

Master's Thesis - master Sustainable Development

How the asparagus industry has led to sustainability and socio-economic issues the region of Ica



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List of Abbreviations

AAA - Autoridades Administrativas del Agua
AGAP - Association of Agricultural Producers Guilds of Peru
ALA - Autoridades Locales de Agua
ANA - Autoridad Nacional del Agua
BRC - British Retail Consortium
CAMPO - el Sindicato de Campo
CCP - Critical Control Points
CEN - European Committee for Standardization
CGTP - General Confederation of Peruvian Workers
CNTPE - National Council for Labor and Employment Promotion
COPRI - Comisión de Promoción de la Inversión Privada
DIGESA - Dirección General de Salud Ambiental
FDI - Foreign Direct Investment
FENTAGRO - National Federation of Agricultural Workers
FNV - Federatie Nederlandse Vakbeweging
GAP - Good Agricultural Practice
GMP - Good Manufacturing Practices
HACCP - Hazard Analysis and Critical Control Point
ICM - Integrated Crop Management
ILO - International Labor Organization
IMF - International Monetary Fund
IPC - Integrated Pest Control
ISO - International Organization for Standardization
IWRM - Integrated Water Resource Management
JUASVI - junta de usuarios de aguas subterráneas del valle de Ica
Junta - Junta de Usuarios
SDG - Sustainable Development Goal
NGO - Non Government Organization
OECD - Organization for Economic Co-operation and Development
PETACC - Tambo-Ccaracocha Project
PLANTA - el Sindicato de Planta
PTPA - United States-Peru Free Trade Agreement
QA - quality assurance
QMS - Quality Management System
SENASA - Servicio Nacional de Sanidad y Calidad Agroalimentaria
Sindicatos - workplace specific unions
SOP - Standard Operating Procedures
UNECE - United Nations Economic Commission for Europe
UNSCC - United Nations Standards Coordinating Committee
WTO - World Trade Organization

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Abstract

This research analyzes the Peruvian asparagus industry and its influence on the access of water and land in the Ica region.

Firstly the actors and value chain were analyzed. The public actors consist of the water authorities and COPRI. The water authorities are the ANA, ALA, local water authorities and the Junta, who regulate and enforce. Private actors are investors, agro-exporters, agricultural workers, and small farmers. The investors and agro-exporters are considered wealthy, while the workers and small farmers have a low socio-economic status (Schwarz, 2016). The Peruvian asparagus industry contains the agro-exporters' value chain, and the small farmers' value chain. The agro-exporter's value chain is fully integrated and optimized (Schwarz, 2016). The chain of the small/medium farmers is not integrated and each activity is done by a different actor.

Different regulations were analyzed to answer the second sub-question. The most important regulations are the trade regulations, water regulations, and land ownership regulations. Trade regulations have allowed foreign investors to acquire land and water. Water regulation allowed an unlimited extraction of water. Land regulations allowed for large land acquisition and agricultural activities (Gomes, 2015).

Sustainability issues in Ica were analyzed to answer the third sub-question. Water scarcity issues are affecting Ica's ecosystems due to agricultural water extraction (Hepworth, 2010). Surface water is used, but the reliability is low as rivers are dried up during the dry periods. Competition leads to pressure to reduce production costs and to increase crop quality (Diaz Rios, 2018). Agro-exporters have gained a preference position which creates inequality between them and the peruvian people.

The fourth sub-question looks at socio-economic issues, such as the underpayment and low working conditions for workers. Despite a low unemployment rate, many workers are at risk for losing their jobs, caused by unfair labor contracts. Covid-19 related issues have exposed how much power the employers have over their workers, where employers forced their workers to resume working despite health hazards and poor hygiene situations.

The fifth sub-question is answered through analyzing sustainability strategies. Sustainable resource use strategies include water use efficiency, crop switching, regulation of water use, aquifer replenishments, and water import. Working conditions strategies include regulating working conditions and wages, and supporting labor unions (Adam, 2018).

In order to answer the main research question and to improve the access to land and water in the Ica region, four groups should be helped. The small asparagus farmers, the population of Ica, and the indigenous communities are best helped with better and more secure access to water and land. The agricultural workers are best helped with better wages and working conditions.

1. Introduction

1.1 Introduction

Water is an important resource for the basic needs of humans, as it is needed to sustain the health, livelihood, and productivity of people. The quantity and quality should be adequate in order to maintain a high quality of life for people. Clean water and good sanitation is a high priority for the United Nations, as they have dedicated two of its sustainability goals towards food security, which are the Sustainable Development Goals (SDGs) (SDGNederland, 2021). The sixth sustainability goal is named Clean water and sanitary, it aims to ensure that everyone has sustainable access to water and sanitary services before the year 2030. This sustainability goal is important as high water access will also affect the other sustainability goals positively (SDGNederland, 2021). Especially in places with low water access, reaching this sustainability could greatly improve the livelihood of vulnerable people. Besides for basic human needs, water can also be used for economic activities such as the cultivation of crops. These crops can be used to feed the people in the region, which improves the living conditions of the region. However, when the produced food is exported to different places, the production has not contributed to the food availability of the region. Local resources were used to produce food to feed the people in other regions, while the local people were denied the opportunity to use these resources for themselves (Hepworth, 2010).

In the Peruvian region Ica land and water is used by multinational companies of foreign origin to produce asparagus for the international market, these asparagus are exported to western countries for consumption. The asparagus are cheaply produced in Ica, and sold for a high price by retailers to western consumers (Hepworth, 2010). The way in how water and land is used has a lot of resemblance with resource grabbing, more specifically land and water grabbing. Resource grabbing is the large-scale acquisition of resources, which are used for production activities that benefit western countries (Roman, 2014).

The high production level of asparagus in the Ica region has led to a high demand for water and land. However, the Ica region had little arable land when the asparagus production started, due it being a desert region with dry lands. In order to make the land suitable for the cultivation of asparagus the irrigation of large plots of land was needed (Hepworth, 2010). Investments were made to increase the underground water extraction, which allowed for pumping large amounts of water from the underground aquifers. This increased the amount of arable land in the Ica region, making the region suitable for intensive asparagus production. However, this extra land and water is not used for supporting the local population of Ica, instead it is used for the producer's own gain (Hepworth, 2010). A lot of profit is made from producing asparagus Ica, making water a valuable commodity in the region. This has increased the price of water in the region, making water less affordable for the local population.

Besides water, this research also looks at the economical impact of the asparagus industry in Ica, which is related to SDG 8, decent work and economic growth (SDGNederland, 2021). This sustainability goal aims to stimulate sustainable economic growth that provides jobs with reasonable wages and working conditions. These jobs should not harm the environment, and child labor and

(modern) slavery should be combated (SDGNederland, 2021). Countries should support economic activities that are sustainable and inclusive, in order to have sustainable economic growth.

The economic growth in the Ica region is the result of the large scale of export of agricultural products. However, whether the activities that are leading to this economic growth are seen as sustainable remains debatable. It can be argued that the export of resource intensive products is stripping the region from its resources, which threatens the livelihood of the local population.

The export of products made from local resources is not unique and it is occurring worldwide in many places with different types of resources. This process is called extractivism, which is where natural resources are extracted in a region in order to sell them on the world market (Acosta, 2012). Many of these exploitations are located in developing countries, and are financed and operated by western multinational companies. Extractivism has neo-liberal origins where the transaction of resources is considered as a driver for economic growth for both countries. For developing countries it is seen as an opportunity for economic growth through foreign direct investments (FDI) that enables economic activities in the country that improves the living conditions in the developing country (Acosta, 2012). The local communities gain economic wealth from this in the form of labor opportunities and wages. For the developed country, extractivism is seen as an opportunity to have access to products that are too hard or expensive to produce in the developed country.

From a neo-liberal perspective, extractivism is seen as a win-win situation for both the exporting and importing countries, as they both profit from the exchange (Acosta, 2012). However, in practice there is an inequality between the advantages for the importing country and the exporting country, where the advantages of the importing country are much higher than the advantages of the exporting country.

As many of the producing activities are located in the exporting country, the burdens of the production is on the people in this country. This means that their access to resources gets reduced because of the activities. In Ica the asparagus production has led to a high level of water extraction. The water extraction has surpassed the renewal rate of the freshwater sources, which means that the quality and quantity of the water is diminishing in the region. Besides Ica, other Peruvian regions are also suffering from water scarcity issues as a result of the high water extraction of its industries. The access to water has deteriorated for Ica's water users, which harms mostly the vulnerable water users. Basic water services have become more expensive, and more effort is needed to draw water from water access points (Hepworth, 2010). On the other hand, the big asparagus producers are not hampered in their access to water, and can continue with their water intensive activities. They make enough profit to cover the costs of higher water prices and expensive equipment. Besides this, their contribution to Ica's economy has gained them priority access to land and water, which is of much better quality than the land and water that is available for Ica's local population.

