of the subtropical zone (Figure 3.6). Its climatic diversity is the result of its particular geographical location and landscape and its proximity to the Caspian Sea. Humid subtropical weather prevails in the coastal area near the Caspian Sea, in the Lankaran lowlands in the southeast – home to the main tea-growing area of the country. Azerbaijan's tea plantations lie between the Caspian Sea and the Talysh Mountains, in a region where the subtropical climate and humidity make it an adequate, although not optimal, location for growing tea. About half of the region is mountainous, the other half consisting of lowlands and plains.

The estimated average yearly precipitation in Lankaran is 1146 mm.[16] In contrast to Georgia, seasonal differences are much more pronounced, and around 85 percent of rainfall occurs between September and March. Seasonal amplitudes are also much more significant (Figures 3.6 and 3.7). These factors make the tea growing conditions in the Astara-Lankaran area less optimal than in Georgian tea-producing areas, and in most cases, irrigation is required in the drier months.

The tea productive season in Azerbaijan runs from May until September, with the plant remaining dormant during the colder months. This puts Azerbaijan at a disadvantage compared to major tea producers such as India, Sri Lanka and Kenya[17] where tea can be harvested throughout the year as a result of the warmer climate. Similar to Georgia, Azerbaijan has three major harvests: i) first or spring flush in May; ii) second or summer flush in June-July; and iii) last flush in September, which can also be considered the pruning season, when raw material for making tea bricks is harvested. The May flush made teas command a premium price for their better quality.

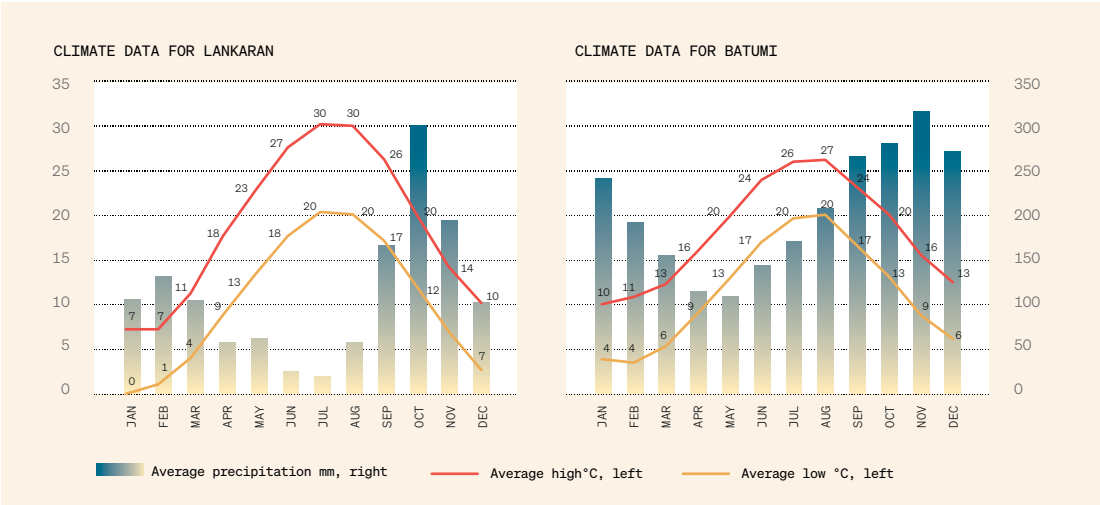

Figure 3.6 & 3.7
Climate data for Lankaran, Azerbaijan and Batumi, Georgia

SOURCE: World Meteorological Organization (WMO). Cited June 2021. https://public.wmo.int/en.

16 World Meteorological Organization (UN).
17 Other tea producers include Zimbabwe, Uganda, Malawi, Mozambique, Ethiopia, Rwanda, and Burundi.

Temperature The average maximum annual temperature in Lankaran is 18.5°C and the average annual minimum is 10.2°C. In January and February, the coldest months, average lows are around 0°C with negative temperatures a common occurrence. Despite the fact that tea is most suited to warmer climates, it is very flexible and can adapt to these colder conditions. Optimal conditions for growing tea require an average temperature during the growing season above 10°C and annual amplitudes of the average monthly temperature not exceeding 17–18°C. This amplitude is slightly higher in Lankaran at about 21.5°C.

Soil Tea plants can grow in soils with an acidity varying between pH 4.5 and 6.5[18] with optimal conditions between pH 4.5 and 5.5.[19] Above pH 5.5 and below pH 4.5 yields usually decline. Below 3.0 and above 7.0 tea dies. As a rule of thumb, and all things being equal, a yield at a soil pH of 5.0 will be 30 percent higher than the yield from a similar soil at pH of 6.0 (Melican, 2016) or pH 4.0. This means that with the same input costs, soil acidity will have a direct influence on yields and therefore on farmer's profit.

Precipitation According to the World Meteorological Organization, the estimated average yearly precipitation in Lankaran is 1146 mm (about half of what is observed in Georgian tea producing areas). In contrast to Georgia, seasonal differences in precipitation patterns are also much more pronounced, and around 85 percent of rainfall occurs between September and March. As seasonal temperature amplitudes are also much more significant (Figures 3.6 and 3.7), tea growing conditions in the Astara-Lankaran area less optimal than in major tea producing countries around the world, as well as the Georgian tea-producing areas. Moreover, in most cases irrigation is required in the drier months as precipitation does not provide enough water supply.

In addition, in the fields with weak and shallow soil, tea leaves will fall during periods of heat and drought (May to September), which decreases the annual yield. Adequate irrigation not only increases productivity, but it also improves quality, increasing the percentage of more tender and valuable leaves.

18 Interviews with local experts.
19 Tea Research Association, available at: www.tocklai.org/activities/tea-cultivation/

As Azerbaijan's agriculture is vulnerable to climate change which is expected to pose a risk for water resources in the near future, irrigation will be required in order to maintain yields. Depending on the soil structure and composition and the degree of field inclination, various irrigation methods could be used, including furrows, artificial rain and drip irrigation. During the field visits, it was acknowledged that the traditional tea growing area is losing its subtropical characteristics. More details on climate change risks and the environmental sustainability of Azerbaijan's tea sector are provided in the chapter on Environmental Sustainability.

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3.4 PRODUCTION AND PROCESSING PRACTICES

This section summarizes key observations on tea production and processing practices from field visits realized between 6 and 9 October 2019 in the Lankaran district, during which six producers of varying distinction were visited. These are:

- Astracay Tea Co (ATC)
- Lankaran Cay Tea Co (LTC)
- Gilan Holding
- Yashil Cay Tea Co (YTC)
- Kheyraddin Tea Co (KTC)
- Azercay Tea Co (AzTC)

With the exception of Yashil Cay, we visited the processing factories of each company and, as found in Georgia, there are working remnants of the Soviet tea industry (Factory No. 1, Factory No. 2), gleaming examples of manufacturing technology and hybrid models (for the same reasons as in Georgia).

All manufacturers had acceptable tea processing knowledge but, as is the case in Georgia, it was not applied adequately enough to optimize made tea output; furthermore, there are a number of factors that have a negative impact on reaching full productivity and quality potential. Our findings on the key production and processing aspects are summarized below.

Tea bush and field care. The programme for the development of the tea industry does not provide for the rehabilitation of old plantations but for the creation of new ones (in contrast to Georgia), therefore, no rehabilitated tea plantations were visited. However, visits to YashilCay's existing tea fields revealed that they have been well planted, and are relatively weed-free and irrigated. Their need for irrigation differs from that of Georgia (although it might become necessary in Georgia due to climate change) and must enable flush development during the low rains and humidity period of the summer months. However, this creates a risk of "fogging" which may result in accelerating the introduction of pests as it gives them a medium through which to travel.

Green leaf intake. As mentioned in the previous section, primary tea production (green leaf production) in Azerbaijan, unlike in major tea producing regions around the world, is highly seasonal and takes place only between May and September with the following distribution:

Table 3.1
Estimated distribution of annual green tea leaves output by month

Month	May	June	July	August	September
% of annual crop	50	10	10	15	15

SOURCE: estimates based on interviews with local producers.

As a result of this uneven distribution, a great deal more labour is required in May than in the subsequent months, and there is a risk that the quality of the harvest will be compromised because of the lack of elasticity in the labour pool. A focus on maximizing the opportunity of first harvest material that has the best quality potential is key in improving the competitiveness of Azerbaijani tea farms.

Field visits suggest that the processor control over smallholder leaf was no greater than in Georgia, but most processors (with the curious exception of Lankaran Cay) had some tea under their own control. Astaraçay, with 450Ha, was the largest, followed by Yashil Cay that used their own leaf from well-tended plantations. Azercay has now planted 100 ha under the tea sector development programme and these should reach full productivity by 2024.

Quality of leaf. There was little leaf to be seen, as processing was finished at the time of visits (October), but where there was leaf, it appeared to be of a reasonable standard.

Time to factory. Leaf collection by factories seemed to be a little less tardy than in Georgia, mainly due to the dense geography of the Lankaran region (Astracay reported standard delivery times of less than 4 hours in most cases).

Care of green leaf. There is an endemic issue with respect to the understanding of the green leaf shelf life and this is reflected in the laissez-faire attitude towards leaf handling at both the producer and processor levels. Lankaran Cay stated that in summer they leave the leaf for up to 36 hours before it enters the factory and begins processing. At this point the leaf is never going to create anything of substance in terms of quality.

Plucking rounds. Similar to Georgia, there are significant issues related to the plucking timing and process. The green leaf collection area is not dovetailed to the tea factory capacity, so there is no regular supply to meet manufacturing needs in terms of the volumes required for efficient processing. In fact, factories tell smallholders when they will open the factories and accept leaf to ensure they receive enough leaf to efficiently process. This is problematic as, by waiting, the percentage of poor leaf goes up, impacting the quality of processed (made) tea.

Farm gate price. In Lankaran, the applied farm-gate prices obtained from Astaraçay and Yashil Cay were as follows: AZN 0.8–1.0/AZNKg for 4–6 leaves and AZN 1.4/Kg for 2–3 leaves.

Processing equipment. Apart from Kheyraddin Tea, all factories had made some investment in new machinery, mainly from China or Taiwan. Astaraçay has a completely new factory with a brand-new processing line, from Taiwan. It is a state-of-the art facility, however, the factory was inadvertently sold a green tea shaping drum which was never used, the intention perhaps being to illustrate a mechanical approach to tea production. This factory was the only one that would pass the international GFSI standards and is in the process of FSSC 22000 implementation (see Box 3.1).

Overall, however, visits showed that, as is the case with Georgia, the focus for success in Azerbaijan lies in the rehabilitation of or the planting out of new tea rather than in the factories.

BOX 3.1

THE GLOBAL FOOD SAFETY INITIATIVE AND THE FOOD SAFETY SYSTEM CERTIFICATION 22000 (FSSC22000)

The GFSI is a business-driven initiative for the development of food safety management systems to ensure food facilities are processing safe food for consumers.

The GFSI is a private organization that oversees and approves different auditing platforms as meeting their criteria. This criterion provides a standard of recognition to specific food safety audits.

In practice, this means that a food processor or manufacturer who can point to their GFSI certification can show their customers and potential customers that their plant is operating with a structured, comprehensive, and effective food safety program.

The Foundation Food Safety System Certification 22000 (FSSC 22000), on the other hand, offers a complete certification Scheme for the auditing and certification of Food Safety Management Systems (FSMS) or FSMS and Quality Management Systems.

The FSSC 22000 Scheme sets out the requirements for certification bodies, accreditation bodies, and training organizations to develop and implement its operations for auditing and certification of food safety management systems of organizations within the entire food supply chain. The issued certificate confirms that the organization's food safety management system is in conformance with the scheme requirements and that the organization can maintain compliance with these requirements.

Through meeting the GFSI Benchmarking Requirements, the FSSC 22000 Scheme has been given full GFSI recognition since 2010. GFSI recognition demonstrates that the Scheme meets certain standards, leading to international food industry acceptance.


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Chapter 4
Tea profitability and competitiveness

Crop financial profitability per unit of land is a key factor influencing land use decisions by farmers. A number of crop budgets and activity models (production scenarios) were prepared to illustrate the impact of different investments and the financial viability of tea production and processing. These crop budgets present detailed annual expenses, including inputs, land preparation and labour and estimate average yields[20] in different production conditions. Additional models were prepared to illustrate investment in the production of alternative crops, with rice and oranges – two crops suited to the Astara and Lankaran districts – chosen as examples. Activity models of tea processing enterprises were prepared to illustrate the linkages along the commodity chain, and to show the impact and financial viability of a potential investment in tea processing. The following models were prepared:

Model 1	New tea plantation oriented towards high volumes harvest
Model 2	New tea plantation oriented towards higher quality – lower volumes harvest
Model 3	Green leaves production for green tea using mechanization
Model 4	Processing from own plantation
Model 5	New oranges plantation

20 The agronomic parameters (yields, assumptions on the yield increase) for the models are based on the information collected by the team's agronomist during the field visits in the country.

4.1 ASSUMPTIONS

The following assumptions were used for our models:

Prices. Financial input and output prices (farm-gate prices) for the tea crop and alternative crop models were collected during the field missions conducted in June and October 2019. For non-traded items, the entire production, at least in the areas of project intervention, is destined for local markets hence the market price is a fair measure of the willingness to pay and is a good estimate of the opportunity cost. Therefore, financial prices are found to be reliable approximations of their economic value for most of the items used in the analysis.

In the case of traded goods such as tea, parity price at the farm gate was calculated. The crop produced being an export crop, it has to be processed before it can be exported. Therefore, the value to the economy is determined by the FOB price, but in order to calculate the reference price at farm gate from the export price, transport costs from the factory to the port, port handling costs, export tax, processing costs and transport from the farm to the factory were included. A 1:4.3 conversion rate was used to convert green tea leaves to made tea.

The financial price for labour varies between AZN 10–25 per day. The high labour intensity of tea production (due to manual harvesting of green leaves) coupled with a seasonal migration of the labour force to urban areas means that the labour force is in scarce supply and has an opportunity cost equal/or greater than its market price.

Yields. The volume of green tea leaves collected ("plucked") is closely linked to the age of the plantation, plantation density, climate and humidity parameters and farm-specific decisions on the number of leaves to be collected per plucking round. Most commonly, plucking operations involve the selection of two young leaves and the central, unopened bud (2L&B) for best quality. Lower quality harvest would include up to 5–6 leaves and bud (5-6L&B). Today most Azeri tea farmers use a selective plucking method, when the first harvest in May consists of 2–3L&B (low quantity, high quality leaves) and is done by hand and is then followed by a mechanized harvest of larger volumes, up to 5–6L&B, in the following months. 2-3L&B quality represents a smaller share of the total harvest, however it fetches a higher farm gate price. 2–3L&B is sold to a processing unit at 1.4 AZN/kg while low quality leaves and branches (5–6L&B) are sold at 0.8–1 AZN/kg (1 AZN/kg is used in our models). Harvesting 5–6L&B deteriorates the quality of the final product dramatically and would be considered unsustainable in most major producing countries. Therefore, our improved models (Models 2 and 3) assume harvesting of up to 2–3L&B at any given time.

Currently, green leaves yields (as observed during the field visit in June 2019) are rather low, which could be explained by different factors such as the quality of planting material used[21], suitability of soil (pH), pruning techniques, harvesting method, fertilization as well as air humidity and moisture content in green leaves. The current green tea leaves yields in fully productive plantations fluctuate between 3 tonnes and 5 tonnes per hectare. In the case of a new tea plantation, after land management works and plantation conducted in Year 1, the first very small yield (about 5 percent of the yield of a fully productive plantation) is expected in Year 3. While full productivity in Azerbaijan can be expected to be achieved anywhere between Years 7 and 11, depending on specific conditions, our models make a conservative assumption of it being reached in Year 10.

4.2 INVESTMENT COSTS

4.2.1 New plantation investment cost

The investment cost for a new plantation is composed of the following elements: land purchase cost (if required), plants (seedlings) and planting cost, land preparation (and related equipment) and irrigation equipment (Figure 4.1).

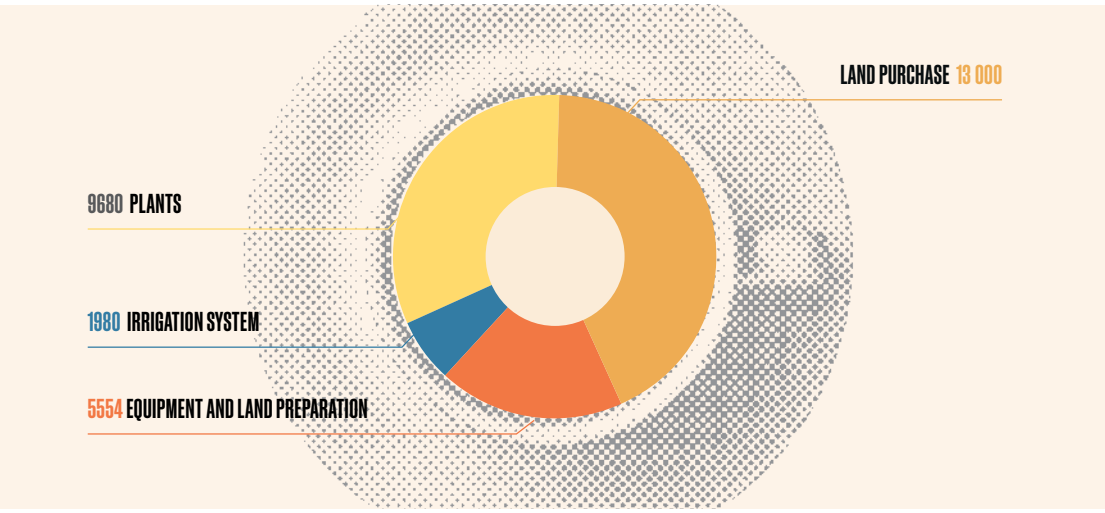

Figure 4.1
Summary of investment costs in a new plantation (in AZN)

SOURCE: Field data, 2019.