The inequality of access to land and water has led to protests of the local population, as the government has considered the interests of the foreign companies more important than the interests of local people (Hepworth, 2010). Since the introduction of the international asparagus producers sustainability issues have started to occur in the region, which has harmed the people in

the region. However, the local people were not the ones who wanted asparagus production in the Ica region.

During the 1990s neoliberal ideas became popular in many western countries, and many international financial institutions became supporters of these ideas. The dominant idea was that free markets, trade liberalization, and privatization would lead to long-term economic growth and the reduction of poverty. In order to improve the situation of poor countries, structural adjustment programmes (SAP) were initiated by the IMF and the World Bank to reform the country's economic structure according to these neoliberal ideas (Hepworth, 2010).

Many of these SAPs were based on the principles of the Washington consensus, which was a concept that introduced ten principles in how economic and political reforms should be prescribed. It was believed that the principles would help struggling developing countries to build a stable economy, and to create industries and markets that were stable and productive (Hepworth, 2010). In general the principles of the Washington consensus were in favor of opening the country's markets for trade and investments, which would allow the local economy to grow and expand. Key to this was the implementation of an export oriented economic strategy that would lead to high economic activities and welfare.

The IMF and World Bank are international financial institutions who are committed to reducing poverty in the world, and provide loans and financial help for struggling developing countries. Both institutions believed that the principles of the Washington Consensus were essential for developing countries in order to become economically stable, and that it would lead to a proper management of the country's funds (Hepworth, 2010). In order to steer developing countries into the right direction the IMF and World Bank had made requirements for applying for financial support and loans based on the principles of the Washington consensus. The inclusion of these principles would increase the success rate of the loans, which would guarantee that the country is spending the funds properly. It also helps safeguard the financial investments of the institutions, as countries are using an approved development method to improve their situation.

During the 1990s many Latin American countries were struggling with their financial situation as a result of the debt crisis in the 1980s. In order to solve these crises intervention was needed, the IMF and World Bank were willing to provide funds if the countries agreed to reform their economic and political structure. Peru had during this period an election that resulted in a new political leader that took office as president in the country (Hepworth, 2010). The newly elected president was the inexperienced Fujimori who promised thorough political reforms, which were realized when he made new arrangements with the IMF on Peru's loans and debts. As a result the Peruvian government opened up its market and allowed foreign companies to operate in the country. Many government institutions and activities became privatized, such as utility services and enforcement. Also legislation on ownership became privatized, allowing foreign companies to own large plots of land to exploit.

These neoliberale governmental reforms have led to many foreign economic activities to take place in the region. Western investors saw this as a chance for economic prosperity and started to investigate the potentials of Peru. In the Ica region the investors found a plentiness of exploitable

resources, such as water and fertile land. The region had favorable circumstances to produce valuable agricultural export products on a large scale, this was important to attract investors as they value profitable businesses highly (Hepworth, 2010). Export focused asparagus production was found to be the most profitable business, and many international companies moved to the Ica region to produce asparagus. Over a short time asparagus production dominated the regional crop cultivation, and Ica became a major global producer of asparagus.

1.2 Societal background

Currently, Peru is the second largest asparagus producer in the world, behind China's production (Workman, 2019). Asparagus is Peru's third agricultural export product behind coffee and cacao, which makes it an important export product for the country's economy. A total 158 million KGs of asparagus is exported in 2020 with a value of \$488.6 million (Campos, 2021). Of the total of \$7,55 billion in exported agricultural products, the export of asparagus accounted for a 5,2% of the total agricultural net worth of Peru (Andina, 2021).

Research on the development of the Peruvian asparagus cultivation has been explored by the FAO, where successes and challenges were found that have formed the current asparagus production (Diaz Rios, 2018). Here it was suggested that the Peruvian asparagus industry still had challenges ahead in its competitiveness on the global export market. This thesis tries to look at how these challenges affect the sustainability and socio-economics of the asparagus industry, and how this can be improved in the Ica region.

Most of Ica's economic activities consist of export related industries such as resource extraction and agriculture (Hepworth, 2010). Ica has the desire to improve its economic position, and has the ambition to become a region of major importance. In the context of sustainability, the growth of the asparagus industry has both a positive and negative effect on sustainability in Ica. The positive effects are the socio-economic impacts, such as a higher employment rate for agricultural workers. In the last decades the employment rate in the agricultural sectors has increased with a growth between 6% and 25% since 2003 in export based crops such as asparagus (Diaz Rios, 2018).

As the demand for agricultural workers is based on the level of production, the wages of the workers are higher during economic high times (Achterbosch, 2014). This production level is dependent on the expected revenue for the season, and the size of the harvest. On the other hand, this will also happen when the sector experiences a bad period (Goméz, 2015). Producers will miss income as a result of unsold surpluses, and in order to prevent a lower revenue in the next period the production will be adjusted (Hepworth, 2010). The result is that the harvest is smaller, just as the demand for agricultural workers is. This research tries to look at how the asparagus industry is formed by these external market dynamics, and how it affects the sustainability and the socio-economics for the region of Ica.

When the asparagus industry of Ica improves its sustainability, it will help the asparagus industry to meet Peru's targets on the Sustainable development goals (SDG). The sustainable development goals are targets set by the UN that need to be met before the year 2030, in order to ensure a sustainable

future (SDGNederland, 2021). The sixth sustainability goal is a water related goal and is centralized around the access to it, in order to make this possible water sources need to be properly managed. Subgoals 6.4 and 6.6 are important for Ica's water management, as they are aimed at protecting and improving water sources. Subgoal 6.4 tries to improve the efficiency of water users, in order to reduce water scarcity caused by high water extraction. Subgoal 6.6 tries to protect and restore water based ecosystems, in order to ensure water services for everyone. The ecosystems need to be monitored in order to prevent degradation. Water based ecosystems include wetlands, rivers, lakes, groundwater and reservoirs.

The eight sustainability goal is a socio-economic related goal, and is centralized around sustainable economic growth and labor conditions. Subgoal 8.4 and 8.8 are important for sustainable growth and better labor conditions for Ica's asparagus industry (SDGNederland, 2021). Subgoal 8.4 tries to decouple economic growth from environmental deterioration through improvements in the efficiency and consumption of resources. Subgoal 8.8 tries to improve the working conditions of employees in companies and to protect the working rights of vulnerable workers (SDGNederland, 2021). Especially the rights of women and migrants needs to be ensured, as their health and safety is most at risk.

1.3 Scientific background

Identifying the issues of externally induced extractivism could help in achieving the goals of SDG 6 and SDG 8, as the knowledge on Ica's water management and socio-economics could prevent resource depletion and inequalities in the region. Water scarcity is specified as an indicator in SDG 6, and the occurrence of it can be seen as a lack of efficiency in water use (Mindlin, 2020). The need for improvements in efficiency could act as a social driver for both the consumers and producers in Ica to support sustainability in the value chain. Especially in a situation with scarce resources it is important to prevent the loss of resources, as both consumers and producers are dependent on it in order to sustain themselves (Mindlin, 2020).

High product quality standards lead to the rejection of lower graded products, which happens during the production and processing phases. Different solutions exist to prevent production losses, such as the introduction of secondary uses of rejected products (Kaur, 2020). For asparagus this could result in surpluses being processed into other products (Fuentes-Alventosa, 2013). Besides being an economic issue, food loss is also an environmental issue (Feedback, 2017). Resources that are used for the cultivation of asparagus are wasted when food loss occurs, which becomes a more serious problem when there is scarcity (James, 2015).

Water scarcity is an issue in Peru, as the popular Ica region is an arid region in a desert valley. Thanks to an extensive irrigation system that uses water from the Ica river and underground aquifers, the Peruvian agriculture is able to thrive in the region. The source of the Ica river comes from melting water of the Andes mountains, while the source of the aquifers come from seeping water of the mountains (Salmoral, 2020). The stream of the Ica river is dependent on the seasonal fluctuations over the year, with some periods where the river is dry. The underground aquifers are slowly filled at a fixed rate, as it takes a long time for seeping water to reach the underground cavities (Salmoral, 2020). The rate in which the seeping water fills the aquifers is much lower than what gets pumped

out, leading to a deficiency of water over time. This might cause problems in the future for the region's agricultural activities, if water becomes scarce when the underground sources become exhausted. When this happens, the different agricultural parties will be competing over the last few water sources to sustain their economic activities (James, 2015).