21 Seedlings remain a traditional source of planting material, with genetic variability of plants that leads to unpredictable differences in yields and in returns. Vegetative propagation (VP) method where selection is made on the basis of yield capacity is considered to be able to give two to three times greater yields than those obtained from the traditional seedling sources with certain varieties at the Tropical Crops Institute capable of producing yields of up to 5 tonnes/ha.

If the new plantation is to be established on purchased land, then the cost of land is the largest investment cost. It is then followed by the cost of seedlings. The current practice is to use seedlings from seeds (and not clones from vegetative propagation). In Azerbaijan, the density of plants is about 22 000 plants/ha, which is even higher than in Georgia (where it is about 15 000). This density contributes to the rapid creation of a "plucking table" – compensating for the climatic conditions that are less favorable for a fast vegetative growth than main tea producing countries – that would be easy to harvest and that would be large enough to create shadow and prevent weeds.

In the past, both seedlings and irrigation equipment used to be subsidized: 40 percent of the irrigation equipment investment costs and 10 percent of the cost of seedlings. This has now been replaced by the AZN 700/ha subsidy for the first seven years from planting. The total investment cost (as paid by farmers) for establishing a new plantation is thus estimated at around AZN 33 000/ha (about USD 9500/ha) if land is to be purchased, and about AZN 20 000 (USD 11 700) if the plantation is established on existing land.

4.2.2 Investment in mechanical harvesting

This could primarily be considered for plantations producing leaves destined for green tea, but in combination with manual harvesting of the top-quality leaves (for instance, during the first flush in May) could also represent an option to discuss for black tea production. Traditionally, black tea is both the most widely produced and consumed type of tea in Azerbaijan. However, field visits suggest that the country has a comparative advantage for green tea production (especially for the European market) given the potential to control the chemical content of its green tea production and therefore, be compliant with European standards. Furthermore, green tea cultivation allows for the use of mechanized harvesting without this affecting the quality of final product.

In most tea-producing countries, tea leaves are harvested by hand. Few exceptions are countries with high labour costs (Japan, Argentina). It takes a considerable amount of practice and concentration to maintain precision throughout selective hand plucking for any length of time. Nevertheless, skilled pluckers are able to work steadily for an eight-hour shift and pick around 15 kg of shoots. Any lapse in attention will add coarse leaf to the basket and result in a lower price for the resulting tea. Furthermore, any decline in labour efficiency (due to climate or working conditions) would significantly increase total production costs and decrease profit margins. Currently, in Azerbaijan one- and two-people mechanical harvesters are used by farmers for selective plucking. The so-called first flush or spring green leaf is harvested by hand for a valuable "May tea." The summer and autumn leaf are harvested as follows: first, a limited volume by hand and then the bulk of it by machine for lower value teas. There are three major harvests per season. Given the use of the follow up mechanical harvests as pruning, farmers need to wait weeks before the new flesh is grown. This type of harvesting technique has a negative impact on the quality as well as on the total yield volumes.

Common options worldwide for mechanical harvest are: sheer plucking (usually two-persons) or by tractor (either a riding machine or a self-rail-tracking machine which is capable of further reducing labour costs). If such methods are adopted, however, adequate advisory services should be put in place, in addition to a well-informed choice of machinery considering local conditions, to ensure that mechanical harvesting produces the desired results. Two-man mechanical harvesters should not cut deep, should provide decent leaf and not debilitate the bush from continual cropping. Table 4.1 below provides an overview of the daily plucking capacity depending on the method used.

Table 4.1

Plucking capacity per harvesting method

Method	Harvest per day and per person
Hand plucking method	
Hand plucking	10–15kg
Hand sheer plucking	100–200kg
Mechanical plucking method	
Portable machine for two persons	700–1000kg
Riding machine	4000–5000kg
Self-rail-tracking machine	2000–3000kg

SOURCE: World Green Tea Association. 2019. Cultivation of Japanese Tea - Manual Mission's estimations. www.o-cha.net/english/cup/pdf/14.pdf.

Given the limited size of smallholder plots in Azerbaijan, field visits suggest that the appropriate choice of a machine would be a two-man gasoline engine machine. In our models, we assumed the acquisition of a new Kawasaki (New Century Corp) DL-4CP-100 machine with a cost of USD 800. From the harvesting standpoint, such a two-man machine can manage 1500 kg of leaf per day and one machine should be sufficient, by far, for a small farm of up to a few hectares.

4.2.3 Processing equipment investment cost

Tea processing is the process through which green tea leaves are transformed into made tea: either black, green or any other type. Overall, the processing methods used for black and green tea are very similar. Regarding black tea, the five key steps in terms of processing are: withering, rolling, fermentation, drying, sorting. For green tea, there are four key steps: withering, rolling, steaming and drying.

The whole set of production machines would include different machinery for each step of the process, for tea output from several kilograms to several tonnes. However, tea processing for all tea types (including both black and green) consists of a very similar set of methods with minor variations. The same equipment could therefore be used for both black and green tea making, with an additional steaming machine required for green tea to stop fermentation (where the oxidation process actually gives us the black tea). Investment costs could vary according to the capacity of processing, country of origin of the equipment, as well as to some technical decisions such as open-air withering (no additional costs) or withering with a machine (suitable for processing the volumes larger than 10 tonnes of green leaf). Based on field visits, our estimate of the cost of a whole set of processing equipment (produced in China), is around USD 84 000 with a processing capacity of about 12.5 tonnes made tea per season, which would be adequate considering production in Azerbaijan.

4.3 DESCRIPTION OF TEA PRODUCTION MODELS

Below is a short description of each of the models produced by our financial analysis.

Model 1

New tea plantation establishment with use of current agronomic practices (BAU)

Tea is a perennial crop with a production life of over 50 years, therefore the quality of the planting material in a new plantation is of critical importance because of its effect on the total returns of a tea garden throughout its useful life (in the investment costs section the influence of planting material on investment costs was discussed).

Initial financial investment includes purchasing (or raising) plants, land purchase and preparation and seedlings' planting. As tea is a perennial plant, it takes time to come to maturity. Under ideal conditions the first plucking may be attempted at 4 years while full maturity takes about 5 years. Thus, there is no income for 4 years (1 year in nursery and 3 years in the field) and at least 6 years for full income under ideal growing conditions.

In Azerbaijan, however, given certain local climatic disadvantages (cold winters, long dry seasons) the first significant plucking can be expected at 4 years in the field while maturity may require between 7 and 10 years, with yields potentially increasing up to Year 11. Up-front capital costs and initial delays in income give tea growing a long time to break even. On the other hand, tea is a long-lived plant. Some gardens in Darjeeling have large areas of bushes that were planted in the 1850s and are still being grown commercially. The typical working life for modern tea plants around the world is 50–80 years for seedling tea and about 40 years for vegetatively propagated/clonal tea, which however has the potential to grow faster.

It has been observed that seedling tea plants are more resistant to pest attacks as compared to clonal tea plants.[22] However, plucking cycles are longer in the case of seedling plants, and the productivity is lower (FAO-AGRIS, 2009) at 4000 kg/ha, as against 6000 kg/ha in clonal plants.

Every month, the first harvest is done by hand to collect 2–3L&B and is followed by a massive mechanical harvest of low-quality leaves. The plant then requires several weeks to recover and grow new leaves. This is why using this method makes it possible to harvest once a month only, at best. This type of harvesting method leads to predominantly poor-quality leaves that will amount to about 80 percent of the harvest (up to 5–6L&B), and 2L&B representing the remaining 20 percent of the harvest. As per experts' opinion, Model 1 reflects a very bleak reality. If the objective is to produce any tea of acceptable quality, the harvesting — mechanized or manual — of up to 5–6L&B is deeply unsustainable.

Model 2

New tea plantation establishment with adoption of improved agronomic practices

This model relies on optimal fertilization and frequent hand plucking to maintain the plant in a vegetative phase, with every bush plucked at intervals of 5–10 days, depending on whether the leaf is "flushing" or not (this would allow for higher yields and higher quality of leaves to be collected). The assumptions and data (investment costs, building up of yields) used are the same as in the Model 1. As regards field visits, there is the possibility to apply this type of harvesting techniques to nearly the entire plantation, and it has therefore been assumed that 100 percent of the tea estate will be collecting 2–3L&B, in line with standard international practice.

Model 3

Green tea leaves production with improved agronomic practices and using mechanization

Taking into consideration the cultivation costs alone, we can see that tea cultivation is one of the most demanding agricultural activities, and among the operations involved in tea production, plucking is one of the most labour-intensive. For newcomers, learning to pluck is very time-consuming, which therefore increases production costs. When plucking is performed skilfully it is still a slow procedure, as speeding up invariably reduces green leaf quality, thus reducing the selling price. Most of the world tea production currently relies on the low cost of labour.

In key tea-producing countries, where hand pluckers' daily wage rate is around USD 1 to USD 1.50, harvesting costs for machine harvested green leaf are less than half of this. Given the higher labour cost in Azerbaijan, (pluckers' daily wage rate being around US 17), the saving would be even higher. Thus, cost-cutting measures in this part of the operation would significantly reduce the total cost of production. In this regard, mechanization is one of the effective alternatives that can in theory reduce these costs as it has in other

22 Tea plants can be grown using both seeds and cuttings (it is called vegetative propagation). The seed pods are produced the season following the tree blooming and take as long as two months to germinate. Once germinated, it takes another two to three years for the tea tree to be ready for harvest. Plants raised from cuttings are called clonal seedlings. They are true to type and contain same qualities as that of their mother plants.

agricultural areas. The limitation to this approach is the effect of mechanization on product quality, but wherever it can be introduced to save labour without loss in quality of either green leaf raw material or final tea product, it should be implemented.

When using harvesting machinery, green leaf cannot be produced with high enough quality to manufacture high end/specialty black tea. However, in the case of green tea it is possible to mechanically harvest green tea leaves without affecting the quality of the final product (made green tea).

The difference with black tea is that to make good quality black tea it is important to harvest the tea leaves in a manner that delivers them complete/whole to the factory for processing. This is because during the black tea process, the enzyme is activated only at the end of the process (about 18 hours after harvesting) so that any cut or bruise on the leaf at the beginning of the process will create oxidation at this point, instead of doing it in a controlled fashion, at rolling stage. This will result in uneven and potentially over oxidized material creating softer, less bright and flavourful cups.

In green processing the deactivation step takes place immediately upon entering the factory and therefore, using harvesting techniques that cut the leaf is not nearly as damaging to the eventual quality in the finished product (provided the lead time to factory is not too long). For these reasons, mechanical harvesting has traditionally been restricted to green tea manufacturing origins (Japan, China) and when used for black tea, it has resulted in poor liquoring teas (Russia, Georgia, Turkey, Argentina).

However, as labour becomes increasingly expensive, in all origins there has been an acceleration in the research into producing better, more selective harvesters. These are now used more and more in black tea origins but still do not make good quality orthodox (leaf) manufacture possible.

In fact, unless exceptionally special black teas are created, in league with a strong generic marketing campaign and support, the cost of production for making black tea from hand harvesting is going to be too high. In this case, alternate methods of harvesting would have to be brought in, which will require a complete change to manufactured tea outputs: green, tea for extracts.

Model 4 and 4 bis.

Processing

Field visits proved that it is rather difficult to collect any information on the cost of processing of tea, since most companies are reluctant to share information on the subject. Thanks to a continuous effort and after two field missions, some benchmark information has been collected for the present study.

Both models represent a small tea processing enterprise; data used in the model is based on the information collected from several operating businesses that were interviewed during the field visit. The financial analysis of the processing activity is meant to illustrate the linkage along the commodity chain (primary agriculture and processing) as well as the financial profitability of such a small investment project from the point of view of the owner/entrepreneur. In both cases, input quantities are assumed to be from a green leaf base of 10 ha, with an average yield of 6 tonnes/ha, amounting to a total of 60 tonnes of green leaf per year. The made tea output is 14 tonnes per year (at a made tea to leaf conversion rate of 1:4.3).

Final production is split between three main qualities: premium (25 percent), high (50 percent) and low (25 percent). Made tea is sold in bulk at AZN 25 (premium), AZN 18 (high) and at AZN 8 (low). For methodological purpose, and for an easier comparison with international prices, the model stops at bulk production, therefore there are no costs associated with packaging.
The difference between the two models is:

Model 4

Model 4 assumes tea production from the factory's own land, whereby primary production costs are factored into the financial model (about AZN 0.37/kg). Primary production in this case is assumed to be at the improved efficiency level as per Model 2.

Model 4 bis.

Model 4 bis, on the other hand, is linked to a raw material base of about 10 ha and it is assumed that this is a standalone processing activity, therefore the unit is purchasing the necessary raw material at market prices (AZN 1.4/kg).

Cost of primary tea production under different scenarios and alternative crops

Figure 4.2 presents the production cost per hectare of producing tea leaves under different scenarios as well as oranges (models 1–3 and 5). Costs are presented in terms of key categories: irrigation, labour, machinery, planting material, fertilizer. Straight line depreciation was applied to material and seedlings; for simplicity, the salvage values have been assumed to be zero. The cost of land was not depreciated, as it was considered to have an infinite useful life. At AZN 13 000 per hectare, land is the single most important element if included in the investment cost structure. For purpose of better presentation, and in order to be able to assess the shares of the other types of Investment costs, land cost is not presented in the diagram.

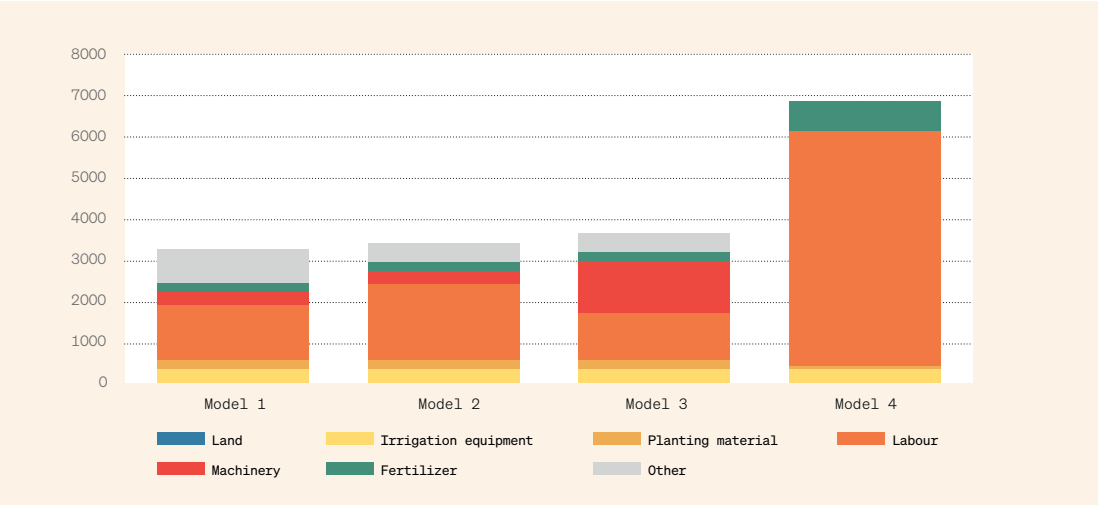

Figure 4.2
Summary of the cost of production per Model (AZN)

SOURCE: primary production models (field data, 2019).

The diagram shows that at the primary production level the largest cost is for labour, and considering the structure of labour costs, plucking represents the highest share. Additional observations can be made for each of the tea production models:

Model 1 The BAU scenario presents rather low costs of production for the simple reason that only about 20 percent of leaves are harvested by hand, 80 percent being harvested using scissors or sheer plucking machinery. However, if massively applied, mechanized harvest drastically slows the growth process and makes regular and frequent plucking impossible, which therefore has a negative impact on yields and quality.

Model 2 In this model, where frequent hand plucking (or frequent and precise mechanical harvest whenever appropriate) increases, the overall labour costs.

Model 3 This model shows the impact of the introduction of both improved agronomic practices and mechanical harvesting on production costs. It is important to mention in order for mechanical harvesting not to affect yields and the quality of leaves, better machinery will be required, as well as fundamental changes in plantation management and attitude to mechanical harvest. Mechanized harvest is not meant to replace hand plucking on a like-for-like basis — to successfully replace hand labour it will require systemic changes in the tea field.

4.4 COST OF PROCESSING

The costs of processing are split between the following elements: equipment, labour, energy costs and raw material:

- **Labour** refers to hired employees participating in the production process (from leaves reception to bulk made tea). These costs exclude labour associated with bagging/packaging, as well as sales and administration.
- **Equipment** (capital machinery) includes allowances for depreciation of factory equipment and supplies for repairs and maintenance. Factory depreciation is calculated based on estimates of the full replacement cost of capital and an average depreciation period of 20 years.
- **Energy**. Tea processing is energy intensive. Withering, drying, grading and packing tea requires about 65.5 kWh energy/kg of made tea.
- **Raw material** is assumed to either be produced on the owned estate (M4) or purchased from the neighboring estates (M4 bis). Processors usually bear the transportation costs of green leaves from the field to the factory, which has also been factored into the models. Currently, the cost of good quality green leaves (2L&B) bought from the farmers is about AZN 1.4/kg. A shift towards a higher quality production of specialty tea aiming for high end and niche markets will require a higher quality input and therefore a quality premium for 2L&B. However, what this premium might be is difficult to estimate at this stage.

4.5 GROSS MARGINS UNDER DIFFERENT PRODUCTION SCENARIOS

Table 4.2 presents the gross margins, net present value (NPV) and Financial Internal Rate of Return estimated under different scenarios for tea and oranges in USD per hectare. On the primary production side, at full development all models present positive returns, however these annual returns are low if compared to a monthly salary of an agricultural worker (about AZN 300/month equivalent to about USD 2100 per year). Given the relatively small tea plots of each household, as well as the very high intensity and elevated cost of labour, primary tea production alone cannot fully provide for the households' livelihood. If tea production is not vertically integrated or does not use mechanical harvesting, its return to labour would not make it a financially appealing crop for farmers. This was also confirmed by interviews with the farmers during field visits, as income from other crops or off-farm income appeared to dominate the total income of the households, while earnings from tea cultivation were considered an additional source of income.