In the research of the NGO 'Feedback' it was explored on how economic uncertainty has affected the production of asparagus. This uncertainty can be caused by external market influences such as competition, changing relations between countries, disasters, and other unexpected disruptions. Many of these uncertainties will lead to price fluctuations, which will lead to a changing demand on asparagus. When a mismatch between demand and supply happens it could cause surpluses and production losses, which will lead to lower profits for the asparagus producer. In order to compensate for these profit losses companies could reduce the wages of employees or even fire them, which both will lead to the loss of income for the workers (feedback, 2017).

Besides economic uncertainties, the income of workers is also threatened during business as usual situations. For example seasonalities, which are expected periods where the demand for asparagus is lower during a certain period of the year. During the low seasons producers are adjusting their production to the lower demands, which means that less labor is needed in the asparagus industry. The workers who are unable to work will have no income during this period, which means that their livelihood becomes threatened.

Since the introduction of export driven agriculture, economic activities have increased in the Ica region and the production of asparagus has become important for the region's economy. When looking at the asparagus producers, many of the large asparagus producers are owned by foreign multinational companies. These multinationals were responsible for the investments that led to the introduction of asparagus production in the Ica region (Hepworth, 2010). Although asparagus production was externally induced by foreign producers, they are currently not the only asparagus producers in the Ica region anymore. When asparagus production was proven successful by the foreign producers, many local small farmers from Ica attempted to produce asparagus themselves. These smaller asparagus producers consisted of farmers that produced local products, and farmers that already produced export focused products (Hepworth, 2010). Because of the higher profitability of cultivating asparagus, many of these smaller farmers were willing to switch their crops for asparagus. Examples of local products that were replaced are corn, grapes, and potatoes, examples of pre-existing export focused products that were replaced are coffee, cotton and sugar.

Because the asparagus market is solely an export focused industry, many local farmers that previously produced traditional products had to experience the externalities of the international market for the first time. They had to face uncertainties such as price fluctuations, market standards, and fierce international competition. Unlike their previous situation, the uncertainties of the international market could change the demand for asparagus in a way that could threaten the livelihood of small asparagus farmers (James, 2015). This has led to the situation where the livelihood of the farmers have become dependent on the profits from the sale of asparagus on the international market, instead of the relatively stable seasonality of the local crops market. To prevent losses from market fluctuations, an option that could be explored is to offer asparagus on the local market, so that asparagus farmers would have more financial security when instabilities occur on the international market (Feedback, 2017).

2. Themes and theories

2.1 Asparagus consumption

The asparagus (*Asparagus Officinalis*) is a plant species that is consumed by people as a vegetable. They are commonly known as green or white edible shoots that need to be cooked before eating. However, the plant species itself looks a bit different compared to the vegetable product, where a fully grown plant can be described as a grass-like shrub with flower buds in it (Asparagus-lover, 2018). The mature plant cannot be eaten as the leaves are hard and the stems woody, instead the sprouts are eaten when the plant has not been fully grown. These young sprouts are formed underground from the roots and are cut when the 'heads' are coming above the ground (Claes, 2021). Asparagus cultivation is a labor intensive activity, as only shoots that are grown under the optimal circumstances will have the size and taste that is suitable for export and consumption.



Figure 1: White, green and purple asparagus variations

Asparagus is mainly consumed in western countries such as the US, Canada, France, Germany and the Netherlands, most of these countries are able to cultivate asparagus themselves (Goméz, 2015). However, they are only able to cultivate them during the 'asparagus season'. This means that they need to import asparagus from other regions if consumers want to eat them during these off-periods.

Asparagus is a plant that originates from the Mediterranean region, where it grows naturally in warm places near areas with water. For cultivation a sub-tropical and sub-temperate climate is preferable, where the soil should be well drained with plenty of nutrients in the land (Agri-farming, 2018).

As the Ica region has a temperate climate, Ica is able to produce asparagus the whole year long (Agricola la Venta, 2018). This advantage gives Ica the ability to sell and export asparagus to these countries in off-season periods. Besides Peru, China and Mexico are also able to produce asparagus during the off-season periods, which makes them competitors in the same market. China's production surpasses that of Peru in absolute amounts, while Mexico's production is more competitive in exporting to the US as it is able to benefit from tax reductions (Gomez, 2015).

2.2 Non-traditional export products

Globalization is a phenomenon where the interaction between people, organizations, companies and industries has become worldwide, including intensive economic activities such as the trade of products, technology, knowledge and capital (Davis, 2001). The expansive network of people and

companies allows farmers to sell their products to consumers on the other side of the world, and allows investors to invest in projects in faraway regions. Whole industries are nowadays dependent on the export of products, with some of the industries producing products that are unfamiliar or unpopular for their local population (Buatsi, 2002). These products are known as non-traditional export products, and the asparagus is seen as such a product. Non-traditional export products are often introduced by foreign parties in order to produce them cheaply, in contrast to the higher production costs in their native country. Labor costs, climate and resource availability differs greatly between places, which makes export focused production a profitable business model.

Asparagus has already been consumed by people since ancient times in the 'old world', in some European countries asparagus is even seen as a part of their traditional cuisine (Cultures de Chez Nous, 2021). However, in Peru asparagus are seen as a non-traditional vegetable, as its introduction into the region was relatively recent. A lack of history could cause a low popularity of a product, as it might be considered too different compared to the already available products. In Peru people still consider asparagus a strange crop, and the cultivation of it is solely aimed for export. Despite being the same product, the cultural meaning of asparagus as a traditional and non-traditional crop differs per country. This is typical for non-traditional export products, as other comparable products such as artichokes and avocados are considered popular in western countries, while lacking popularity in the cultivating country (Feedback, 2017).



Figure 2: Asparagus depicted on ancient roman mosaic

A characteristic of the non-traditional export industry is the cultivation of non-native agricultural products, which happens instead of the region's own native agricultural products (IADB, 1994). The reason behind this is the higher demand of the non-native products compared to the native products, which makes them more profitable to export to different countries (Hallam et al, 2004). Many non-native products are considered cash crops, which are crops that are solely cultivated to generate profit. Typical non-traditional export products consist of popular fruits or vegetables that are rather expensive (Hallam et al, 2004).

2.3 The Peruvian asparagus market

Asparagus is a relatively new product for Peru, but in a relatively short time it gained a lot of popularity to cultivate and has become a major export product for its economy. However, asparagus is considered a non-native plant species as its origin is rooted in the eastern Mediterranean region. Asparagus was popular amongst the Egyptians and Greeks as a food and medicine. From the 16th

century asparagus gained its status as a delicacy for the elite, and in the 18th century asparagus became available for commoners (Cultures de Chez Nous, 2021). Nowadays asparagus is eaten by every layer in society, but its price is still more expensive compared to other vegetables.

The combination of price and popularity of asparagus makes it an attractive crop for cash-crop cultivation. Cash-crop cultivation is a strategy that is often used to improve the economy in a region, as it brings opportunities for economic activities and higher wages in the region compared to the traditional crop cultivation (Achterbosch, 2014). The commercial activities of cash-crop cultivation are more likely to attract capital investments, agricultural innovations, and labor-opportunities. Because of a higher international popularity, cash crops are easier to sell for a high price on international markets than local traditional products.

The higher revenue of cash crops enables households in cultivating regions to profit from these activities, which improves their livelihood and food security. The downside is that the households are dependent on the sale of the non-traditional crop and its economic fluctuations. In a stable economic time households have more money to buy food, thus a higher welfare. But when an economic downfall occurs the households risk having less income and deteriorated welfare (Hepworth, 2010). Large companies have many systems in place to cope with these, such as laying off employees when they don't make enough profit (Sengupta, 2017). Smallholder farmers in contrast, have a livelihood to upkeep and can be hit hard when price changes occur. This means that when surpluses occur they have to sell their products for a much lower price that don't cover the costs, as the costs of packaging stays the same regardless of the product's price (Feedback, 2017).

2.4 Asparagus cultivation

The asparagus producers in Ica can be divided between two groups, the large agro-exporters and the small/medium size farmers, both groups cultivate asparagus for exporting purposes. This research considers large agro-exporters farms that have more than 300 ha of land and have more than 1 employer per ha, small/medium size farmers are considered to have less than 300 ha of land and to have less than 1 employer per ha (NEA, 2016).

The agro-exporters are asparagus producers that were introduced in Ica in the 1990s by multinational companies and investors. The political reforms of the Fujimori administration has allowed foreign investments in Peru, which attracted export focused industries. Asparagus production was seen as a profitable economic activity that attracted many funds from investors. This has led to the agro exporters being able to operate on a much bigger scale with their own packaging, transport and distribution services (Schwarz, 2016). They often have a direct connection with large retailers and a network of traders that distributes their product around the world. Through economies of scale and contractual negotiations agro-exporters are able to minimize the costs of packaging and transport maximizing their profits. As a result of investments, big agro exporters have the latest methods and technology available, thus producing asparagus of a consistent high quality. This makes it easier for retailers to sell their products, resulting in a high price per batch.