Table 4.2
Financial benefits summary of tea under different production scenarios and oranges

		Margin		NPV		
Model	Description	AZN/ha	USD/ha	AZN	USD	FIRR
M1	Tea: new plantation, business as usual	965	569	-18 112	-10 686	-7%
M2	Tea: new plantation, focus on quality	6455	3808	3721	2196	7%
M3	Tea: new plantation, mechanization to produce green tea	7153	4220	1979	1167	6%
M4	Tea processing plant: own leaf	284 751	168 003	1 156 582	682 383	19%
M4bis	Tea processing plant: purchased leaf	222 601	131 335	1 896 154	1 118 731	81%
M5	Oranges: new plantation	9410	5552	-10 582	-6243	4%

SOURCE: Field data and authors' calculations, 2019.

Model 4 and 4 bis.

Models 4 and 4 bis on processing illustrate the impact of shifting to higher value-added activities within the chain, and vertical integration on improvement of a net profitability of a tea activity. Tea production could not attain higher net returns in the non-value-added market, given high costs of production at the primary (field) level. The FIRR on the incremental net benefits over 20 years is 19 percent, which is well above the opportunity cost of capital. The processing model is sensitive to input prices, particularly to prices of fresh leaves. It is important to note that – as the M4bis shows – this type of investment could have a strong backward linkage to the potential creation of a market for increased production of smallholders' fresh tea leaves. This solution would therefore serve primary producers/tea farmers who, while seeking the new market opportunity, would invest in the growth of their farms. The smallholder farmers would collectively need to supply the amount of 40 tonnes of leaves per year, equivalent to about AZN 56 000 (USD 33 000). It is expected that this will create additional employment for the equivalent of three full-time person at the enterprise level.

4.6 DISCUSSION OF ALTERNATIVES TO TEA

Within the Lankaran district, the main crops competing with tea at the moment are rice and citrus fruit, although other crops, especially tropical and subtropical fruit, are also grown in the area. Order No. 3227 of the President of the Republic of Azerbaijan dated September 12, 2017 *On Additional Measures Related to the Development of Citrus, Tea and Paddy Production in the Republic of Azerbaijan* has created additional support for the development of these crops. For the purpose of the study, rice and oranges were considered as representative of the main alternatives to tea in the area. As shown by our financial analysis, both crops represent financially viable alternatives to tea and, in most cases, allow local farmers to achieve higher gross margins from their production.

4.6.1 Rice

Although we did not examine rice in our financial analysis, since it is an annual crop and an assessment of its financial benefits per unit of land would entail an analysis of a full crop rotation cycle, it might be a financially viable alternative to tea in combination with other profitable annual crops (for example, certain annual fruit and vegetables), considering its higher gross margins.

The Lankaran and Aran economic regions are the key rice producing regions of Azerbaijan. Rice farming is currently being developed in Girdani, Veravul, Urga, Siyavar, Hirkan, Kholmili, Shikhakaran, Mamusta, Separadi and other villages of the Lankaran district.

In recent years, rice growing in Azerbaijan has been developing at a rapid pace. If a few years ago rice production was considered a labour-intensive industry and farmers experienced great difficulties in sowing and harvesting as a result, today it is fully mechanized. New technologies used in rice growing make this industry more attractive and profitable, as significant investments in harvesting and sowing equipment are being made in the regions where rice production is expanding.

Rice is a moisture-loving plant. Consequently, there should not be a deficit in water in the areas where it is grown. In the regions of Azerbaijan there are many wetlands that can be used for the development of this industry, especially the southern regions such as Lankaran and Astara. This industry has always been a traditional economic activity for the southern regions of Azerbaijan with a number of local varieties developed in the 1960s. However, rice cultivation in Azerbaijan saw a decline between 2000 and 2015 (Figure 4.3).

As a result of the 2018 State Program for the Development of Rice Growing in Azerbaijan for 2018–2025, farmers have again begun to engage in this crop and the total area stood at around 4000 ha in 2018.

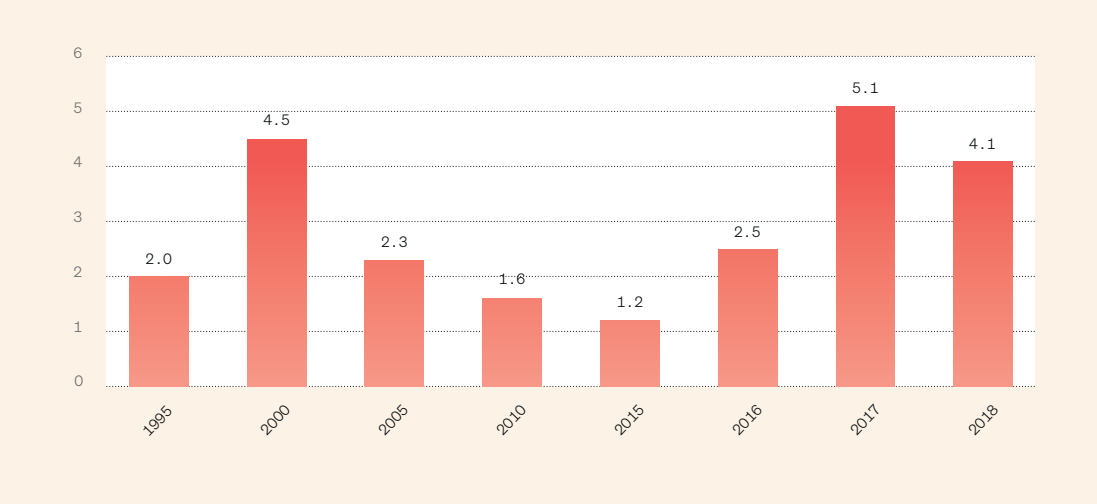

Figure 4.3
Sown area of rice, all categories of farms (thsd. hectare)

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

In spite of the ongoing mechanization, labour still constitutes the most significant cost in rice production (Figure 4.4). Nevertheless, as per Figure 4.6, the gross margin for this crop is currently estimated to be higher than that of tea (Model 1) at around AZN 4300/ha equivalent to approximately USD 2500/ha. Therefore, rice represents a viable alternative for farmers in the Lankaran district, especially considering that it is an annual crop that does not require an initial investment as significant as the one in a tea plantation, thus potentially more attractive to smallholders.

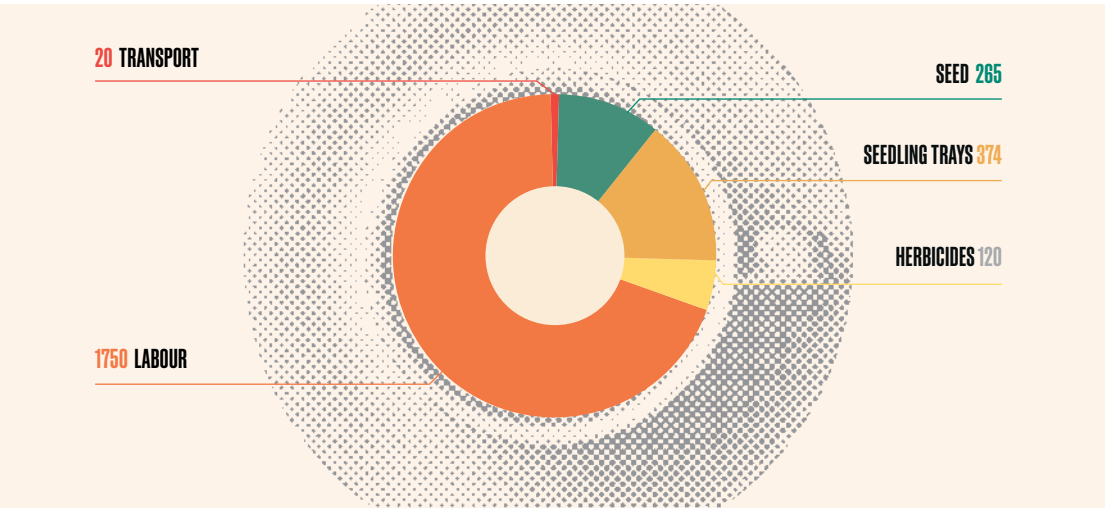

Figure 4.4
Cost of production breakdown for rice (in USD/ha)

SOURCE: Interviews with producers, 2019.

4.6.2 Oranges

Thanks to its warm climate, Azerbaijan has a long tradition of producing citrus fruit. Citrus production is by far mainly dominated by mandarins (1600 ha in 2018), and during Soviet times Azerbaijan, together with Georgia, was a major supplier of this fruit to the rest of the Soviet Union. Although the production of oranges is more limited, it has grown about five times since 2008, reaching 250 ha in 2018 for a total production of around 3000 tonnes. In fact, orange production was encouraged by Order No. 3227 of the President of the Republic of Azerbaijan, *On Additional Measures Related to the Development of Citrus, Tea and Paddy Production in the Republic of Azerbaijan* on 12 September, 2017. The order is in line with the new subsidy system, whereby orange groves along with other intensive orchards are given the highest possible state support with a subsidy of AZN 800 (USD 470) per hectare for the first 4 years after planting (this is followed by a subsidy of AZN 240 or USD 140/ha thereafter).

In recent years, rice growing in Azerbaijan has been developing at a rapid pace. If a few years ago rice production was considered a labour-intensive industry and farmers experienced great difficulties in sowing and harvesting as a result, today it is fully mechanized. New technologies used in rice growing make this industry more attractive and profitable, as significant investments in harvesting and sowing equipment are being made in the regions where rice production is expanding.

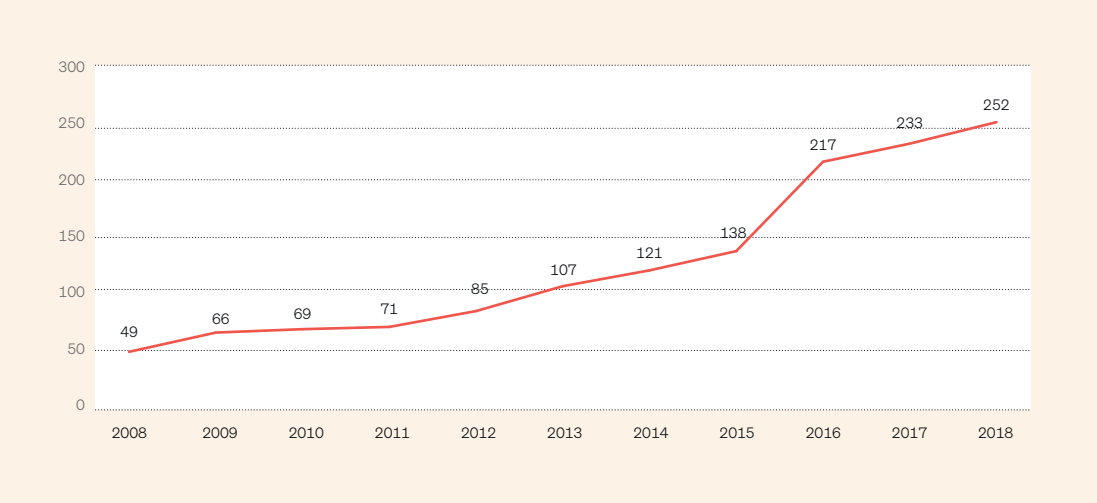

Figure 4.5
Sown area of oranges, all categories of farms (thsd. hectare)

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

Although exports remain limited, sporadic and are almost exclusively for neighbouring Russia (93 tonnes in 2016, 55 tonnes in 2017), they have managed to fetch prices of about USD 1/kg, which is about 40 percent higher than the average price of Russian orange imports (USD 0.61–0.68/kg in 2015–2019), thus demonstrating the potential of Azerbaijani oranges as a niche product on the Russian market.

Production is currently concentrated along the southern Caspian coast in areas where tea is also grown. Although the area is currently limited to about 250 ha of oranges, which are a relatively profitable crop (about USD 5500/ha, and more profitable than tea even under the improved production scenarios), they might represent an attractive crop for local farmers. As can be seen from Figure 4.6, labour costs are the most significant at the production level (about three-fourths of total production costs), as orange harvesting, similarly to other citrus crops, is very labour-intensive. In fact, our model assumes around 280 days per hectare per season for harvesting, which is about five times higher than for tea. In this respect, oranges and other citrus crops might not only represent an interesting alternative to tea in terms of farm-level profitability, but also in terms of their potential for contributing to rural employment in the regions where agro-climatic conditions allow for their cultivation. However, further research will be required to assess this and other aspects related to the social and environmental sustainability of citrus production in the Lankaran and Astara districts, *vis-à-vis* tea as both crops gain significance.

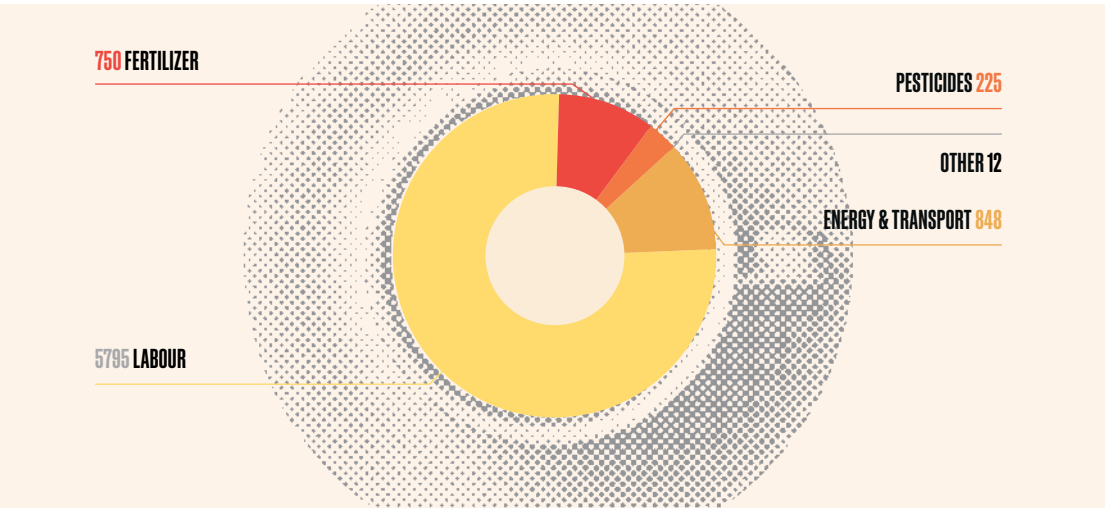

Figure 4.6
Cost of production breakdown for oranges

SOURCE: Interviews with producers, 2019.

4.7 THE INTERNATIONAL COMPETITIVENESS OF AZERBAIJANI TEA

In this sub-section we look at three major factors that determine the overall competitiveness of Azerbaijani tea in international markets.

First, we carried out a sensory analysis of several different teas produced in Azerbaijan and assessed them against the main international competing tea types of different origins, based on an internationally accepted quality score scale that combines a number of sensory quality aspects.

Second, based on the obtained sensory quality scores and several other price determinants, such as leaf score and the presence of defects, we estimated the international price of Azerbaijani teas against other comparable tea types of foreign origin.

Third, we compared tea production costs in Azerbaijan and in major tea producing countries as an indicator of international competitiveness. As elicited in the section on tea financial profitability, tea production costs in Azerbaijan are high, mainly due to high labour costs, and the comparative analysis confirms this.

Our findings suggest that parallel improvements in both quality and production efficiency, in terms of production costs, are required in order for Azerbaijani tea to be internationally competitive. This confirms our previous recommendation for the need to reassess harvesting practices through a careful cost-benefit analysis of manual vs mechanized harvesting or a combination of the two, on a case-by-case basis, with a view to improve the quality of made tea, reduce production costs and make improvements on the sector's competitiveness.

4.7.1 Azerbaijani tea sensory quality in a comparative perspective

The majority of competition in terms of imports in both Azerbaijan and Georgia, comes mostly from Sri Lanka and to a lesser extent from India. While there are also significant amounts imported from India and Turkey, these are in fact mostly trans-ship points for Sri Lankan and Indian tea. Both origins offer products that are invariably cheaper than both the Georgian and Azerbaijan domestic production.

These major tea producing origins have been producing orthodox (leaf) teas for over 100 years and have had a storied and successful tea supply relationship with the former Soviet Union and now its successor states, which is difficult to unravel.

The quality of their manufacture is different and generally better compared to that of Georgia and Azerbaijan for a variety of reasons that include agro-climatic conditions, leaf stock, leaf handling practices, production equipment/techniques and most pertinently customer demand. Both India and Sri Lanka have for many years been producing quality teas characterized by tight rolled leaves and an amber liquor of medium to thick body, in response to the high-volume demand for such teas in Russia and the Middle East.

The aforementioned traits that make Indian and Sri Lankan teas so attractive to the United States of America, European Union, Commonwealth of Independent States and Middle Eastern consumers alike, were evident in our comparative sensory analysis of these origins against the analyzed Georgian and Azerbaijani tea samples. Azerbaijani teas were evaluated against the relevant international competitors that were chosen based on their dominance of the orthodox category within the Azerbaijani market. A similar analysis was conducted with Georgian teas and allows for a comparison between the two Caucasus tea producers (see Annex).

The evaluation methodology used is a sensory enumerated evaluation of those characteristics, which have through various CPG (consumer packaged goods) studies, been shown to represent the most important attributes to the consumer, which are:

All the above characteristics depend on the processing of tea leaves and the storage conditions of finished tea. They are good indicators for optimizing processing.

Figure 4.7 summarizes the results of three analysed samples of Azerbaijani origin against Sri Lankan and Indian teas (Ceylon Pekoe and Assam Pekoe) as the main competing origin on the Azerbaijan tea market. The same comparative analysis was performed with Kenyan and Vietnamese origins and these results are summarized in the Annex, in addition to the results of the similar analysis conducted for Georgian teas.