Besides the large agro-exporters, many small scale farmers are found in the region of Ica (NEA, 2016). These farmers also cultivate asparagus for export, but unlike the big farmers these farmers have a small plot of land in which they are only able to cultivate a single crop. Small scale farmers have relatively high costs compared to their profit per product compared to agro-exporters, resulting in very small margins for their revenue.

Most small scale farmers consist of family farmers that have to do all the labor work such as the cultivation and harvest themselves, but are dependent on external companies to package and distribute their products (Schwarz, 2016). These companies offer their services for a premium, which further reduces the margins for the farmers. Most small scale farmers operate on an informal scale with basic methods and equipment, resulting in asparagus of inconsistent quality (Feedback, 2017). This makes it harder for traders to rate and certificate their asparagus, resulting in a lower price per batch. The farmers also face a bigger risk when export companies reject their batch, as the margin per batch is smaller compared to the big farmers.

Besides higher relative costs the farmers face a different risk in the form of water scarcity, as the agro-export companies have better equipment to pump the water for irrigation (James, 2015). This leads to a difference between the quality of asparagus, making it for exporting companies more attractive to buy asparagus from agro-exporters. In order to improve their resilience, the small scale farmers have organized themselves in a farmers' association named Association of Agricultural Producers Guilds of Peru (AGAP) to form a network of farmers that help each other out when needed (NEA, 2016).

2.5 Sustainability improvement strategies

Sustainability issues are situations that have a negative effect on the future of the people or environment, these could be directly or indirectly affected by it. Sustainability issues can affect the wellbeing of humans, the economy, or the state of the ecology. Well-known sustainability issues are climate change, environmental pollution and degradation, and biodiversity loss (SDGNederland, 2021). In the case of the asparagus industry in Ica water, land, and socio-economic issues are relevant sustainability issues. Sustainability issues could occur in different forms, such as physical issues and social issues. For the asparagus industry in Ica resource availability and land pollution are related to physical sustainability issues, access to resources, labor rights and poverty are related to social issues.

In order to secure the future of those affected, strategies can be made to resolve sustainability issues. For drafting a suitable strategy the implications of the sustainability issue can be researched, which could help in exploring the different options for potential strategies. Strategies could try to solve the causes of sustainability issues, which prevents the issues from happening. Or strategies could try to reduce the effects of sustainability issues with mitigation measures.

When exploring sustainability improvement strategies, multiple options could be available wherein the effects in resolving the issues are unclear. Some strategies are simple and effective, while other strategies are complex where it is unclear how effective the strategy will be. Sometimes strategies can be used to solve more than one sustainability issue at the same time, when the solution has additional effects on sustainability. For example increases in efficiency, which reduces the costs of production, but also the use of resources. Therefore it is wise to choose the right strategy that fits the situation.

Sustainability improvement strategies can be orientated towards different stages of the value chain, such as the production, trade or retail stages (SDGNederland, 2021). When considering sustainability for asparagus producers, the production phase is the most harming phase for the environment, as here are the most resources used. However, the other phases could influence the production phase

in reducing their environmental impact. For example, retail could steer production demands through the prevention of surpluses and food losses.

Not only vulnerable groups are affected by sustainability issues, also powerful economic actors could be affected by the effects of sustainability issues. Sustainability issues are relevant for agro-exporters as they are producing products that are dependent on the use of the environment and natural resources. When ecosystem services are lost it could deteriorate the quality of asparagus, as the crops will only grow under the right circumstances. Important quality characteristics for asparagus are the right thickness, length, and color, as these are the factors that are valued by traders (Oordt, 1996). When an asparagus batch has a flaw on one of these properties the whole batch could be rejected. This strict standard prevents the food from being exported, which is problematic for the profit of the agro-exporter (Feedback, 2017). Therefore ecological damage could lead to economic damage, and asparagus producers should try to prevent it if they want to remain profitable.

Consumer oriented sustainability strategies often involve the purchase of products. Herein, the product should be affordable and of high quality in order to convince the consumer to buy the product. However, when the consumer hears that the product is harming the environment, the consumer could decide to stop buying the product. Therefore sustainability strategies could be aimed at informing consumers on the sustainability effects of the products they buy. Because the asparagus producers are financially dependent on the sale of their products, a boycott of their product could hit them financially hard. If sufficient enough consumers are boycotting the products, asparagus producers could decide to change their production towards more sustainability.

2.6 Neo-extractivism

Neo-extractivism is the concept where developing countries have the opportunity to become economically successful by exporting products or resources made from locally extracted resources. The theory is that export focused industry would lead to a stable economy and poverty reduction (Byrnes, 2017). However, this theory is flawed as these activities are often proposed by foreign companies that don't have strong ties to the producing country. This means that profit and production is often chosen over the local people and the environment.

On the front of social implications, foreign companies often promise high employment opportunities and quality of life improvements for the people of the developing country. However, this promise is broken when the companies want to maximize their profit, which leads to low wages and bad working conditions (Byrnes, 2017). Often the high paying positions in a company are already filled by foreign managers, leaving only the low paying labor intensive jobs for the local population.

On the front of environmental implications, extractivism could lead to resource depletion, loss of biodiversity, and pollution (Byrnes, 2017). Because of the large profits and investments, foreign companies often have large buffers that enable them to recover from environmental shocks. On the other hand, the local population does not have such a buffer and is harder affected by these environmental shocks. This difference in vulnerability is important, because the activities of the foreign companies have caused these environmental shocks (Byrnes, 2017). As the companies are those who are less affected by these shocks, they are often optimistic about the consequences of the environmental change. This gives them the idea that their activities are causing not as much

harm than in reality, and makes them less susceptible to the suggestions of environmental groups. When the companies do not take these issues seriously, they will continue their activities as usual. Meanwhile these effects are affecting the vulnerable indigenous groups, which are more sensitive to small environmental changes.

2.7 Resource grabbing

Resource grabbing is a situation wherein a resource is accumulated by a large and powerful actor, in this research resource grabbing consists of water grabbing and land grabbing. Water grabbing is a situation where the access to water of a group is compromised by a more powerful actor (Franco, 2014). Land grabbing is very comparable to water grabbing, but instead of the acquisition of a high volume of water the powerful actor is acquiring large plots of land.

In a situation of water grabbing the powerful actor has appropriated the right to water through legal or illegal means, which gives them the power to use the water in an unrestricted way (Franco, 2014). The unrestricted access to water could lead to a mismanagement of water resources which damages the local ecosystems, causing water depletion and the loss of ecological services. Large scale capital accumulation, commodification, and privatization of water resources are processes that often lead to water grabbing (Franco, 2014). In this way less powerful actors lose their access to water sources through dispossession and they become restricted in their rights to extract water.

Land grabbing often happens through deals with the government, wherein the investor buys large plots of land cheaply (Franco, 2014). During these deals the local population are not notified of the land acquisition, and sometimes people become displaced when their land is bought up by the companies. In other cases the local people experience a lot of nuisances when investors start developing economic activities on neighboring land. The consequences of land grabbing is that it often leads to a rise in land value, as the big acquisitions increase the scarcity of arable land.

Recognizing resource grabbing is not always clear, as the political, ecological, and socio-economic context differs per situation. Some cases of resource grabbing happen under circumstances which are allowed by the governing authorities (Franco, 2014). However, it could still lead to a situation where one party gets disproportionately disadvantaged due to complexities with power relations, politics, or negotiation processes. Resource grabbing occurs in many domains, including activities that involve food, energy, climate, and utility services. These activities could lead to changes in the allocation, and distribution of the resource, which could make it a contested resource.

Resource grabbing is mostly done by actors who call themselves investors, they can consist of foreign governments, businesses, or speculative investors (Franco, 2014). These investors are motivated by economic drivers, as unrestricted access allows water to be cheaply exploited. In many cases the national government has permitted resource grabbing in some form, such as relaxations in their regulations and laws. Governments have an interest in allowing resource grabbing by foreign investors, as it would lead to a foreign inflow of money. These investors are able to monetize the resource in the region through its activities, which would lead to a steady source of income for the government.

Boelens et al. (2014) has identified four ways in how prioritized resource access could lead to resource grabbing. The first way is a confrontation on control in access, where a powerful actor appropriates the resources from a weaker actor. This can be done through force such as violence, but it could also be done with economic power by buying out every available resource. The second way is through changing the rules and governance on resource access, which would lead to a redistribution and allocation of the resource. Neoliberal reforms is an example wherein resources become privatized, enabling private actors to gain exclusive rights to the resources. The third way is through influencing the existing decision-making authorities, which would give a certain party a preference position on resource access. Mostly the governing authorities listen to the interests of the powerful actors, rather than the interests of the small vulnerable peasants. Lastly the fourth way in which resource grabbing could occur is through reframing and changing the discourse of the governance. Herein the decision-making government bases their resource management on the information that is provided by a knowledgeable actor. In many cases the most knowledgeable actors are the big companies that have an interest in resource grabbing, who could provide only information that suits them the best. This information is presented as objective information, but in reality it only highlights the issues that fit the agenda of the company, instead of the critical neutral information.