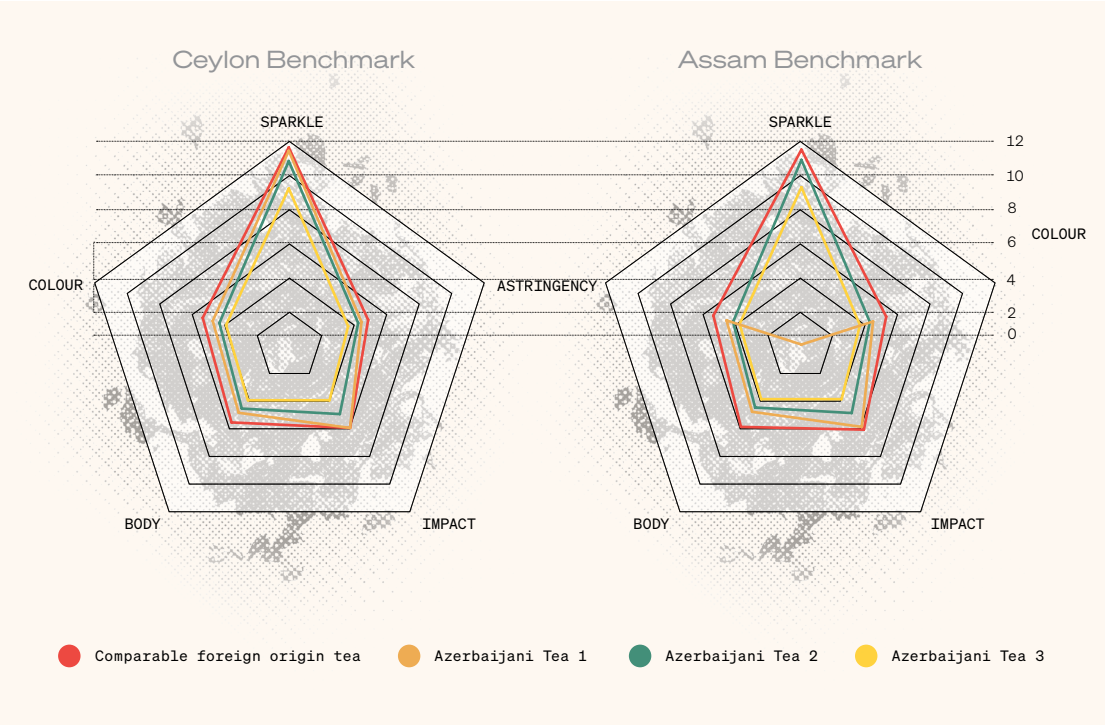

Figure 4.7
Tea sensory analysis comparison between with Sri Lanka (left) and India (right)

SOURCE: Authors.

Our analysis shows that the two top import origins (Sri Lanka and India) have considerably better developed characteristics than the domestic production, but not in such a dramatic fashion as in Georgia (see Annex). However, Viet Nam is still the closest comparative tea and offers some point for comparison in terms of international price evaluation.

Azerbaijan teas, as sampled, scored slightly higher than their Georgian counterparts in the areas that are developed during wither and fermentation. However, the differences are not significant enough to differentiate with respect to international value, without looking at other factors.

While this is a small sample, we deem it to be on the whole representative of the main differences that exist in terms of quality between imported and domestic teas. Overall, Azerbaijani teas can be qualified as light liquoring with relatively underdeveloped characteristics. In spite of the mixture of factories, from past relics of Soviet cultivation to modern Chinese equipped facilities, the output is similar and uncompetitive in comparison to

international imports, both in terms of quality and price. The high price driven by the cost of green leaf coupled with low yields puts into question the sustainability of the industry in its current state. Indeed the fact that the main companies in the market can access less expensive international tea to which the consumer has gotten accustomed represents a challenge. This will require careful design and government support, and there is no guarantee for success.

4.7.2 International price estimates

Our evaluation of the international price of the analysed Azerbaijani teas is based on their quality scores (see the aforementioned five criteria) in addition to several other criteria that determine the value of a tea in the international market, which include:[23]

- **leaf score:** the consideration of leaf from the perspectives of attractiveness, evenness, colour, make and fit for purpose. In fact, this is probably the most important factor in the evaluation of tea;
- **defects:** on top of the five sensory attributes scored, teas should exhibit sound manufacturing practices which will impact their performance consistency and their shelf life, as well as consumers' tastes. This criterion looks at all the defaults, wherever generated;
- **market weighting:** this looks purely at the supply and demand of the overall type and quality offered. A tea may be an example of good manufacture but be of a grade and quality that is in over supply or it may be in a balanced market category but just not as desirable, overall, as the competitive incumbents.

The weighting given to each of these three criteria is gleaned from market data collected each week, from the relevant markets, which analyses the relative value against auction scores. This is delivered to clients from the following firms.

Tea-Link (Colombo) pvt Ltd	Sri Lanka
PurbaTea (Export) pvt Ltd	India
MJ Clarke Ltd	Kenya
Van Rees Ltd	Viet Nam

These weightings are added to a comparative value from sensory scores. This is done by using average scores for standards, from each auction centre, and their running average prices over one year. This methodology, coupled with their sensory evaluations gives us a reasonable assurance for value of single points (0.1) for brightness, body and astringency of USD 0.10/Kg.

These combined factors make up our International Price Evaluation which is summarized in Table 4.2 below. All tea samples were graded in isolation by our tea expert, but were then qualified by an independent trading house for value.

23 The weight of each component in can be seen in the file used for this calculation which is enclosed in the annex.

Table 4.3
Calculated values for Georgian and Azerbaijan leaf teas against seven relevant competitive origins (All Producers of orthodox leaf teas)*

Origin	Rate (%)	Market price USD/kg
Kenya	Kericho	3.83
Sri Lanka	Low grown leaf	4.96
Malawi	EP	3.90
Viet Nam	Lamdong	2.18
Argentina	Maingrade	1.91
China	Green steamed	8.25
India	Nilgiri orthodox	5.66
Kenya	KTDA East of Rift	4.40
India	Assam post second flush	5.27
India	Darjeeling	14.60
Indonesia	W Java	3.80
China	Green Pan fired	10.50
Georgia	Martvili	3.58
Azerbaijan	Asteracay	3.58
Georgia	Lazi Premium	3.60
Georgia	Renegade Oolong	18.17
Azerbaijan	Yashil Cay	2.95
Azerbaijan	Khegraddin	0.82
Georgia	Georgian Bouquet	4.27

*NOTE: For Azerbaijani and Georgian teas, market price is based on valuation by an international trading house (Van Rees North America, for the teas tested. The other origins are all market contracted prices against which they were vetted.

SOURCE: Team's tea expert estimates.

4.7.3 Cost of production benchmarking

In this section, we consider the cost of production (COP) of the leading competitive origins in comparison to Azerbaijan. Georgia is also mentioned, as a similar analysis was carried out for the parallel study on the Georgia tea sector under the same project.

As actual production costs are extremely difficult to come by due to the unwillingness of producers to share them, a first step was to look at the export value (USD/kg) of all relevant competitive origins as a proxy for COP vs the actual COP of both Azerbaijan and Georgia, as obtained during the financial analysis carried out for this study. The aim is to provide a rough idea of the competitive pricing landscape vs the cost of making tea in our target

origins. Figure 4.8 is a stark illustration of the reality of our focus and suggests that the practicality of producing black tea in volume for the international market is not realistic in bulk form. In fact, as it appears, the cost of producing 1 kg of tea in Azerbaijan is in almost all cases higher than the actual average export value of tea (made tea) from India, Sri Lanka, Indonesia, Viet Nam and even Turkey. Our estimate of the cost of production of 1 kg of made tea in Azerbaijan is about USD 5/kg when purchasing green leaf and about USD 4.5/kg when using own leaf. In either case, this value is higher or similar to the average price at which all major producers export their made tea (e.g. between 2016 and 2018, about USD 3/kg for India or USD 4 to 5/kg for Sri Lanka).

This does not preclude the opportunity for value added exports but significant efforts need to be undertaken for Azerbaijan to be internationally competitive even in that case. The gap is such that if value addition is to be considered for export, then choosing a format that minimizes the share of tea cost in the total cost of goods (COG) is a good focus to have. This leads to the idea of considering teabags over packed/bulk tea, where tea weight and percentage of the cost of goods is lower (30–40 percent for packed tea vs > 60 percent for packets), to mitigate the impact of the cost of tea.

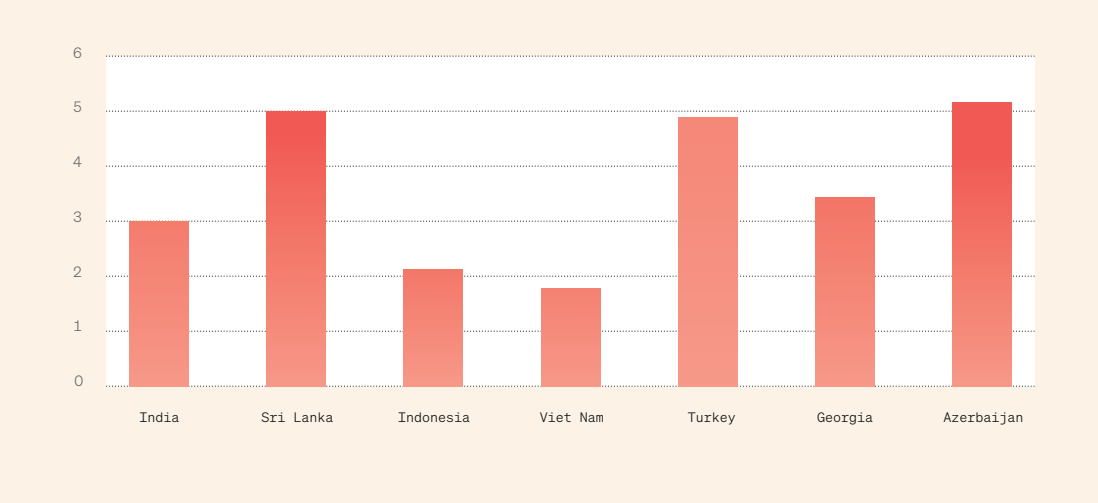

Figure 4.8
ITC export values all tea by origin vs COP all tea for Georgia and Azerbaijan (values for 1 kg of product in USD)

SOURCE: Author's calculation and International Tea Committee (ITC). Cited June 2021. https://inttea.com/.

Interviews with producers in India, Sri Lanka and Viet Nam confirmed that indeed, the differences in the cost of production between on the one hand, Azerbaijan and Georgia, and on the other, major tea producing countries, are significant.

However, a closer look at these origins suggests that prices largely follow supply and demand but are mediated, through open outcry auction limits, to delivering sustainable prices to producers ("sustainable" in this context is deemed as "acceptable," as the producer sets the minimum selling price at which the broker can sell, prior to each auction). In the case of India, the COP is seen to be higher than export values but sales of higher value teas to the internal market partially mitigate this, though producers are presently losing money in the organized sector.

As actual costs of production are extremely difficult to gather due to a highly protective and suspicious producer environment, the template delivered to and completed by Viet Nam was not the norm by which answers could be gleaned from Sri Lanka and India. The COPs of these two origins were derived from close discussions with producers in Assam (N.E India) and Ruhuna (Lowgrown, S.W region) where the majority of leaf exports are derived. However, each COP obtained was put to other producers in each origin to test their validity and is considered an "accurate approximation." The producers interviewed for each origin are:

Warren Tea Ltd	India
Mcleod Russel Ltd	India and Viet Nam
Watawalla Plantations Group	Sri Lanka

These findings are consistent with green leaf price (farm gate) in each origin which are as follows:

Table 4.4
Average green leaf price

Origin	Price, USD /Kg
Georgia	0.30*
Azerbaijan	0.64**
Sri Lanka	0.57
India	0.10
Viet Nam	0.09

* Average price for 20 percent of output at GEL 3 (USD 1.1) and 80 percent at GEL 0.35 (USD 0.13) depending on quality.

** Average price for 20 percent of output at AZN 1.4 (USD 0.82) and 80 percent at AZN 1 (USD 0.59) depending on quality.

SOURCE: Authors.


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Chapter 5
Environmental sustainability

Tea production in Azerbaijan may be affected by the impact of climate change, reducing its potential for expansion and/or increasing the agriculture footprint of the country. The following section presents the possible adverse and beneficial impacts of climate change on tea production as well as the potential impacts of tea production on the environment.

5.1 METHODOLOGY

The information, data and assumptions reported in the present brief derive from:

- **Literature Review:** FAO collected and analysed data from scientific publications and project documents related to tea production in Azerbaijan, Turkey and the main tea-producing countries. Concerning climate change, priority was given to: (i) national communications to the United Nations Convention on Climate Change (UNFCCC) and others; (ii) national action plans and strategies; (iii) UN assessments and reports; (iv) publications from national institutions and academia (national and international); and (v) bilateral donors' reports or projects. Information on tea and the impact of climate change on tea derives from the review of international scientific publications and national data.

- **GeoSpatial Analysis:** As part of its mandate to support member countries, FAO developed a set of tools and methodologies to allow rapid and tailored geospatial analysis. A result of this effort is Earth Map, an open-source application that allows for the interpretation of large remote sensing datasets in near real time.[24] Earth Map is an innovative tool that facilitates and empowers users to perform historical and current climate-environmental analysis for a given area (regional, inter-regional, national, district, and sub-district) through a graphical interface that has been developed by FAO thanks to its partnership with Google.

24 For further information please see Earth Map at: https://earthmap.org.

Data on climate parameters (trends) have been collected via Earth Map accessing the following databases:

- European Centre for Medium-Range Weather Forecasts (ECMWF) climatic grids for Minimum (MIN) and Maximum (MAX) temperatures). www.ecmwf.int/en/forecasts/documentation-and-support/medium-range-forecasts;
- Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) (version 2.0 final) for precipitation (rainfall). www.nature.com/articles/sdata201566;
- CRU TS3.10 Dataset for Updated high-resolution grids of monthly climatic observations. https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.3711.

Concerning climate change projections, the document uses the assumptions and data reported by the Republic of Azerbaijan in its National Communication to the UNFCCC (TNC, 2015).

5.2 GENERAL OVERVIEW OF CLIMATE CHANGE IN AZERBAIJAN

Azerbaijan is largely characterized by a subtropical – continental climate. Nonetheless, due to its geographical position – nestled between the Caspian Sea and high mountains – Azerbaijan's climate is diverse and encompasses eight climate zones (TNC, 2015). Summers are hot and winters are moderate. Average annual temperatures range between 14–15°C in the lowlands, including the coast coastal regions, and 4–5°C in the mountainous regions. Annual precipitation levels range from 1600–1700 mm in in the foothills of the Talysh Mountains to 150–200 mm in the eastern Abşeron Peninsula. Sixty-five percent of the country receives on average less than 400 millimeters per year (TNC, 2015; USAID, 2017).

The observed climate trends in the period 1989–2018 confirm evident changes in temperatures:

I. increased average temperature by about 1.3°C;
II. increased number of hot days (1986–2010);
III. decrease in glacier mass by about 50 percent (1990–2017); and
IV. increased occurrence of extreme events such as droughts, flash floods and floods with the central and south-eastern regions at greatest risk of being affected (1961–1990 vs 1991–2015).

Despite reports in the last two national communications signaling a marked decrease in precipitation in the period 1991–2010, data from other sources (mostly based on remote sensing analysis[25] reports precipitation as stable or increasing (Harris, I. *et al.*, 2013). As such, trends in precipitation in Azerbaijan are less clear than trends in temperature. Precipitation trends are similarly unclear at different levels of altitude across the country.

25 Updated high-resolution grids of monthly climatic observations – The CRU TS3.10 Dataset. March, 2014.

The The Third National Communication to the UNFCCC (TNC) as well as reports from USAID[26]and the World Bank[27] estimate that:

I. under all scenarios, the number of summer days is expected to increase by the end of the century;
II. the average annual temperature will increase by 2.4°C by 2050 and by 4.5°C toward 2090 (RCP8.5);
III. precipitation projections show little variation compared to the reference period (1986–2005), nonetheless precipitation is marginally more likely to fall in summer months and to rise in winter months while under the higher emission pathways (RCP8.5 and RCP6.0), the annual probability of severe drought in Azerbaijan is projected to rise significantly;
IV. the total annual hot days of temperatures above 35°C will rise by 17.5 days in 2050 (RCP 8.5).

Recent climate change vulnerability assessments of Azerbaijan concur in identifying an alarming trend of:

I. increasing water demand for irrigation;
II. increasing erosion phenomena along the coastline due to forecasted rise of the current Caspian Sea level (+1.5-+2 m asl by 2050);
III. introduction of new diseases and pests; and
IV. increased incidence of forest losses (www.enpi-fleg.org/site/assets/files/1657/final_assessment_report_climate_change.pdf)

The TNC and the latest climate risk profile available for Azerbaijan (USAID, 2017) identify agriculture as one of the most vulnerable compartments due to its:

> ...high reliance on subsistence farming, with low productivity, high rates of soil degradation and limited land availability [...]. Models suggest that all key crop yields will be compromised (except for pasture), with rainfed potato and cotton expected to experience the greatest yield declines.

Agriculture contributes to the national GDP by about 5 percent (World Bank, 2018) with about 47 percent of the population living in rural areas. Agriculture alone accounts for about 39 percent of the country's labour force (IFAD, 2019).

In 2012, the World Bank highlighted "an increased exposure to new pests and diseases for agricultural crops, forests, and livestock due to temperature increases" (World Bank, 2012). The TNC (2015) confirms this threat and restates the urgency of including pest and diseases management strategies among the priority adaptation actions. Higher temperatures will increase the spread of crop diseases and pests, particularly for forests and annual crops and possibly all the other annual and perennial crops.

26 USAID Global Climate Change, 2017.
27 World Bank Climate Change Knowledge Portal, 2019.

As reported in the ND-GAIN matrix-indicator, Azerbaijan is still facing adaptation challenges, but it is well positioned to adapt.[28] As highlighted in the (I)NDC (UNFCCC, 2017), the main targets of the country relate to mitigation. Although adaptation needs are mentioned, the country did not identify any specific direction or subsector. Nonetheless, as reported by the OECD (2016), Azerbaijan requires additional financial and technical support in order to ensure the "introduction of climate-resistant crop species, application of windbreaks (agroforestry), introducing water saving technologies, application of conservative cultivation technologies, and awareness raising". Available literature also identifies lack of innovation in the agriculture sector as one of the main priority to address is "the rate of innovation adoption among local farmers [that] is still low" (Sadigov, 2017).

According to the Second Biennial Updated Report of the Republic of Azerbaijan (UNFCCC, 2018) to the UNFCCC, Azerbaijan's greenhouse gasses (GHG-2011-2013) profile is dominated by the energy sector (80 percent of which fugitive emissions are about 50 percent), agriculture, industrial processes and waste contribute by 14 percent, 5 percent, and 1 percent, respectively. Total emissions accounted in 2015 for about 69 MtCO2e (7.46 tCO2e yearly capita). The country plans to unconditionally reduce its GHG emissions by 35 percent below the business as usual scenario (BAU-1990) by 2030 (UNFCCC, 2017).

As reported by the TNC, 2015, the Ministry of Ecology and Natural Resources (MENR) is responsible for the preparation and implementation of climate change related policies. The country established the State Commission on Climate Change, responsible for coordination on climate related issues and it represents 18 ministries including the Ministry of Ecology and Natural Resources (MENR) and other governmental institutions such as the State Oil Company of Azerbaijan Republic (SOCAR), the National Scientific Academy of Azerbaijan and the State Agency for Alternative and Renewable Energy Sources (SAARES).

Azerbaijan actively cooperates at a regional level on climate change issues, and is involved in the EU ClimaEast project among other. The main climate change (including agriculture) documents and policies for Azerbaijan are the following:

- Third National Communication to the UNFCCC GHG national inventory report (UNDP/GEF, 2015)
- Intended Nationally Determined Contribution (UNDP/GEF, 2015)
- Climate Risk Profile of Azerbaijan (USAID, 2016)
- Financing Climate Action in Azerbaijan (OECD, 2016)

28 According to the ND-GAIN indicator, Azerbaijan is the 80th least vulnerable country and the 81th most ready country. Chen *et al.*, 2017. Global Adaptation Index: Georgia

5.3 TEA AND CLIMATE CHANGE

Tea production is limited to only a few agro-climatic zones in 58 countries around the world and it is highly sensitive to changes in growing parameters. The scientific community as well as the Working Group on Climate Change (WGCC) of the IGG/Tea, consider that "climate change will have a significant impact on future tea production, independent from the geographic distribution of the tea crop" (FAO, 2015) and will mostly affect small producers (Ochieng, 2016). Literature thoroughly describes the implications of climate change for tea (*Camellia sinensis*) and the top tea producing countries identifying increasing temperatures (MIN-MAX), change in relative humidity, sunshine hours and changing precipitation patterns as the main drivers of impacts on tea production (Ochieng, 2016; Werner, 2017; ITC, 2014; UNCTAD, 2016).

"The possible fallouts of the climate change are already witnessed in the loss of yields and increased management costs for developing coping strategies" (FAO, 2016). Increased temperatures are shifting suitable agro-climatic zones to higher altitudes and increasing water demand in most major producing countries. Changing precipitation patterns and the increase of extreme weather events such as droughts, hail storms, floods, frosts, extreme rainfall will have repercussions on production costs (need of irrigation), water availability, soil quality and stability and tea quality (Ahmed, 2014; Ahmed *et al.*, 2019). Nonetheless, according to WGCC-IGG/Tea: "A more serious problem, however, is the increased incidence of new pests and diseases that attack tea bushes" (FAO, 2015). This will be mostly due to the environmental conditions that are more favorable and the collapse of the natural boundaries of pest and diseases.

Indirectly, the described changes in temperature and precipitation may result in additional indirect adverse impacts (e.g. deforestation, land use changes, reduced biodiversity) due to the establishment of new plantations in more suitable areas (ITC, 2014; FAO, 2015). Additionally, due to changes in precipitation patterns there will be higher uncertainty with application of fertilizers and pesticides with tangible adverse impacts on yields and tea quality (ITC, 2014). These phenomena are highlighted in available literature:

> Knowledge of potential distributions and habitat preferences of tea *(Camellia sinensis)* under current and future climate conditions are vital for policy makers and stakeholders to develop suitable adaptation measures to mitigate against any detrimental effects of climate change
>
> (Jayasinghe, 2019).

5.4 CLIMATE CHANGE AND TEA PRODUCTION IN AZERBAIJAN

Tea was introduced in western Azerbaijan in the early 20th century and by the 1980s tea plantations occupied more than 13 000 ha located mostly in the coastal regions of Lankaran and Astara (ADB, 2005). After independence from the Soviet Union, tea production started declining and tea factories were gradually abandoned. Already in 2005 the total hectares of tea declined to less than 4000 hectares (79 percent of which irrigated) due to cropping and land-use change patterns that favoured grains and vegetables at the expense of tea production (ADB, 2005; UNDP, 2009). At present, the trend described by the ADB in 2005 and UNDP in 2008 and productive tea plantations accounts today for about 667 hectares with no clear indication concerning the hectares where tea production could be potentially expanded (FAOSTAT, 2017).

According to the State Statistical Committee (Goa Stats, 2018), tea is still produced in the two economic regions of Lankaran (91 percent) and Sheki-Zagatala (9 percent). The 2018 total production of tea reached 410 tonnes of green leaves, produced by both agricultural enterprise (52.5 percent) and smallholders (47.5 percent). In this regard it is worth noting that during the period 2015–2017, the proportion of tea produced by agricultural enterprises and smallholder changed from 1:0.4 to almost 1:1. Figure 5.1 shows how a large area (about 37 hectares) was gradually abandoned, as a result of a rapid assessment of the most recent aerial and satellite pictures of the region carried out by FAO for the purposes of this brief.

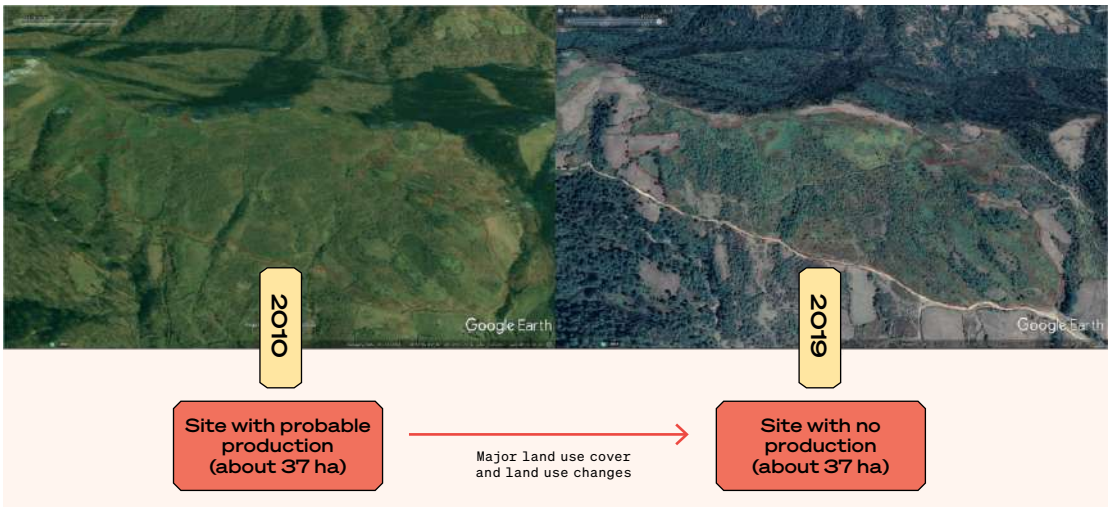

Figure 5.1
Example of abandonment of tea plantations in Azerbaijan (Lankaran district), 2004 vs 2019

SOURCE: Google Earth pro. Cited May 2021. https://www.google.com/earth/versions/.

As tea is native to the humid tropics and subtropics, available literature on climate change impacts on *Camellia sinensis* concentrates mostly on varieties (e.g. *sinensis and assamica*) from the top producing countries (Werner, 2017). Recent literature on tea in Azerbaijan does not report information or data on the varieties that are currently in use. The only official reference found is the country report to the FAO international technical conference on plant genetic resources of 1996:

> Tea is sown on 65 farms including 26 specialized state farms in which processing industry has been developed. Its indigenous selective varieties, i.e. Ghysha davarnly, Azerbaijan-I, Azerbaijan-II, Azerbaijan-III and Azerbaijan IV, have found their practical application
>
> (FAO,1996).

Unfortunately, there is not enough scientific data on the phenology of such hybrids and therefore on potential climate change impacts on Azerbaijan's tea. Therefore, comparable production areas such as Turkey will be used as a proxy. Moreover, given the distribution of tea plantations in Azerbaijan, this brief will concentrate on the districts of Astara, Lankaran and Massaly.

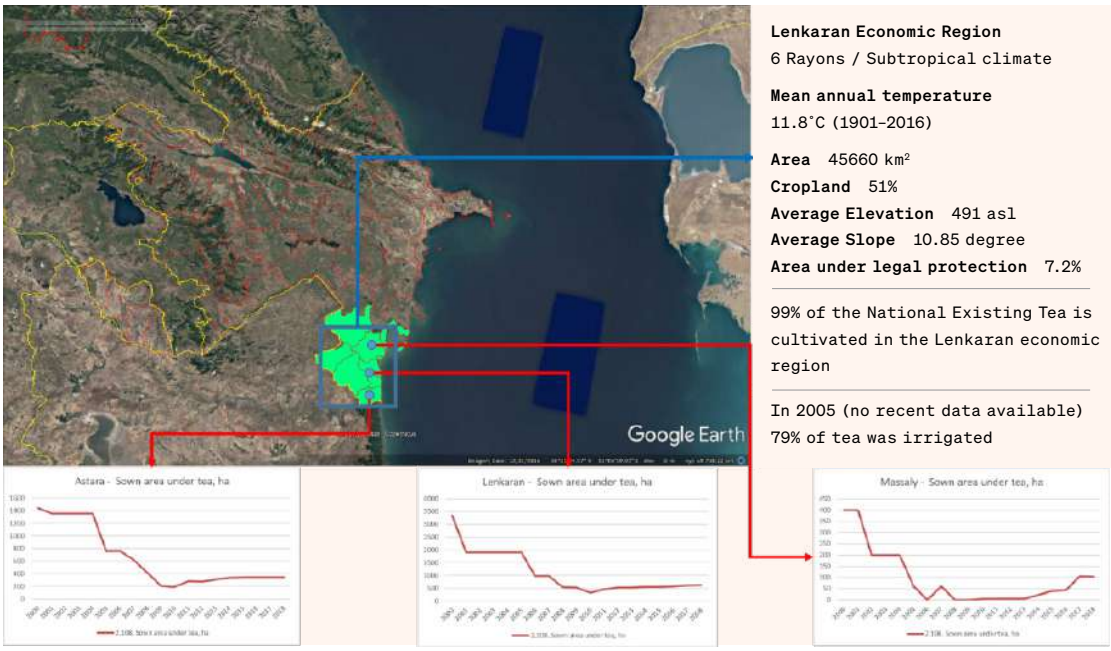

Figure 5.2
Tea production in the Lankaran economic region

SOURCES: Goa Stats, 2018. Statistical Handbook of Goa 2018-2019; UNDP, 2008.

It is reported that (see Table 5.1) minimum and maximum temperatures are increasing in each district while precipitation (annual rainfall) although highly variable is generally stable. As for the national scenario, projections forecast further increases in temperature and rainfall reduction in each region.

Table 5.1
Temperature and rainfall* trends/projections (+ Increase; - Decrease)**

	Temperature (trends) 1989–2016		Temperature (projections) 2021–2100		Precipitation (trends) 1981–2018	Precipitation (projections) 2021–2100
Region	Annual min	Annual max	Annual min	Annual max	Annual rainfall	
Astara	+ (1.069 C)	+ (1.293 C)	+ 2.4°/4.5°C (TNC 2015)		+/- Great monthly variability	Stable but with possible drop of up to -10% (TNC 2015)
Lankaran	+ (1.242 C)	+ (0.829 C)				
Massaly	+ (10.668C)	+ (1.823 C)				

* Rainfall in the three districts shows high levels of variability.

** Sources for trends: CHIRPS: Climate Hazards Group InfraRed Precipitation with Station data and The European Centre for Medium-Range Weather Forecasts for temperatures. Sources for precipitation (rainfall): Third National Communication (TNC) to the UNFCCC.

SOURCE: Authors' compilation based on various sources (see notes).

After having analysed the available literature and applying a conservative and precautionary approach, it is reasonable to assume that (Table 5.2):

I. the exposure of tea production to climate change in Azerbaijan is medium/high;
II. due to the lack of research and development (R&D) investments in the sector in the past 20/30 years and to production being mostly concentrated in smallholder farms, the sector is vulnerable;
III. possible impacts may include reductions of yields and quality of Azerbaijan tea if produced under a business-as-usual (BAU) scenario.

Table 5.2
Reported exposure, vulnerability and impacts in the Lankaran region

Variable	Exposure	Main drivers of vulnerability	Possible adverse / beneficial impacts	Rationale
Temperature	Very high	**Scattered distributions of remaining tea plots and severe adaptation deficit of the sector.** Lack of R&D in the tea sector has not improved and/or adapted existing varieties nor production practices. Agriculture and specifically, tea production in Azerbaijan is now largely dominated by smallholders (FAO, 2018; Sadigov, 2017; Goa Stats, 2018) lacking the financial and knowledge capital to address climate change or to move towards climate smart approaches to tea production and adopt irrigation technologies; or furthermore to coordinate preventive and proactive integrated pest management practices.	**Reduced resilience** of current varieties leading to reduction of yields and quality. Increasing temperatures (MIN and MAX) are increasing the water deficit with major adverse impacts on rainfed tea production that requires irrigation also in mountain areas.	Reported temperature trends (MIN and MAX) and projections are within the limits of tea growth parameters (Nair, 2010). The registered and projected increase in temperatures may reduce the resilience of plants and potentially their productivity in existing areas due to increased evapotranspiration. Increasing temperatures may require agroforestry practices to shade tea plants and reduce evapotranspiration especially in the plains.
Precipitation	Medium		**Need of irrigation** technologies to face water stress.	Current trends describe a situation where rainfall is already not enough for tea production and the recorded increase in temperature are already affecting tea plantation. Projections indicate that rainfall may reduce the opportunity cost of investing in restoring tea fields and/or initiate new plantations if not associated with the adequate irrigation infrastructure.
Pest and diseases	Very high		**Reduce yields** and quality of productions.	There is sufficient evidence in literature to assume that damages from pests and diseases will be magnified and intensified by climate change. Although tea is not a major crop in Azerbaijan, pests and diseases that are currently affecting neighboring countries (e.g. Iran) could move easily to Azerbaijan.
Extreme events	Low			There is no evidence of extreme events affecting tea in Azerbaijan. Nonetheless, the reported increase of hot days as well as of temperatures my results in damages to tea plants and their productivity.

SOURCES: Data Based on: World Bank, 2012. Georgia, Climate Change and Agriculture: Country Note. Washington, D.C. http://siteresources.worldbank.org/AZERBAIJANEXTN/Resources/CN_Azerbaijan_FINAL.pdf. World Bank, 2014. *Reducing the Vulnerability of Georgia's Agricultural Systems to Climate Change*. Washington, D.C. World Bank, 2019. information not available; FAOSTAT, 2019; TNC, 2015. *Third National Communication to the UNFCCC—Republic of Azerbaijan*. Baku. https://unfccc.int/resource/docs/natc/azenc3.pdf; USAID, 2016. *The Georgian Road Map on Climate Change Adaptation*.

5.5 ENVIRONMENTAL IMPACT OF TEA PRODUCTION IN AZERBAIJAN

The main adverse environmental impacts of tea production depend mostly on: (i) land use/land cover changes (Yuksek, 2009); (ii) cultivation and management practices (FAO, 2016); (iii) geographical position and (iv) processing technology (Munasinghe, 2017; Allen, 2019).[29]

Nonetheless, as *Camellia sinensis* is a perennial plant, tea production may also have beneficial impacts for farmers when plants are located in areas subject to erosion and instability and if planting/cultivation/management of tea is done adopting precise non-intensive, climate-smart (Tran, 2019; Reay, 2019) and organic protocols (Seyis, 2018; Qiao, 2015; Doanh, 2018; FAO, 2016b; Kamau, 2015).

Azerbaijani tea is a quasi-organic crop due to the fact that farmers are not applying any minerals. However, transportation from the field to the remaining factories as well as the processing and packaging of leaves is still done using outdated technology and unsustainable sources of energy (fossil fuels) with probable adverse impacts on the environment. Table 5.3 reports the main recorded adverse and beneficial impacts linked to tea production in Azerbaijan.

29 Cradle to Gate approach including production/purchase of raw materials, cultivation, waste and processing analysed with LCA approaches (Doublet, 2010).