3. Research design

This chapter will explain what the objectives of this research are and which question it tries to answer. After explaining the questions the chapter will further explain the different research methods used, and will provide context on the study location.

3.1 Research questions

The societal and scientific relevance of this research can be found in the type of knowledge that the research generates, which could be applied in order to understand issues regarding food production and food security. This research will be performed in the context of the Peruvian asparagus industry to gather knowledge on whether such an industry is beneficial for the local food security.

Therefore the main Research Question is: ***How has externally induced asparagus production affected the access of water and land in the Ica region?***

The sub questions are as follow:

1. *Which actors are involved in the production of asparagus in the Ica region, and how are they organized in value chains?*
2. *How has governance and regulations transformed the agricultural landscape of the Ica region?*
3. *Which sustainability implications are related to the asparagus production in the Ica region?*
4. *Which socio-economic implications are related to the asparagus production in the Ica region?*

5. Which options are available to solve the sustainability and socio-economic implications of the asparagus industry in the Ica region?

The overview of research questions shows what the main theme is of each sub-question and which type of research is performed to answer these sub-questions.

3.2 Overview of research questions

Research question	Type of research	Type of method
Main		
Sq1: Actors & value chain	Explorative (Framing)	Mapping through desk research > Reports mentioning different actors and phases of production
Sq2: Current situation (causes)	Collecting data	Mapping through desk research > Reports mentioning different regulations Desk research > gathering information of asparagus companies on their current criteria and activities
Sq3: Current situation (effects)	Data analyzing	Desk research > mapping documentations of known sustainability issues Desk research > gathering information on the available options for sustainability implications
Sq4: Current situation (effects)	Data analyzing	Desk research > mapping documentations of socio-economic implications Desk research > gathering information on the available options for socio-economic improvements Desk research > current political agenda, existing/future legislation
Sq5: Strategies (potential)	Recommending	Desk research > gathering information on existing sustainability strategies

Table 1: Connecting research questions and research type

This thesis consists of a research of 30 ECTS. The scope of this research is narrowed to the asparagus industry in Peru, specifically the Ica valley region where most asparagus in Peru is cultivated. The scope includes asparagus producers located in the Ica valley, as well as actors in the Peruvian exporting sector. The overview of research questions in table 1 describes which research methods are applied to gather a certain type of data and to answer the sub questions.

3.3 Methods

Most of the data for this research were collected in the period September and November, this is done through desk research. The data is used in order to answer the sub-questions and the main questions.

3.3.1 Desk research

Desk research is the most important part of this research, here are documents studied. These documents consist of company statements, scientific and economic reports, and news articles. During the whole research, desk research was the primary research method to gather knowledge and to explore the subject. In this research it is stated as the main research methods for answering the sub questions. For answering these questions the primary targets of the desk research are industrial actors, such as farming companies, export and import companies and asparagus resellers. These industrial actors often have reports, websites, and news articles available that state their current businesses and situation. Many of these information sources came from the company themselves, but there are also many secondary information sources that write about these industrial actors and their current affairs.

3.3.2 Data collection

The primary goal of the data collection is to gather data that formed an accurate image on the current situation in the Peruvian asparagus industry. However, collecting useful data has been complicated by foreseen and unforeseen circumstances. A foreseen circumstance is the language barrier, as the official language of Peru is Spanish. During the desk research many relevant articles were found that were written in Spanish, and some translation was used to convert them into English. This makes the articles sensitive for translation errors, as the accuracy of the translations could be affected by context specific interpretations. The primary focus of this research was on English written articles due to the high amount of available articles.

An unforeseen circumstance is the global corona pandemic, which made it not possible to travel to Peru, therefore fieldwork and participant observation cannot be done. Instead the research was performed through online means. Although telephonic interviews and online meetings were planned, due to the low response of the actors these were not performed. Instead, a replacement for interview data was found in the form of secondary interview data. Many reports on the asparagus industry contained excerpts from interviews, but some reports have included whole interviews in their appendixes. These secondary interview data were analyzed and used in this research instead of primary interview data.

3.3.3 Ethics

When doing research on sustainability issues it is important that the research is conducted in an ethical manner, with respect for the privacy, opinions, and position of the participants. To prevent people getting into trouble by sharing their opinion, the anonymity of the participants should be guaranteed. Especially for actors in a vulnerable position that might lose their position when criticizing the system they are in. For example asparagus farmers that might lose their contract with exporting companies when they address issues, or employees that share information that competing companies could use. Therefore information is handled with care and confidence, to ensure the privacy and safety of the participants. When writing the thesis, participant data was not used. The secondary interview data were already anonymized with pseudonyms, and company names used in articles were already publicly available.

The author of this research should be aware of his own position in the research, as some ethical issues in Peru might be different than in the Netherlands. As a male of Asian descent living in the

Netherlands, the author might have a different understanding of culturally sensitive topics than what is usual in the Peruvian context. An example could be discrimination which could happen when writing about cultural groups. To prevent situations where a wrong description could lead to a sensitive topic, a guide is used.

The book 'Development Fieldwork: A practical guide' from Regina Scheyvens (2014) gives a guideline for handling ethics in an official procedure, which ensures the privacy and safety of people. The guide describes how research is performed with people in a sensitive position and which things need to be taken into account with. Especially for people of marginalized, privileged or vulnerable groups, it is important that the research follows the right procedures.

The book 'Ethics in Organizational Research' from Matthew Jones, (2014) gives a guideline for handling ethics in an organizational setting, which is useful for conducting research on exporting and agricultural companies. Here the processes, ethics, and access of companies are described, and which issues could occur while doing research.

3.4 Case study area: Peru and the Ica valley

3.4.1 A profile of Peru

Peru is a South-American country on the western side of the continent, it is located relatively close to the equator which gives it a sub-tropical and temperate climate. As the country has only two seasons, which are the dry season and the wet season, water scarcity could be an issue during the dry season (James, 2015). Peru's landscape is relatively mountainous, where the valley areas are the most suitable place for large scale agricultural activities. This is due to the valley's fertile soil and large rivers that provide irrigation water during the dry season (Diaz Rios, 2018).



Figure 3: A typical Peruvian landscape

This research will take the Ica valley in Peru as a case study area for its research on the asparagus industry. The unique combination of circumstances in the Ica valley has allowed this area to develop a successful exporting industry of different fruits and vegetables (Hepworth, 2010). Especially the asparagus industry has grown to an incredible size, now being the powerhouse that is contributing much to the Peruvian economy. However, the Peruvian asparagus industry did start from a humble

beginning, with small scale productions that were considered as an experiment for a long time. In order to understand how the current asparagus industry came to be, it is important to understand the history of Peru and in which economical context the asparagus industry has developed.

Peru's history has been a one with tumultuous periods and political changes. During the age of discovery Peru was inhabited by the Inca's, which cultivated corn and cotton (MyPeru, 2021). Besides agriculture, the Inca's also had cattle such as alpacas and guinea pigs. The Inca had a developed economy with many cities and extensive roads, becoming a mighty empire ruled over a vast area.

When the Europeans arrived in Peru the Incan empire began to destabilize as diseases and war tore the empire apart. The Spanish conquests led to the decline of the native peruvian population and the colonization of settlements (Flight, 2011). During this period the Spaniards gained a lot of wealth and economic power through the extraction of valuable metals and minerals. The colonizers forced the native communities to mine for resources that were exported to Europe. As European landlords ruled over the native people, the rulers required that the population should take over their habits, culture and religion . Also food was important, as the Peruvian agriculture was transformed by the rulers to produce crops, cattle, poultry that originated from the 'old world' (MyPeru, 2021). The colonial land-tenure structure between Peru and Spain has led to an intensive trade relation, introducing new food products for both cultures. Spaniards were introduced to corn, turkey, tomatoes, potatoes and many other foods, the Inca were introduced to beef, chicken, pork, apples, bananas, cucumbers and other common European food (MyPeru, 2021).

After a long period of being a colony Peru became independent from Spain in 1824, what followed was a period with many wars, revolutions, territorial disputes and political reforms (MyPeru, 2021). The 20th century was a changing period met with political stability, economic crises and two world wars. This was also the period with many political, social and economic reforms, with in the 1960s the nationalization of many industries and services (IISD, 2017). The agrarian reforms of that period disowned many farmers of their land, leading to the displacement of people from the rural areas to the cities. At the same time the government proposed import substitution industrialization on its economy, which led to the limitation of trade and foreign exchange. Instead of an import-export economy, domestic production was prioritized with local products replacing the imported goods. Although these reforms were met with initial growth, in the end it led to hyperinflation in the Peruvian economy and high debts.