Table 5.3

Main known environmental impacts of tea production based on tea farming and processing steps

	Activity	Adverse impacts		Beneficial impacts
From nursery to harvest	Planting	Low	Nonetheless, due to seedlings' preparation and hardening in nurseries, impact may become medium/high depending on inputs management at the nursery. In the case of new plantations and/or revitalization of abandoned ones, the impact is to be considered potentially high due to possible land cover changes, loss of biodiversity and reduced resilience of the ecosystem. Additionally, in the analysed regions new plantations might conflict with the existing system of protected areas and park that is particularly extended in the Lankaran region, where already 7 percent of the territory is under some sort of protection. Furthermore, in the case of aging and/or abandoned tea plantations soils' PH tends to be further lowered restricting the use of possible alternative crops (Goss, 2014) or implying the need of applying PH regulators such as lime.	Establishing tea plantation on agriculture lands in slopes prone to soil instability and erosion and landslides may contribute in reducing the risk of land and mudslides and in increasing carbon removals.
	Manuring	Medium / high	Depending on inputs origin (organic vs mineral) and management. The use of mineral fertilizers can pollute soils and water resources with major adverse impacts on ecosystems and human/animal health.	
	Irrigation and drainage	Medium / high	As reported tea in Azerbaijan is irrigated and given the reported increasing trends for temperatures, water needs are expected to increase further.	
	Pest/ Diseases control	High	Depending on inputs origin (mineral vs organic) and management (e.g. conventional vs integrated), pests and diseases control can have severe adverse impacts on biodiversity, water resources and human/animal health.	
	Weed Control	High	Depending on inputs origin (mineral vs organic) and management, weed control can have severe adverse impacts on biodiversity, water resources and human/animal health.	
	Pruning/ Skiffing/ Plucking	Low/ medium	Depending on technology (machine vs. workers), source of energy and maintenance can have adverse impacts on biodiversity, water resources and human/animal health.	
Transport and processing	Transport	Low / medium	Depending on technology (in farm), transport type and distance to processing (off farm) can have adverse impacts on biodiversity, water resources and human/animal health.	To be determined case by case depending on agriculture practices and processing technologies, tea production may increase carbon removals.
	Withering			
	Rolling/ Fermentation/ Drying/ Sorting			

SOURCE: Authors' compilation with Mukhopadhay, 2017. Cultivation, Improvement, and Environmental Impacts of Tea. *Oxford Research Encyclopedia of Environmental Science*. https://doi.org/10.1093/acrefore/9780199389414.013.373.

5.6 COMPARISON WITH ALTERNATIVE CROPS

While tea production in Azerbaijan declined, other cultivations slowly developed (e.g. kiwi) and started to "encroach" many of the tea areas (e.g. rice). Due to the lack of information related to possible competitors this section assumes a situation similar to Georgia. As reported in the previous sections, the lack of available literature on specific crops, their climate change exposure/vulnerability and their impact on the environment does not allow for a comparative analysis. Nonetheless, although more detailed studies are recommended the differences in terms of exposure and impacts may be marginal (Table 5.4). This is assuming that:

I. all the alternatives will be organic;
II. alternatives do not imply land cover/land use changes;
III. alternatives are not intensive or semi-intensive;
IV. alternatives substitute plantations located on soils on slopes.

Table 5.4
Comparative hypothetic impact scenario between tea and its competitors in target areas

Indicator	Exposure	Kiwi	Rice
Possible exposure to reported and projected climate change impacts (+Temperature/ -Precipitation/+Hail/+Pest and Diseases)	Medium / high	High: reported increase of temperature and evapotranspiration may result (possibly in lowlands) in insufficient winter chilling increases and in increasing water needs (Tait, 2017). Irrigation is a precondition for production in both low and high lands. Erratic rainfall patterns may interfere with pollination requiring mechanized pollination (Minarro, 2015). Need to mitigate the risk of hail with nets and other investments.	High: reported increase of temperature and evapotranspiration may result (using Turkey and Iran as proxy) in spikelet sterility and pests and diseases attacks (e.g. *Pyricularia oryzae, Helminthosporium oryzae* and *Fusarium moniliforme*) (Surek, 1997; Nguyen, 2006, FAO, 2018). Nonetheless, assuming water will be available with no restriction increased temperature may enhance productivity (Koc, 2013).
Possible adverse environmental impacts (as per Table 5.2)	Low / medium	Medium: under organic production impacts are limited (Lago 2015). Nonetheless, water demand remains high.	High: Major land cover/land use changes are to be expected. If produced with flooding, rice production will be water intense with high irrigation needs (FAO, 2015) and with high emission of CO2 equivalent (Miranda, 2015). Water pollution due to nitrogen (Tayefeh, 2018).
Possible beneficial environmental impacts (as per Table 5.2)	Low / medium	None reported	None reported

SOURCE: Authors.

5.7 CONCLUSIONS AND RECOMMENDATIONS

Tea production in Azerbaijan is exposed and therefore vulnerable to climate change, however it is not as exposed as other countries (i.e. Kenya, Sri Lanka, India and China). Recorded and projected changes may result in immediate adverse impacts and on the potential enlargement of the areas suitable for tea production as irrigation is now a precondition to produce regardless of altitude. Consequently, the vulnerability of current productions as well as of future expansion of the sector is not to be neglected. The described trends and projections may reduce the overall resilience of tea mostly because of increased water needs and increased exposure to new pests and diseases. Although producers claim that tea production is not currently facing pest and disease problems, Azerbaijan does not appear ready or equipped to cope with such risks in the event of outbreaks similar to those currently affecting Turkey, Iran and others. Addressing the described bottlenecks will reduce the overall risk of cultivating tea and expanding its production. Therefore, tea expansion in the country will require parallel investments in R&D to identify and "tailor" the best varieties as well as water management initiatives, to prepare for possible adverse impacts and to ensure that required irrigation for tea will not have additional adverse impacts on water resources.

Concerning the general environment, the adverse impacts of current tea cultivation in Azerbaijan appear to be moderate for existing farms and moderate/high in case of new plantations. Assuming there is or will be no land-use change, the cultivation of tea is an effective way to protect mountainous soils from erosion and instability. Nonetheless, the overall impact of tea processing should be considered moderate/high due to the obsolete technologies and energy sources currently in use. Therefore, tea expansion in Azerbaijan may be possible assuming that:

I. irrigation is available at the same cost as per other crops;
II. the appropriate environmental safeguards are in place from cultivation to processing limit, mitigate and/or neutralize emissions other adverse environmental impacts. This point is of particular importance, as the expansion of the sector may cause possible conflicts with the current network of protected areas and national parks.

As climate change and environmental concerns may adversely impact tea production, to ensure its long-term environmental and economic sustainability, the following recommendations have been made:

- ensuring a precise mapping of past, existing and suitable areas for tea production;
- ensuring the appropriate investments to support the adoption and use of irrigation practices and technologies. Irrigation is a precondition for tea production;
- ensuring R&D investments in the sector;
- enhancing the capacity of institutional and private stakeholders to identify and address pests and diseases events and to act preventively;
- supporting climate smart agriculture/organic practices of existing

and new tea production (although literature considers that further studies on the use of organic fertilizers on tea are needed, various authors suggest that, considering the overall ratio between adverse and beneficial impacts of using mineral fertilizers versus organic ones, organic fertilizer may be more efficient on the long run (Islama, 2017; Gerbrewold, 2018);

- promoting (for new plantations) mix cropping and agroforestry to ensure the shading of tea plants against increasing temperatures and protection from extreme events such as heat waves.

Chapter 6
Consumption

For cultural reasons tea plays an important role in Azerbaijani society and is considered to be a "national drink," which is consumed not only at home but is also offered in cafés, tea houses and restaurants. According to the SSC, per capita tea consumption per year increased from 1.6 kg 2008 to 2.1 kg in 2018, an increase of 31.3 percent or about 3 percent annually (Figure 6.1). Coupled with demographic growth (about +0.9 percent per year), this means that total tea consumption in the country increased by almost 58 percent in ten years (2008–2018) from 13 300 tonnes to just over 21 000 tonnes. As these trends are expected to continue in the near future, they represent a promising opportunity for the tea sector.

Figure 6.1
Tea consumption in Azerbaijan

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

Data from the SSC place Azerbaijan among the top-ranking countries in terms of per capita tea consumption globally and the country ranks sixth by this indicator (Figure 6.2).[30]

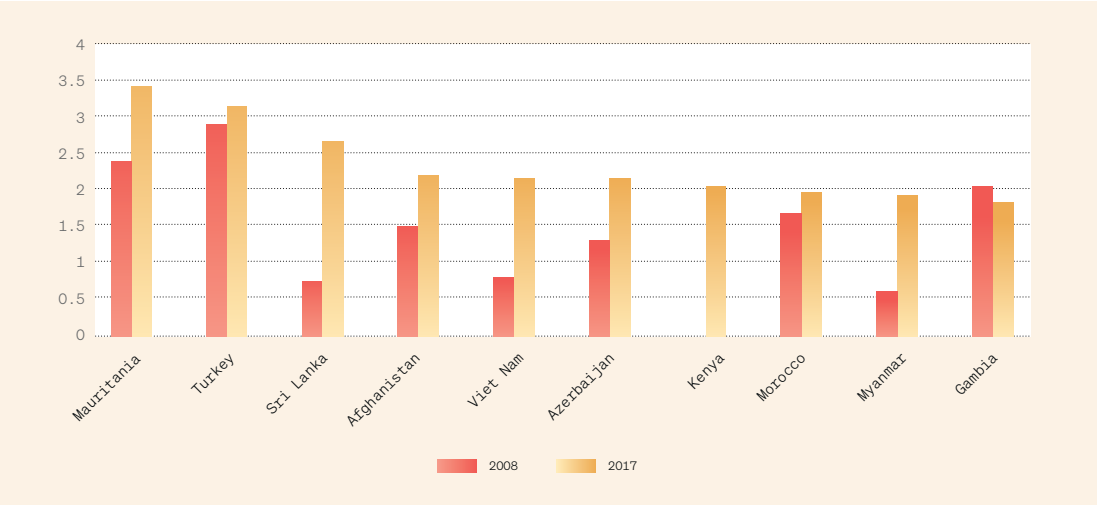

Figure 6.2
Top ten countries by per capita tea consumption

SOURCES: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/ for Azerbaijan and FAO. 2021. FAOSTAT. In: FAO. Rome. Cited May 2021. www.fao.org/faostat/en/ for all other countries (no data available for Kenya in 2008).

With domestic production being under 1000 tonnes, Azerbaijan was relying on imported tea for over 96 percent of its domestic tea supply as of 2018. It should be noted, however, that most tea is imported in bulk (85 percent as of 2019) with a significant share packed and branded in Azerbaijan and either sold domestically or exported as "Azerbaijani tea" – whether blended or not with tea of actual Azerbaijani origin.

The effect of such practices on the evolution of consumer preferences both domestically and in key export markets may be significant, as consumers are led to believe that the tea characteristics they are used to are typical of Azerbaijani tea, while in fact it is mostly imported tea. The introduction of the rules of origin or geographic indications coupled with parallel efforts to educate consumers about the unique characteristics of tea grown in Azerbaijan are a possible basis for the creation of more discerning tea markets, both domestically and in key export destinations.

While there is no data on tea demand elasticity in Azerbaijan, FAO estimates that global demand elasticity for black tea varies between -0.32 and -0.80, which means that a 10 percent increase in black tea prices would lead to a decline in demand for black tea of between 3.2 percent and 8 percent, thus revealing the relative lack of elasticity of the demand for black tea.

30 When compared with data on per capita tea consumption from FAOSTAT.

Chapter 7
Trade

7.1 MAIN TRENDS

Although Azerbaijan was a net exporter of tea until 2015, the growing trend of its exports was reversed in 2013 and by 2016 the country had become a net importer (Figure 7.1). Nevertheless, perhaps as a consequence of the recent revival of the tea sector, a slight increase in exports observed. At the time of finalization of this report (2020), latest UN Comtrade data on trade in 2019 shows a 10 percent increase in tea volumes exported by Azerbaijan compared to 2018.

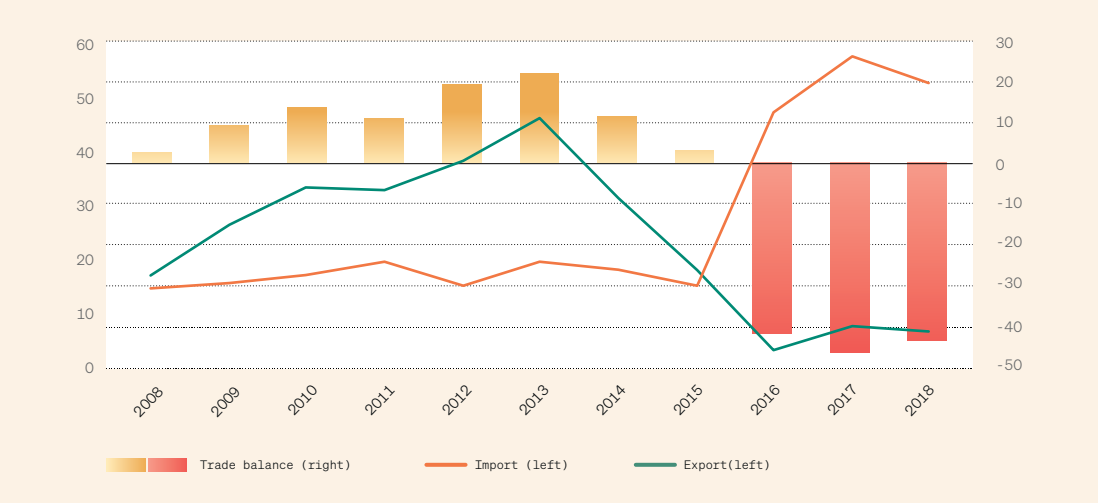

Figure 7.1
Azerbaijan tea imports, exports (left) and trade balance (right) in million USD

SOURCE: State Statistical Committee of the Republic of Azerbaijan (SSC). 2021. Cited 12 May 2021. www.stat.gov.az/.

The main destination of Azerbaijani tea exports are the former Soviet republics. In particular, exports to Russia, Georgia, Ukraine and Kazakhstan accounted for more than 95 percent of total tea exports of the country in 2018. On the other hand, Sri Lanka, Russia (re-export of packaged tea) and India are among the biggest suppliers of tea to the domestic market of Azerbaijan, with more than a 96 percent share in total import of tea. Sri Lanka is by far the most significant import origin with a share of 87.5 percent, as illustrated in Figure 7.2.

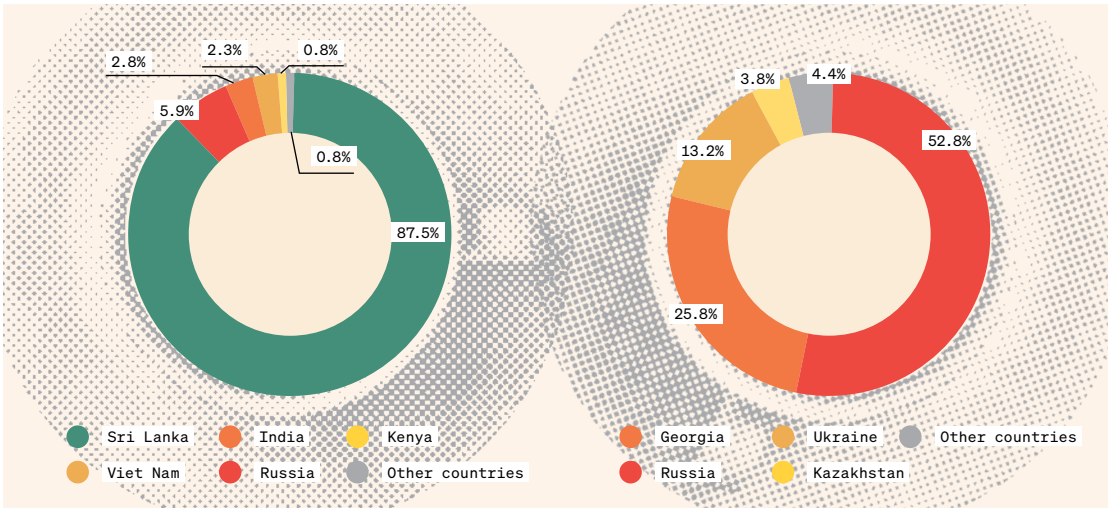

Figure 7.2
Geographic distribution of Azerbaijani tea imports (left) and exports (right) in 2018

SOURCE: State Customs Committee of the Republic of Azerbaijan. Cited June 2021. https://customs.gov.az/en.

The majority of tea traded by Azerbaijan (both imports and exports) is black tea, constituting 92 percent of the country's exports and 98 percent of its imports in volume terms (Figure 7.3), which is in line with strong customer preferences for black tea domestically.

Almost 84 percent of the tea exported from Azerbaijan consists of black tea packaged in tea bags and placed in boxes weighing up to 3 kg. The exported black tea is therefore, likely destined for final consumption in foreign markets. In contrast, about 89 percent of imported black tea into Azerbaijan is in bulk (packages exceeding 3 kg) and is further processed (packaging and branding) in Azerbaijan to be either sold domestically or re-exported.

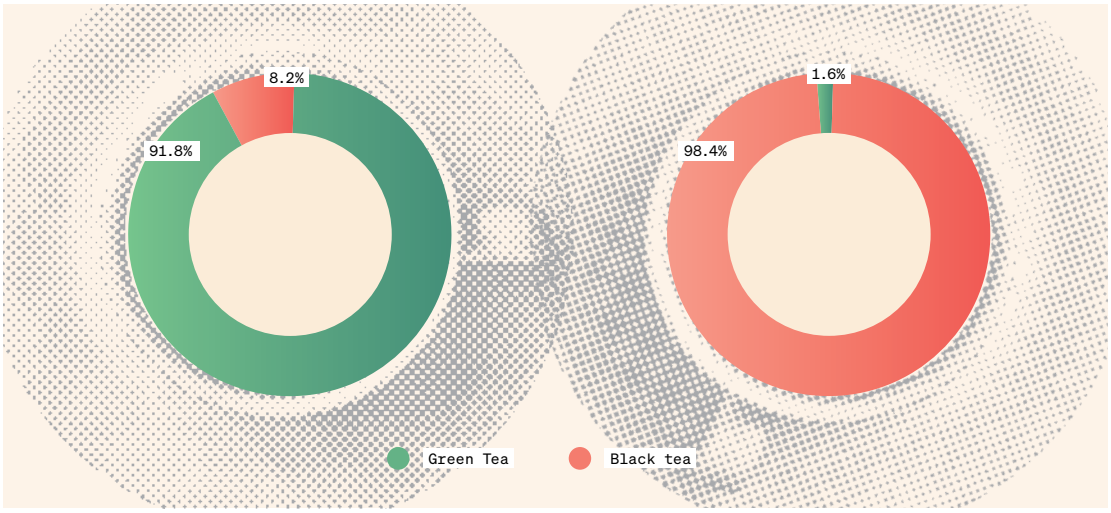

Figure 7.3
Share of exported (left)/imported (right) in Azerbaijan by type (in tons) in 2018

SOURCE: State Customs Committee of the Republic of Azerbaijan. Cited June 2021. https://customs.gov.az/en.

On average, export prices are about two times higher than import ones: USD 6.86/kg for exports and USD 3.84/kg for imports in 2018, indicating that the exported tea is mainly directed to the high-end market. This is also higher than the average international tea price of USD 2.6/kg as reported by FAO.

In the Russian Federation, where Azerbaijan imported 425 tonnes of tea in packs under 3 kg and 17 tonnes in bulk (packs over 3 kg) in 2019, the reported import price for Azerbaijani tea was slightly lower than the Russian import average from all other origins for bulk tea, but higher than the packaged tea average. This may suggest that although imported teas from Sri Lanka or China are of a higher quality, once packaged and marketed as "Made in Azerbaijan", tea imported from Azerbaijan has a certain appeal to consumers and is able to fetch good prices, possibly even higher than for packaged tea from Sri Lanka or Kenya (Figure 7.4).

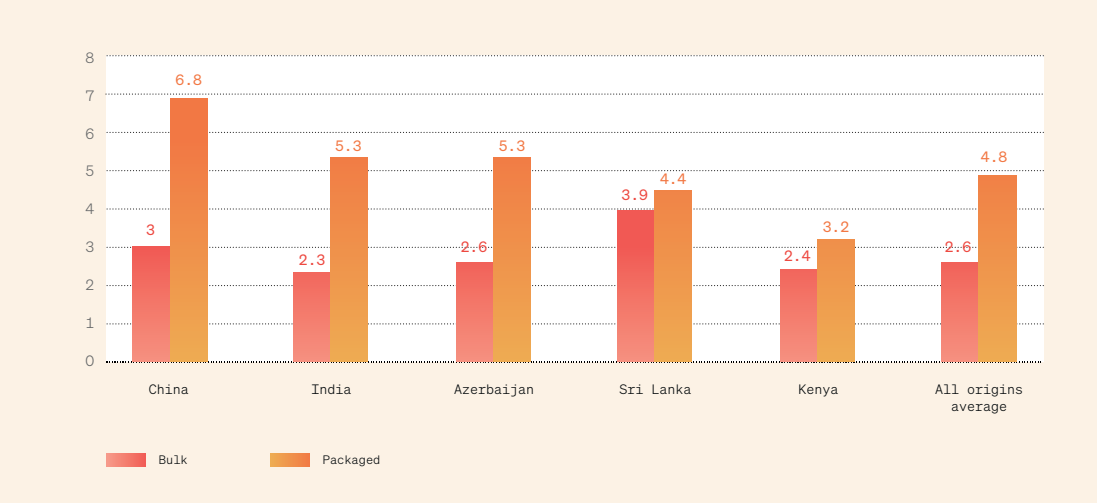

Figure 7.4
Average import price (USD/kg) in Russia for bulk and packaged tea

SOURCE: Trade Data Monitor (TDM). 2019. Cited 12 May 2021. www.tdmlogin.com/ tdm/index.html.

7.2 TARIFF POLICY

As Azerbaijan is not a member of the World Trade Organization (WTO),[31] the country is, in practice, able to fully control its tariff policy. The Government of Azerbaijan recently adopted export subsidies for some agricultural products, however they do not include tea. Currently, tariff rates for different categories of tea and its related products range between 0.5 and 15 percent (Figure 7.5) with the average tariff rate for tea around 11.1 percent (lower than the global average of 13.1 percent).[32]

It is important to note that a much lower tariff rate of 0.5 percent (ad valorem) applies in the case of the black tea imported in bulk by a tea processing company that has its manufacturing plant within the territory of Azerbaijan. This is mostly done to stimulate the domestic processing industry which, as mentioned, markets significant quantities of imported tea blended with domestically produced tea both in the country and in exports markets. To benefit from this tariff reduction, the company has to have a certificate on adopting international standard ISO-9002 and a certificate (given by the local tax administration and the State Centre of Standardization and Metrology that determines the share of local tea in the final made tea.

31 Although Azerbaijan applied for WTO accession in 1997, the membership negotiations are still ongoing.
32 Source: Pitney Bowes Duty Calculator. www.dutycalculator.com.

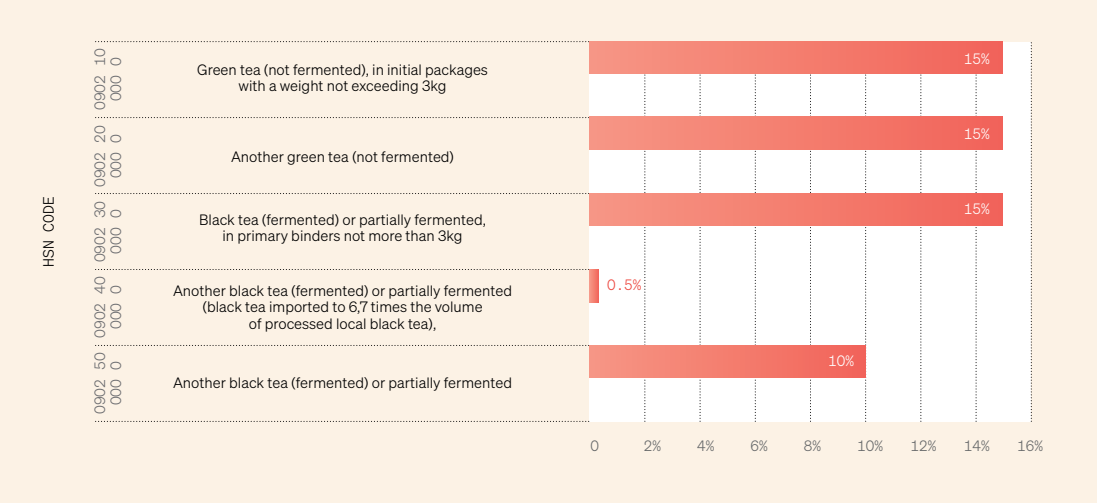

Figure 7.5
Tariff rates (ad valorem) by Harmonized System code for tea

SOURCE: Authors based on data obtained from the State Customs Committee of the Republic of Azerbaijan. Cited June 2021. https://customs.gov.az/en.

It should also be noted that Azerbaijan signed a free trade agreement with some of the former Soviet Union states (Russia, Ukraine, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Moldova and Belarus) and tea and related products can be traded (both imported and exported) freely between these countries without the application of custom duties.[33] This represents an advantage for Azerbaijani processors exporting to Russia, however in absolute terms it benefits Russian tea exporters to Azerbaijan more (in 2019, Russia imported USD 2.5 million worth of tea from Azerbaijan, but exported USD 4.2 million to the country).

7.3 TRADE ROUTES

An important factor when considering the net trade of any country, very relevant to Azerbaijan, is the recognition that many exports from tea origins into the target area are trans-shipped overland for a variety of reasons, including: sanctions, civil unrest, lack of infrastructure, trading relationships,[34] consolidated freight or adherence to specific policies.[35]

In particular, as regards Azerbaijan and neighbouring Turkey, the impact of such factors can be seen with exports of tea from India to Azerbaijan via Iran, and with Turkish imports of Sri Lankan tea which are surreptitiously but voluminously re-exported to the Syrian Arab Republic. This is a reflection of the difficulty of direct imports and with payments in the latter.

33 For more information see the Agreement on the Creation of a Free-Trade Area at: https://www.wipo.int/edocs/lexdocs/treaties/en/ftacis/trt_ftacis.pdf and https://www.wto.org/english/thewto_e/acc_e/geo_e/WTACCGEO4A1_LEG_24.pdf

34 Special trading relationships exist where barter exists or where some incentive, formal or informal, is perceived. For example, a legal incentive is provided by the Dubai Tea Trading Centre which offers duty free blending and packing for any international company.

35 Some teas are trans-shipped through a country with favoured status to the end market to avoid tariffs/duties or sometimes to avoid an ingress point with stricter import regulations.


LƏNKƏRAN ÇAYI
Ekoloji təbii məhsul
BUKET
QARA MƏXMƏRİ ÇAY
LANKARAN TEA
Environmental natural products
PEKOE FANNINGS
TEA - THIS IS A HOLIDAY THAT, IT IS ALWAYS WITH YOU
TİBET ÇAYI
LANKARAN TEA
Tibetica
250 g
ORGANIK
ECOLOGICAL NATURAL PRODUCT

Chapter 8
Policy

8.1 STRATEGIC DIRECTIONS FOR THE TEA SECTOR

The Republic of Azerbaijan's current agricultural strategy – *the Strategic Roadmap for the manufacture and processing of agricultural products in Azerbaijan* (the Roadmap) adopted in 2016 – identifies tea production as a subsector of particular significance for the country to be developed in the coming years.

Most of the tea plantations in Azerbaijan were either destroyed and/or replaced with other crops following the socioeconomic changes of the 1990s, unlike in the case of Georgia, and the current tea sector policy is oriented towards new tea plantations rather than rehabilitation of the existing ones. At present, the development of the country's tea sector is governed by the Azerbaijan State Program for the Development of Tea Industry (2018–2027), approved by an executive order of the President of Azerbaijan in 2018. The programme aims for an increase of the tea productive area of 3000 ha (from 1100 ha in 2018) and sets a production target of 8500 tonnes by 2027 (compared to 900 tonnes in 2018), which will represent around 10–12 percent of domestic consumption.

To achieve its objectives, the programme foresees the following measures:

I. **institutional measures:** improving the regulatory framework, adapting to international standards, encouraging cooperation, introducing insurance mechanisms;
II. **strengthening the scientific and human resource potential:** improving the material and technical base of scientific institutions, training industry specialists in specialized universities and secondary specialized educational institutions, creating new varieties of tea, implementing the results of agro-technical research;
III. **improvements in infrastructure:** creation of certification laboratories, acquisition of international accreditations, bringing new suitable land into cultivation, construction of new water reservoirs, reconstruction of existing ones, improved connectivity to water, gas and electricity of tea processing enterprises;
IV. **public support measures:** encouraging the creation of large farms, creating advisory services for farmers, supporting the creation of specialized enterprises for growing cuttings (for vegetative propagation), encouraging the introduction of advanced irrigation technologies, supporting the creation of new processing enterprises, expanding the range of tea products.
V. **marketing and export promotion:** posting information about local products on the portals of a unified state database, supporting the activities of local producers in international markets.

This comes in addition to a number of large infrastructure projects that are planned and which, although not directly related to the tea sector, are expected to help achieve the set objectives. Among others, this includes the construction of a second Vilyashchay reservoir, as well as of the Boladichai and Viravulchay reservoirs.

The Roadmap within the framework of Strategic Goal No. 2 – strengthening the potential for agricultural production in the value chain – recognizes the potential for export growth and prescribes the expansion of tea plantation areas. As such, one of the priorities of the Roadmap was the improvement of the policy of state support for agricultural producers (priority 8.4), which provides for direct financing or concessional loans for the establishment of perennial orchards, including tea plantations.

While current objectives of the tea development programme may seem relatively modest compared to the significantly larger area dedicated to tea cultivation in the 1980s and earlier, it should be noted that tea now has to compete with a number of crops in Azerbaijan's tea producing region. These are often more financially profitable per unit of land and choosing tea as an investment option among other alternatives by farmers is far from being self-evident.

Additionally, in order for any state policy measures to be successful in achieving their desired objectives, the following critical aspects, as identified by our analysis, should be taken into consideration:

- Little has remained from the plantations conducted during Soviet times, therefore only new plantations are currently considered to revive the tea sector (although it has been reported that around 500 ha of tea plantation in the Astara district are suitable for rehabilitation and could produce good quality tea).
- Given the impossibility of rainfed cultivation, new plantation investments will need to consider additional costs related to irrigation equipment.
- Quality improvement will be requited at leaves' collection stage (so far, the absence of price incentives and main focus on volumes affects quality).
- The impact of climate change on i) tea growing areas; and ii) the quality of leaves due to decreased leaves' moisture (loss of subtropical qualities in some tea production areas) has to be factored in.
- There is an urgent need to invest in the development of nurseries with vegetative propagation (and not seeds) to support a good planting material base as the homogeneity of planting material's varieties is now a major quality issue.
- The potential for GIs is limited (compared to Georgia) and based mostly on the narrative around the Lankaran mountain "terroir" (based on environmental and cultural factors).

8.2 SUBSIDIES TO TEA PRODUCTION

In June 2019 a new system of subsidies to agricultural production was introduced that replaces a number of non-sector specific subsidies that previously applied to a variety of agricultural inputs (fertilizer, machinery, fuels etc.) across most crops.

The new subsidy system, outlined in the "rules for subsidizing agricultural production" was approved by presidential decree in 2019 and provides for a "flat" subsidy per hectare, and the payment amount varies depending on the crop. Payment amounts were determined by a decision[36] of the Agricultural Subsidy Council, that consists of representatives of various government bodies. The subsidy for each crop is calculated by multiplying the base subsidy amount of, set at AZN 200, by each crop's respective "subsidy ratio" (Table 8.1).

36 2 September 2019.

In accordance with these new rules, new tea plantations in Azerbaijan are expected to benefit from a net payment of AZN 700 (USD 410) per hectare per year for the first seven years of planting. Thereafter, the subsidy is reduced to AZN 240 (USD 140) per hectare per year while for new plantations established before 2019 the AZN 240 subsidy applies independently of the age of the plantation. These new subsidies are to be enforced as of 2020 to stimulate new tea plantations as they reach full productivity only 7–10 years after planting. Moreover, cooperatives of over 50 ha are entitled to an extra 10 percent on top of the base amount of the tea subsidy. The current subsidy system provides tea with the second-highest amount of financial support after orchards.

While our estimates suggest that the total cumulative subsidy amount of AZN 4900/ha (USD 2900/ha) over seven years accounts for about 50 percent of the total required investment for a new tea plantation, risks to smallholder engagement still remain high considering the relatively low returns. With little access to microfinancing and prices largely determined by a few medium and large companies that determine prices (currently allowing for only modest margins), smallholders may very well not be able to fully benefit from the programme. This could result in the sale of land to larger producing companies and even though it could contribute to reaching production targets, it may not produce the desired positive socioeconomic impact envisaged for rural populations.

As with Georgia, the small size of plots is clearly a problem and must be aggregated in some form in order to become sustainable agricultural entities in the context of the tea value chain. A cooperative model could be a feasible solution, as is found in other regions where the need to match the yield of individual harvesting occasions to made tea manufacturing capacity has forged this design. The most effective design of this type exists in the KTDA (Kenya Tea Development Authority) whose model could work in Azerbaijan.

Table 8.1
Subsidy ratio and amount by crop (in AZN) under the new 2019 subsidy system

Crop		Subsidy factor	Subsidy amount (manat / ha)
Wheat		1.0	200
Rice		1.4	280
Soy		1.3	260
Sorghum		0.5	100
Other cereals and legumes (barley, rye, millet, rhubarb, peas, lentils, etc.)		0.8	160
Buckwheat		0.9	180
Peanut		0.9	180
Saffron		2.0	400
Sunflower		1.0	200
Tobacco		1.4	280
Cotton		1.1	220
Sugar beet		1.4	280
Potato		1.2	240
Vegetables		1.2	240
Melons		1.1	220
Other plants		0.5	100
Grapes	During the first 4 years after planting	3.0	600
	After year 4	1.2	240
Tea	During the first 7 years after planting	3.5	700
	After year 7	1.2	240
Intensive orchards	During the first 4 years after planting	4.0	800
	After year 4	1.2	240
Intensive orchards	During the first 4 years after planting	2.0	400
	After year 4	1.2	240
Other orchards		1.2	240
Berries		1.0	200

SOURCE: Agrarian Credit and Development Agency (AKIA). Cited June 2021. http://akia.gov.az/en/haqqimizda/.