By the 1990s a new unknown political leader was elected, Fujimori was an inexperienced newcomer on the political field in Peru (IISD, 2017). However, he was an economics professor that had some ideas for reforming the political and economical direction of Peru. Most of these new reforms were based on guidelines from the IMF known as the Washington Consensus, these reforms regulated government expenditures, taxes, interests, trade, FDIs, privatization and property rights (IISD, 2017). This neoliberal approach allowed the privatization of many companies and services, and prioritized trade on the international free market. The reduction of tariffs made Peru a favorable climate again for foreign investors and the result was a drastic decrease in inflation (IISD, 2017).

For the asparagus industry these neoliberal reforms were an important moment, as these reforms marked the beginning of the 'asparagus boom'. Foreign investors were allowed to operate and invest in various industries, leading to the emergence of various export focused industries in Ica. As investors were investigating which export products were most favorable to cultivate and export in Ica, the production of asparagus was deemed as suitable and profitable enough to attract large agro

exporters to Ica(IISD, 2017). These investments have led to the asparagus industry's current state, which is now one of the most important industries in the Ica region.

3.4.2 A profile of the Ica Region

The Ica region is located in the south-west of Peru, it has a desert climate and has been called the 'Land of the sun' by the Peruvians due to its high amount of sunshine. The region's capital city is also named Ica and it is located in a desert valley. The region is an important agricultural area despite being located in the Atacama desert. The city is infamous for its lack of rain, which makes the city dependent on the water of the Ica river and the Ica-Villacuri aquifer for its irrigation of crops (Salmoral, 2020). Because of the many agricultural activities the rate in which the water is extracted is higher than the regeneration rate, making water scarcity a serious problem in the future. To prevent water scarcity in the future, plans are already proposed to build dams and redirect water from other regions with canals.

Although the city of Ica was founded in 1563 by Spanish explorers, many small prehistoric settlements have existed near the current city (MyPeru, 2021). One of the earliest civilizations in the area were the Nazca which were most known for the creation of the Nazca lines. These are figures in the desert land that represent animals, plants and other figures. The Nazca were already active in agriculture as they were cultivating cotton, beans, sweet potatoes and corn. To make this possible in an arid region, ancient canals and aqueducts were built that provided the region with water (MyPeru, 2021). These aqueducts still exist today, and local farmers are using and maintaining them for their own irrigation. Despite the advanced irrigation methods for that time, the Nazca civilization disappeared around 650 AD when a drought of more than 30 years occurred in the region (MyPeru, 2021). This drought was worsened by El nino and erosion caused by agriculture.

After the disappearance of the Nazca civilization the Ica region remained for a long time uninhabited until the Inca arrived in the region around 1400 AD. The Inca used the region to cultivate crops that were exported to the capital of the Incan empire Cuzco. Roads and canals were built to support agriculture, and the region was already able to produce crops all year long (MyPeru, 2021).

During the colonization from Spain the Ica region was chosen to produce wine as grapes were introduced to the region, this also marked the start of the consumption of the traditional Peruvian drink Pisco (MyPeru, 2021). Large plantations known as haciendas were built for grape production by Spanish landholders, and Ica became a culturally diverse region as a result of slave workers that worked on the haciendas.

When Peru became independent Ica became an important producer of food for the Peruvian capital Lima, as it was considered a part of the region of Lima. Although Ica's agricultural potential was a main economic driver for the region, the region of Lima is considered more important for the Peruvian economy (MyPeru, 2021).

In the last 100 years Ica has become one of the most important agricultural regions in Peru, as the fertility of the land has produced crops with high quality. In the 1960s wine, cotton, sugar, coffee and other crops were the region's most important export product (MyPeru, 2021). However, this was before the arrival of big agro-exporters, which means that most of these producers consisted of small/medium farmers. The region had an average level of production and employment, and most people lived in poverty.



Figure 4: agriculture in Ica

The region's economic situation changed after the introduction of the international asparagus production in the 1990s. This so-called export boom has caused a rise in economic activity for the region, as foreign investors saw a lot of potential in cultivating cash crops in Ica. Large agro exporters settled in the region and started growing artichokes, mangos and asparagus (Diaz Rios, 2018). Because some of these crops are labor-intensive to cultivate, many agricultural workers are needed to work on the fields. This attracted many migrant workers from the Peruvian rural area. During this period the city has greatly expanded as a result of the agricultural boom in the region. Today Ica is a modern city with around 282.000 people, because it is the center of the Peruvian asparagus industry it is known by some as the city with zero unemployment (Wilkinson, 2011). Besides agriculture, the city is also known for its tourism, attracting people with its historical museum, architecture, desert and oasis.



Figure 5: The location of the Ica Valley

4. Results I: Actors and value chains

To answer the first research question: “Which actors are involved in the production of asparagus in the Ica region, and how are they organized in value chains?” different stakeholders that were involved in the realization of the asparagus industry are analyzed. After this, the value chain of the asparagus industry is analyzed, which is mapped with a value chain map.

4.1 Public actors

4.1.1 COPRI

An important actor in the realization of the asparagus industry was COPRI, as they were the primary proposers of foreign economic activities in Peru. When the Peruvian government initiated their political reforms in the 1990s the Comisión de Promoción de la Inversión Privada (COPRI) was founded in 1992 by the Fujimori administration (Wise, 1994). COPRI was an independent public commission that oversaw the privatization of many government assets, which was done by restructuring and selling the state-owned properties. Its goal was to sell as many government assets to private parties, in order to expand the private sectors in Peru. The people who were commissioned into COPRI were seen as economic experts in their fields, some of them already had experiences in the successful privatization of Chile and Mexico. The COPRI was composed of foreign and domestic experts, including staff from the Peruvian ministry of energy and mines, MBA technicians, information analysts, and international directors (Wise, 1994). In order to make the privatization of Peru successful these experts proposed the promotion of foreign private investors in order to attract external financial sources into Peru (Beutler, 2016). The new main tasks of the COPRI was to attract investors, advise legislation which was in favor of foreign investments, and to design economic projects and activities that were centralized on foreign financing. These activities became important for the induction of extractive activities in the Ica region, as it led to the high agricultural production in the region.

In the year 2004 the COPRI fused with other governmental institutions and became Provision. New tasks were added such as sustainable growth, maintaining the well-being of the Peruvian people, and to improve the competitive position of Peru (Beutler, 2016). The new tasks of Provision changed its view on investments, as sustainability issues have been put higher on their priority list. After reviewing their previous and current projects it became apparent that many of these projects have led to major sustainability issues. High water usage was a big problem as it has drained many of the region’s water sources, leading to drought problems. In order to solve these sustainability issues, Provision now tries to attract investors to invest in projects that solve the drought problems (Beutler, 2016). However, this new approach is still dependent on financiers from other countries, making it still an externality induced activity.

4.1.2. The Peruvian government

The Peruvian government is the actor that is responsible for the management of the whole country. Over the recent history of Peru different political ideologies became dominant, leading to a different set of policies and regulations between periods. Dependent on the chosen political leader the

government had a different standpoint on economic concepts, such as market liberation, privatization and market protection (Wise, 1994). The Peruvian government had a big influence on the realization of export focused agricultural production, as they provided the circumstances that allowed investors to exploit the resources in Ica. This happened in 1992 when the Peruvian government took a strong neoliberal turn when Fujimori was elected as president. Under the guidance of the IMF and the World Bank, Fujimori implemented a policy of privatization and trade liberation.

When the Fujimori administration proposed to privatize many government assets, it made legal guidelines on how this was to be done. This created the legal and technical structures to attract foreign investors into the country, which was seen as the ultimate success of the privatization effort of the Peruvian government (Wise, 1994). The rationale behind this was that the government did not have enough funds to finance the domestic private sectors, such as financial incentives and subsidies. Instead, the private sector was dependent on external financial sources when it wanted to thrive economically.

Efforts were made by the Fujimori administration to develop an export based industry, in order to increase the incoming external capital flows. Natural resource exploitation and non-traditional export projects were proposed as value-adding economic activities, in order to realize an industry that could make Peru relevant for the international economy (Wise, 1994). When Peru was opened for the international market, it created the right circumstances for investors to exploit the resources in the country. Export focused agricultural production was realized, and the economic activities in the Ica region rose to a high level.