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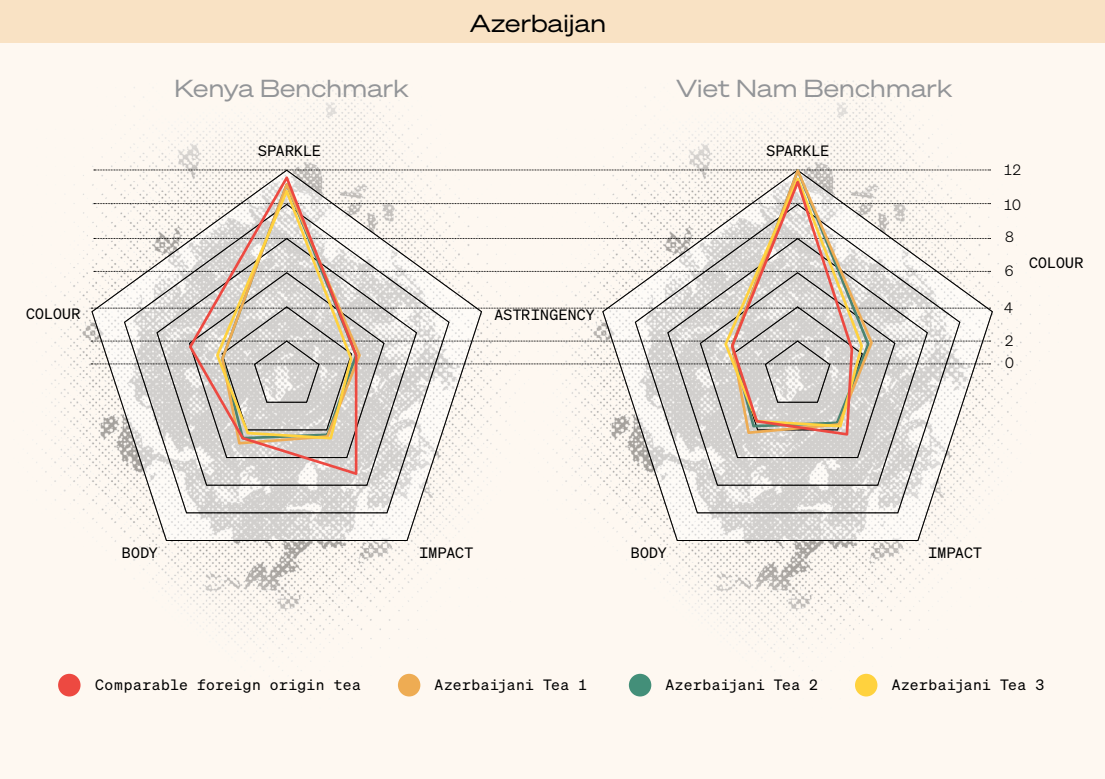
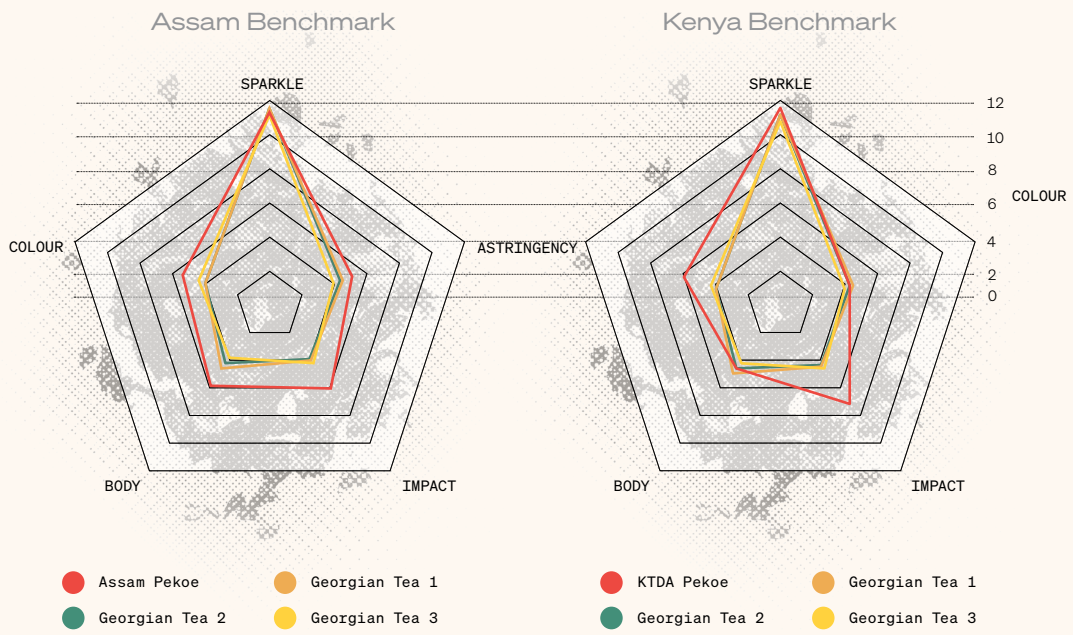
Annexes

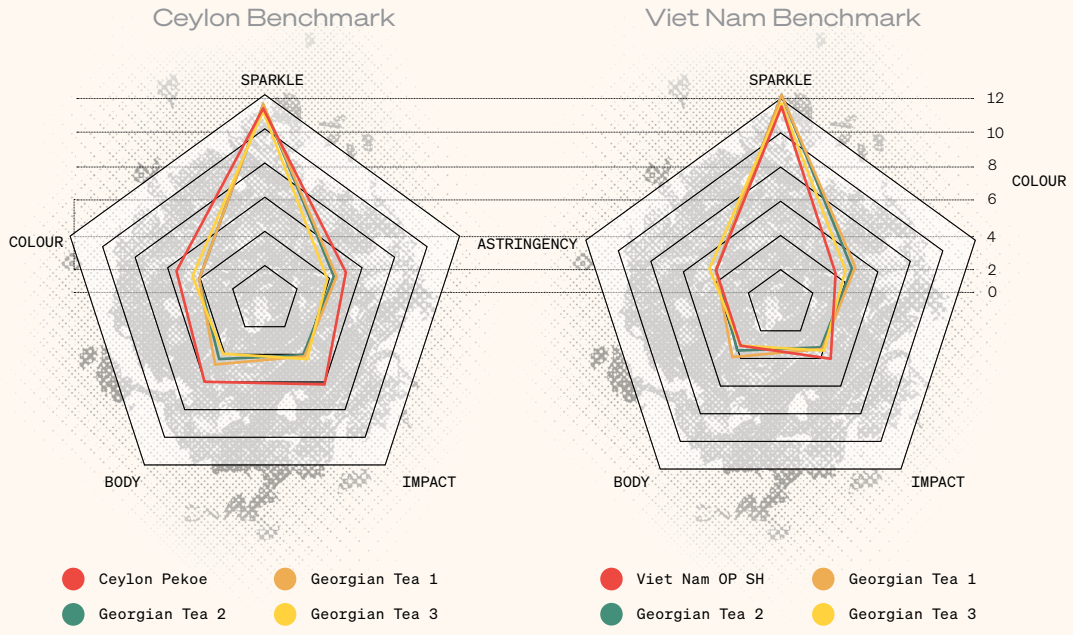
Annex I

Comparative sensory tea analysis



Georgia





SOURCE: Organoleptic analysis by team's tea quality expert.

LLC “Tea Factory Sun Tea ”

Company name and legal form	Sun Tea Tea Factory LLC , part of Azersun Holding
Established	06/30/2003
Legal address	AZ 1021 , Azerbaijan Republic, Baku, Sabuchinsky district, pos. Bakikhanov St. V.Akhmedova 12N.
Actual address of the activity and details	AZ 1021 , Azerbaijan Republic, Baku, Sabuchinsky district, pos. Bakikhanov St. V.Akhmedova 12N.
Telephone	(+994 12) 496 6001 ; (+994 12) 4966614
Website	www.azersun.com
Email	info@azersun.com
Produced products	black and green tea. Brands - “ Azerçay ”, “ Final ”, “ Maryam ” , “ Berqa ” , “ P ürranqi ”
Product certification	ISO 9001 : 2008 , ISO 14001, T SO 18001, ISO 22000, certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygienic certificate of the Republican Ministry of Health of the Republic of Azerbaijan
Equipment used at the enterprise	Italy, Germany, India
Countries to which products are exported	Russia, Iraq, Georgia, USA, Turkmenistan, Tajikistan
Number of employees	206
Production capacity	15 thousand tonnes of tea

LLC Astara Tea

Company name and legal form	Astara Chai LLC
Established	09/26/2012
Legal address	AZ0714, Azerbaijan Republic, Astara district, Kakalos village
Actual address of the activity and details	AZ0700, Azerbaijan Republic, Astara district, Chayoba village (rice mill is located in the village of Kakalos, Astara region
Telephone	(+994 25) 224-21-79; (+994 12) 464-82-53
Website	www.astaratea.az
Email	info@astaratea.az
Produced products	Black tea (Mehmeri, Extra, Pürring, Classic) under the Astarachay and Aztia brands
Product certification	ISO 9001, ISO 14001, ISO 18001, certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygienic certificate of the Republican Center for Hygiene and Epidemiology of the Ministry of Health of the Republic of Azerbaijan, organic certificate from the company Lacon (Germany) about not using any tea plantations any chemical fertilizers
Equipment used at the enterprise	Production of Japan, South Korea, Germany
Countries to which products are exported	Germany, Italy, Japan, Russia
Number of employees	630

LLC “Assam"

Company name and legal form	As Sam LLC
Established	01/05/2010
Legal address	AZ 4200, Azerbaijan Republic, Lankaran region , Sutamurdov village
Actual address of the activity and details	AZ 4200, Azerbaijan Republic, Lankaran region, Sutamurdov village
Telephone	(+994 25 25) 5 20 16
Website	www.beta.az
Email	info@beta.az
Produced products	Tea brand "BETA", "Champion"
Product certification	ISO 9001, 9002, 2000 , certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygiene certificate of the Republican Center for Hygiene and Epidemiology of the Ministry of Health of the Republic of Azerbaijan
Equipment used at the enterprise	German production
Countries to which products are exported	Germany
Number of employees	405
	It is an affiliate of the Turkish company Beta Gida

Farm "Yashyl tea"

Company name and legal form	OOO "Yashyl tea"
Established	12/26/2006
Legal address	AZ 4219, Istisu village, Lankaran region of Azerbaijan Republic
Actual address of the activity and details	AZ 4219, the village Istisu Lankaran region of Azerbaijan
Telephone	(+ 99425) 25 5 1530 Fax : (+ 994 171) 65 554, (+99425)
Website	Lenkaran-Aqro@mail.ru
Email	www.yashilchay.az
Produced products	Green tea leaf, black tea, etc.
Product certification	Certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygienic certificate of the Republican Center for Hygiene and Epidemiology of the Ministry of Health of the Republic of Azerbaijan
Equipment used at the enterprise	Production of China
Number of employees	40
Area of tea plantations	71 hectares
Cultivated varieties	Colchis, Azerbaijan-1, Azerbaijan-2.
Irrigation system	Closed, up to 12 atmospheres pressure. The equipment used is “ Klaas ”, “ Deutis ”, “ Zetor ”.
	It has its own specialized tea shop in the city of Lankaran. Under the brand “Lankaran tea”, 16 types of ecologically pure tea are produced: “Buket çayı”, “Feyxoa çayı”, “Gül,“ Zencefi l ”,“ Zencefil Qold ”,“ Premium ”çayı,“ Ekstra ”,“ Ekstra N1 ”, “Naneli çay”, “Keklikotulu çay”, “Xan çayı”, “Pürrengi” çayı, “Qara mexmeri” çayı, “Tibet” çayı, “Narın”, ”Limonlu” .

LLC “Jahan Tea"

Company name and legal form	LLC “ Jahan Chai”, is a part of “ Jahan Holding”
Established	25/12/2006
Legal address	AZ 7000 , Azerbaijan Republic, Nakhchivan Autonomous Republic, Nakhchivan city, st. Ajemi 2/9
Actual address of the activity and details	AZ 7000, Azerbaijan Republic, Nakhchivan Autonomous Republic, Nakhchivan city, st. Aziz Aliyev 2
Telephone	(+994 36 5) 4 5 60 26 ; (+994 36 5) 4 5 92 92
Website	www.cahan.az
Email	tea@cahan.az
Produced products	Packaging black and green tea
Product certification	ISO 9001: 2008, ISO 14001, TSO 18001, ISO 22000, certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygienic certificate of the Republican Ministry of Health of the Republic of Azerbaijan
Equipment used at the enterprise	Italy, Hungary, USA, Turkey
Trademarks	TUDOR , Araz Tea
Number of employees	35

OJSC "Lankaran Tea-5"

Company name and legal form	OAO "Lankaran Tea -5"
Established	2005
Legal address	AZ 4216 , Azerbaijan Republic, Lankaran district, Gaftoni village
Actual address of the activity and details	AZ 4216, Azerbaijan Republic, Lankaran district, Gaftoni village.
Telephone	(+994 25 25) 6 3337 ; (+994 25 25) 63,338
Website	rashidquliyev@mail.ru
Email	tea@cahan.az
Produced products	Black and green tea
Product certification	With the certificate of conformity of the State Committee for Standardization, Metrology and Patents of the AR
Equipment used at the enterprise	Georgia
Trademarks	to Lankaran Cayi, to Lankaran Buketi , Farman Cay
Number of employees	29

LLC "Zagatala Tea"

Company name and legal form	OOO "Yashyl tea"
Established	23/05/2002
Legal address	AZ 6202 Republic of Azerbaijan, Zagatala region, Zagatala city, 89 Avenue of Azerbaijan
Actual address of the activity and details	AZ6202 Republic of Azerbaijan, Zagatala region, Zagatala, 89 Avenue of Azerbaijan
Telephone	(+ 99424 22) 5 2858
Website	–
Email	–
Produced products	Black velvet tea
Product certification	Certificate of conformity of the State Committee for Standardization, Metrology and Patents of the Republic of Azerbaijan, hygienic certificate of the Republican Center for Hygiene and Epidemiology of the Ministry of Health of the Republic of Azerbaijan
Equipment used at the enterprise	Georgia
Number of employees	6

Glossary

Term	Definition
Adaptation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to the expected climate and its effects.
Adaptive capacity	The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Blending	The process of putting teas of different characteristics together to form a final product. The golden rule of tea blending is to achieve consistency in taste, while reflecting nuances of its different components. Classically, tea blending is associated with black tea production.
Business-as-usual	The state against which change is measured. In the context of transformation pathways, the term "baseline scenarios" refers to scenarios that are based on the assumption that no mitigation policies or measures will be implemented beyond those that are already in force and/or are legislated or planned to be adopted.
Climate	Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.
Climate change	Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.
Climate impacts	Information about the observed impacts of climate variability and change on socioecological systems, e.g. number of people displaced due to floods, to help track the climate context where adaptation strategies are being implemented.
Climate parameters	Information about observed climatic conditions, e.g. temperature, rainfall, and extreme events, that help track the climatic context where adaptation strategies are being implemented.
Climate projection	A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases (GHGs) and aerosols, generally derived by using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized. See also climate scenario.
Climate scenario	A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships, which has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as the observed current climate. See also baseline/reference, emission scenario, mitigation scenario, Representative Concentration Pathways (RCP), scenario, shared socio-economic pathways, socio-economic scenario, SRES scenarios, stabilization, and transformation pathway.

Climate-smart agriculture (CSA)	An approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions, where possible (FAO, 2017).
CTC Tea	CTC or crush, tear, and curl production is one of the two main methods of tea manufacture together with Orthodox tea manufacture. All five steps of Orthodox processing are performed, but much more rapidly and in a limited fashion. CTC was invented specifically for the black tea industry, in an effort to save time (a single batch of tea otherwise can take over a day to produce) and money, but produces teas of lower quality.
Deforestation	Conversion of forest to non-forest. For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change, and Forestry (IPCC, 2000). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC, 2013) and the report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).
District	Azerbaijan is administratively divided into the following subdivisions: 59 districts (districtlar; sing.– district); 11 cities (şeherler; sing.– şeher); 1 autonomous republic (muxtar respublika). The districts are further divided into municipalities (Belediyye).
Drought	A period of abnormally dry weather long enough to cause a serious hydrological imbalance.
Drying	Drying is the final stage of manufacturing of tea. During drying the moisture is removed from the fermented leaf particles in a suitable chamber by vaporization of water in a stream of hot air as the carrier fluid.
Exposure	The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources; in addition to infrastructure or economic, social, or cultural assets in places and settings that could be adversely affected.
Extreme weather event	An event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as, or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g. drought or heavy rainfall over a season).
Fermentation	This is the process of oxidizing green tea leaves to make black and oolong teas. The green leaves are spread out and exposed to the air for three to four hours. During this chemical process, the leaves turn red-brown — this gives fermented tea its dark appearance. All fermented teas undergo a similar enzyme-oxygen reaction; however, the duration and temperature at which the reaction occurs are critical to the final product. Fully oxidized ("fermented") leaves become black tea, whereas partially oxidized ("semi-fermented") leaves produce Pouchong and the various Oolong styles of tea.
Green tea leaf	The "raw" tea leaf before it is processed into black, green or other types of tea (the latter being referred to as made tea).
Greenhouse gas (GHG)	Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the earth's surface, the atmosphere itself, and by clouds.

Impacts (consequences, outcomes)	The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather and climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being; ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes, and can be adverse or beneficial.
Infilling	The process of increasing field densities by adding bushes to fields already planted with tea.
Land Use	Land use refers to the total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g. grazing, timber extraction, conservation and city dwelling). In national greenhouse gas inventories, land use is classified according to the IPCC land use categories of forest land, cropland, grassland, wetland, settlements, and other.
Life cycle assessment (LCA)	Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product or service throughout its life cycle. This definition builds from ISO (2018).
Made Tea	Tea that has undergone processing (either black, green or any other kind).
Mitigation (of climate change)	A human intervention to reduce the sources or enhance the sinks of GHGs.
Orthodox tea	Orthodox tea refers to loose-leaf tea that is produced using traditional (or Orthodox) methods of tea production, which involve plucking, withering, rolling, oxidation/fermentation and drying. It is the dominant processing method in Azerbaijan and Georgia.
Representative concentration pathways (RCP)	Scenarios that include the time series of emissions and concentrations of the full suite of GHGs and aerosols and chemically active gases, as well as land use/land cover.
Representative concentration pathway 6.0 (RCP6)	A pathway that describes trends in long-term, global emissions of GHGs, short-lived species, and land-use/land-cover change leading to a stabilization of radiative forcing at 6.0 Watts per square meter (Wm−2) in the year 2100 without exceeding that value in prior years [Masui 2011].
Representative concentration pathway 8.5 (RCP8.5)	One high pathway for which radiative forcing reaches greater than 8.5 W m-2 by 2100 and continues to rise for some amount of time (the corresponding ECP assuming constant emissions after 2100 and constant concentrations after 2250).
Resilience	The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (Arctic Council, 2013).
Rolling	This process twists and breaks the leaves to release the natural juices. This action activates enzymes that help to initiate fermentation. Rolling also gives the leaves a curled appearance.
Sorting	Tea sorting can help remove physical impurities, such as stems and seeds. Using sorting equipment to improve tea production efficiency is very common in tea processing plants, especially in black tea processing. A colour sorter may also be used to classify final product grades according to colour and shape.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Withering	The process of allowing the fresh leaves to dry. Some producers have special withering rooms, whereas others wither their tea in the open air.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