Currently the Peruvian government is still in favor of export based agriculture, as it is an active member of several international trade agreements. Peru has especially a close relationship with other Latin-American countries and the United States, where it has formed several trade blocs with these countries. The most important trade agreements are the Peru-United States Trade Promotion Agreement and the European Free Trade Agreement, which allows asparagus to be freely exported to these parts of the world. Currently the Peruvian government is negotiating to become a member of the OECD, in order to strengthen its international economic cooperation further (Roman, 2022). In order to become an OECD-member, countries should allow foreign investors to have unlimited access to the country's market. This is done by building a friendly climate for foreign investors through the development of free markets and democratic institutions (Roman, 2022).

4.1.3 The Peruvian water authorities

This is the governmental actor that is responsible for the water management in Peru. The water authorities are tasked by the Peruvian ministry of agriculture and irrigation to create policies and regulations and to set restrictions on water use (UN, 2021). The water authorities have played a big role in attracting international asparagus producers to the region of Ica. However, due to how the water authorities were organized over time, the role of the water authorities differs per period.

Before the 1990s water was managed by the Ministry of Agriculture, which regulated water management on a national level. Improving irrigation was one of its main tasks, which includes large construction projects such as building dams and channels. At this time there were no dedicated local or regional water authorities, and local water management was regulated by the municipalities.

In the 1990s political reforms were made, and the Peruvian water management was also changed. The public water authorities were set aside in favor of a privatized counterpart, the Junta de Usuarios (Junta) which translated to the council of water users. Instead of a centralized national water authority, local water users were tasked to manage water in the region. Tasks such as monitoring, setting water tariffs, and building water infrastructure were done by the Junta (Beutler, 2016). This included water rights and land ownership, enabling the Junta to hand out water extraction licenses to agricultural users. As the Junta consists of water users themselves, they were economically oriented and had subsidized infrastructure for agriculture and irrigation. This has resulted in the Junta handing agro-exporters water extraction licenses that allowed them to expand their activities and resource extraction without any limitations (Hepworth, 2010). This has attracted many international agricultural companies to the Ica region, because unlimited water pumping meant that they could produce crops for a low price. Nowadays these licenses are still valid, meaning that it is hard for the current water authorities to enforce limitations on the water extraction of the agro-exporters (Beutler, 2016).

In the 2000s there was a strong political demand for new water authorities. Instead of a privatized water authority, new public water authorities were needed to be appointed that could operate on a national, regional, and local level. During this time the Junta had become politically powerful, with a bias to promote water use for irrigation (Beutler, 2016). The bias of the Junta on agriculture has led to complaints from the industrial, health, hydroelectric, mining and environmental sectors. They found that the Junta had a too big interest in the growth of the agricultural sector, which has led to a conflict of interests between water users. In order to reduce this conflict of interests, water management needed to be reformed into several independent water authorities. This reformation has been successful, which led to the current structure of the Peruvian water authorities.

The current Peruvian water authority consists of several organizations that operate on different administrative levels, they need to work together to manage the water systems in Peru. The water authorities are divided between the national water authorities Autoridad Nacional del Agua (ANA), the regional water authorities Autoridades Administrativas del Agua (AAA), and the local water authorities (Autoridad Locales del Agua (ALA) and the Junta. The ANA is responsible for the national decision-making tasks, such as approving policies and coordinating regional authorities (UN, 2021). The AAA is responsible for the regional monitoring tasks, such as checking water levels, river flows, and the availability of water in wells (Hepworth, 2010). Below the regional authority are two local authorities, which are the ALA and the Junta. The ALA is the public local governing water authority, and is responsible for monitoring and implementing regulations on local level such as cities and municipalities. The Junta was allowed to exist in its old form, and still operated with a council of private water users. However, their tasks were reduced to monitoring the local water use and water levels. Besides monitoring, the Junta also acts as an advocate for the interests of the local water users by reporting it to the ALA (Beutler, 2016).

When looking at the power relations, the ANA is considered the most powerful water authority as it has national legislative power, such as rule making and enforcing policies. However, in practice its power is somehow constrained. Firstly, the legislative framework for the national water authority was not completed when the ANA started operating. This had left gaps and uncertainties on the tasks of the ANA, resulting in ineffective policies. Also the ANA is not in direct control of the water management, as it has delegated many of its tasks to the lower authorities (Beutler, 2016). This means that the executive tasks duties were done by the lower authorities, such as monitoring and enforcement.

Another constraint for the powers of the water authorities is lobbying, as this influences the decision and policy making processes. Lobbying could be used by foreign companies as a way to exert influence over the policy of the water authorities. This could lead to a situation where the laws and policies become in favor of the foreign companies, such as policies that are less strict, or the relaxation of existing regulations. This influence weakens the political power of water authorities, as lobbying could lead to a different outcome of the policy than what the policymakers originally had envisioned (Beutler, 2016). Decision making should be considerate in order to serve the greater good, but when lobbying occurs decisions are instead made to serve those who have hired the lobbyists.

Besides lobbying, corruption has an even more negative outcome than lobbying. It is comparable to lobbying, as both situations try to convince policymakers or enforcers to change their mind. However, the difference is that corruption uses illicit means to change the decisions of policymakers or enforcers. Many situations of corruption involve bribes, blackmailing, threats or other criminal means.

Corruption is mostly used to allow a forbidden situation to exist or to grant an unfair (dis)advantage to someone. An example is to circumvent bans and limitations through the bribing of enforcers in order to ignore the situation when they discover it. Corruption could also be used to acquire information that gives companies an upper hand over their competition, which can be done through stealing or defalcation (Beutler, 2016). Because of the illicit nature of corruption, actors that are involved in corruption often try to hide it. When an outcome does not make sense or data is hidden, it could be an indication that corruption has occurred. Especially when a certain party has benefited greatly from an unclear situation, and it can't be proved that they got there through fair means. As bribes could be costly, wealthy actors are more likely to be involved in corruption. Regarding the power relation between actors, corruption allows actors to become more powerful than the water authorities when they succeed in bribing government officials (Beutler, 2016).

4.2 Private actors

4.2.1 Private investors

Foreign private investors were important for the realization of the asparagus industry in the Ica region, their finances were used to make the agricultural transformation possible in the Ica region. They were attracted by the promises of the Peruvian government and COPRI about the potential of asparagus production in the Ica region. The private investors are a diverse group of individuals and

organizations, they have financially supported the economic activities in the Peruvian asparagus industry. Several of the investors are banks, entrepreneurs, private individuals, retailers, and other financially powerful actors. The COPRI has successfully attracted many of these investors in the 1990s to support the asparagus industry, making them an important actor during the infancy period of the industry (Beutler, 2016). Depending on the amount of shares and bonds they have in the project, they are able to steer the company towards more sustainability or more profit.

The concern on sustainability issues differs per individual investor, their involvement varies from none to very involved. Many investors are not involved with sustainability as these issues are not affecting them directly. However, a main motivator to invest in a project is profit, which could be affected by sustainability issues. In order to protect their investments, investors could protect the ecosystems and resources that provide the services that are used by their investments. The cost and benefits are important in this consideration, as the costs for protecting the ecosystems should not be higher than the profits of the investment. When the profitability suffers too much from the sustainability issues, investors might pull out of the investment and leave the region. However, more altruistic oriented investors could be willing to support projects that help to solve these sustainability problems.

4.2.2 Agro-exporters

Agro-exporters are a central actor in the realization of the industry in the Ica region, as their activities were the outcome of the plans for the creation of an export oriented industry. Almost all agro-exporters were funded by foreign investors, which made it possible for the agro-exporters to operate on a big scale. The Peruvian government wanted foreign companies to settle in Peru, which meant that the agro-exporters had full support from the Peruvian government to produce asparagus.

Many agro-exporters share a common goal and interest, which is to produce a large amount of asparagus of high quality. However, the form in how they operate may vary. As many agro-exporters work on a contractual basis, their objective is to produce the amount of asparagus needed. Most agro-exporters are private or limited companies, where shareholders or investors have control over the general direction of the company (Beutler, 2016). However, many of these shareholders are only able to express their power during the general meetings of the company, which happens at many companies once per financial period. For the day-to-day management the companies are dependent on the managers and board members of the company. These managers and board members are in control of the processes involving bookkeeping, workers, sales, contracting, quality control and other functions for operating the company.

In the region there are 29 large agro-exporters found that have more than 300 ha of land, making them a noticeable presence in the region (Diaz Rios, 2018). The economic activities of these companies has long been seen as beneficial for the region, resulting in a government that is in favor of supporting the agro-exporters. This has led to lucrative deals for the agro-exporters on water extraction, land ownership and tax benefits. However, over time it became apparent that activities of the agro-exporters led to sustainability implications that were not beneficial for the region.

Lobbying and corruption has led to situations where companies have acquired contracts to extract an unlimited amount of water for almost no cost. Companies were not paying for taxes at all, and bribing of government officials occurred during regulatory checks (Beutler, 2016). This mismanagement has resulted in the depletion of the water resources in Ica, causing water scarcity in the region. The local population was not content with this, and protested for a better division of the water resources in Ica.

Agro-exporters are a powerful actor in the region, and their industry has a high economic and political power (Beutler, 2016). Their concern on sustainability has been low, as productivity and profit are the main drivers of agro-exporters. However, their production is dependent on the amount of resources that is available in the region, making resource scarcity a serious problem when it occurs. Higher costs for the extraction of resources could harm the profitability of the company, giving the companies an incentive to invest in sustainability. However, most agro-exporters are multinationals that could easily move to different countries when the costs of resources become too high. This could lead to an exodus of agro-exporters when resources become depleted in the Ica region. When this happens, it could leave the region in ruins while the agro-exporters are moved out to a different region in which they could exploit their resources.

4.2.3 Agricultural workers

Agricultural workers might not have had any control over the introduction of the asparagus industry in the Ica region, but their presence has led to the attraction of the industry to the region. During the 1990s Peru was a country with high poverty and unemployment, which meant that the wages of the workers were also low. Because asparagus production is a labor intensive activity, many cheap workers were needed to work on the fields. The jobs that needed to be filled were low paying tasks such as maintaining, sowing, planting, construction and harvesting on the asparagus fields (Wilkinson, 2011). These cheap laborers were found in the Ica region, who were willing to work for the asparagus producers for a low wage. This made it possible to produce the asparagus cheaply, which made the asparagus industry in Ica competitive against other asparagus producers in the world.

But as most of the agricultural workers are only lowly positioned employees in the company, they are easily replaced by other workers. Therefore their power is low, as they have little negotiable space. When agricultural workers unite in a labor union they have more space to negotiate, giving them a little more power. Labor unions often try to improve working conditions such as safety, working hours, health care, wages, and other work related issues (Adam, 2019). Their sustainability concern is mostly about social sustainability, as most of the workers are poor migrant laborers themselves.

4.2.4 Small and medium scale asparagus producers

Before the introduction of the asparagus producers in the 1990s to the Ica region, there were already pre-existing agricultural activities in the region. Many of these agrarian producers produced crops for domestic consumption, but there were also producers that produced crops intended for export such as coffee, cotton and sugar. The region of Ica was quite successful in producing fruits

and vegetables, which were exported to the Peruvian capital region of Lima. In order to make these activities possible, the farmers used channels and water pumps to irrigate their crops.

When foreign investors came to the Ica region to assess the potentials of the region, the successes of the pre-existing agricultural activities were an indicator for the possibilities for the region. This has inspired the investors to set up international agricultural activities in the regions, which included asparagus production. Initially when the agro-exporters came to the Ica region to produce asparagus, many of the pre-existing farmers did not have any desire to produce asparagus. The local farmers would rather cultivate the local crops that they were already producing, as they did not have any experience with cultivating asparagus.

When the agro-exporters were proven successful in producing asparagus in the Ica region, the local farmers followed in the production of asparagus. However, they operated on a smaller scale than the agro-exporters, and did not have the resources nor the experience to use the same production methods as the foreign producers. Many of these farmers consisted of subsistence petty farmers and independent medium size farmers with less than 100 ha of land. Besides asparagus, these farmers often produced a variety of types of crops at the same time. The products they grow could consist of crops and animals such as corn, grapes, potatoes, alpacas, sheep, poultry and other comparable products (Beutler, 2016). Asparagus was attractive to cultivate for this group of farmers because of the high price they could get compared to their previous crops.

Although asparagus is a sensitive plant that requires a lot of attention, small farmers were still able to produce them with their limited resources. Many of the smaller scale farmers operate on an informal scale as the farmers have followed only primary schooling. Due to political reforms in the public sector in the 1990s, many public schools closed or became private schools, resulting in only a fraction of the farmers having followed secondary schools or higher (Hepworth, 2010). This means that the level of knowledge of most farmers is much lower than the level of knowledge of the professional farmers. This limits small scale farmers in improving their cultivation techniques, and the quality and quantity of their crops. With their traditional tools and techniques they use simpler production methods than the agro-exporters, which leads to lower quality asparagus. Even when the asparagus was of a lower quality than those of the agro-exporters, the small farmers were still able to get a good price for it. Traders and producers were still willing to buy the asparagus from these small farmers, as they were able to process the asparagus in products where the quality of the asparagus is not important.

Because of the differences in production level, the small scale farmers are not seen as economic competitors by the large agro-exporters (Beutler, 2016). However, as both parties make use of the same common pool resources, they could become competitors when resources become scarce. As the agro-exporters are much bigger and more powerful than the smaller farmers, agro-exporters are able to keep extracting resources when the small scale farmers are not able to access them anymore.

4.3 The value chain of the Peruvian asparagus industry

The value chain is a concept by Michael Porter (1985) in which he describes the different activities that add value to a product in a production chain. Primary activities are activities in a supply chain performed by production actors who take the product and convert them into a new output. The new output can be sent to the customer or the next production actor who converts it further into a more valuable output. The value chain of a product follows the activities from the production phase, until the product reaches the consumer.

The value chain can be used to see which actor contributes in adding value to the product, and how the relations between actors are organized. Some actors are dependent on the services of other actors in the chain, and are therefore less powerful in the chain. Other actors are operating independently, and other actors make use of their services, these actors are therefore powerful.

For the Peruvian asparagus industry the primary activities consist of production, processing, export, import, and retailers. When looking further into Peru's asparagus industry two distinctive value chains can be found, which are centered around two groups of asparagus cultivators. The first value chain centers around the agro-exporters, which have vertically integrated the primary activities in the value chain (Shimizu, 2009). The second value chain centers around the small/medium farmers, which make use of the services of external parties for their primary activities. Herein it can be seen that the agro-exporters operate independently without any interference of other actors. This gives them a lot of control over every process of the chain. The value chain of small producers on the other hand, are dependent on the other actors in the value chain. Foreign producers are in control of them, as their decisions could influence the processes in the chain.

The vertical integration of processes means that the company handles the production, processing and exporting activities themselves in the chain (Schwarz, 2016). In the table below these activities are displayed as a light blue square, which represents agro-exporter. Handling every activity in one company has its advantages as the company retains ownership of the product during each phase, enabling them to profit from each incremental increase in value of the product (Schwarz, 2016). Other benefits increase the profit margin further, such as cost savings through efficiency increase, reduction in transport costs, and not needing to negotiate with external parties on contracts and prices (Shimizu, 2009). Only large agro-exporters are able to integrate their primary activities, as it is only viable when the production is high enough to cover the costs of the needed equipment. It should be noted that vertical integration can only be done with the primary activities that take place within the domestic area. Handling the activities outside the domestic area is highly inefficient, as asparagus is a product that is exported to many countries which creates a massive overhead in handling all these activities (Schwarz, 2016).

The value chain centering around the small/medium asparagus farmers consists of a diverse group of actors that take care of various activities in the value chain (Shimizu, 2009). In this chain every activity needs to be done by a specialized party, as the activities are not integrated in a single company. Every of these parties has the option to choose where to send the asparagus to, which is displayed with arrows in the table below. The chain starts with the small/medium asparagus farmers, who are mostly responsible for the production phase. These asparagus farmers are not big

or wealthy enough to invest in equipment that enables them to integrate any of the activities in the chain, and have to rely on external companies to handle activities such as processing (Shimizu, 2009). By selling the unprocessed asparagus to processors or other external parties value is added to the product, but farmers lose ownership of the product after this sale. This prevents them from profit from any added value to the product further in the value chain (Schwarz, 2016). Because the value of unprocessed asparagus is relatively low, farmers who sell their product at the beginning of the value chain have a small profit margin. However, actors further down the chain have a larger profit margin, as the product gets more valuable when it is further processed (Shimizu, 2009).

Some asparagus farmers are aware of the differences in sale prices and try to sell their unprocessed to actors further down the chain. Farmers have four options to choose where they could send the asparagus to process (Schwarz, 2016). A possible option is to skip the processing phase and send unprocessed asparagus to the trading company, letting them decide how to process the asparagus. Secondly the farmer could export the asparagus directly, letting the foreign importer decide how to process the asparagus. Thirdly the producer could send the unprocessed asparagus directly to the exporters that process the asparagus in the foreign country. A fourth option involves the agro-exporters, where small farmers sell their unprocessed asparagus to the agro-exporters. This option is somewhat unique as it links the value chain of the small/medium farmers to the integrated supply chain of the agro-exporters (Schwarz, 2016).

The reason to choose for a certain option depends on the situation of the farmer and its relation with the actors in the chain. When a small/medium farmer is able to cultivate asparagus of a high quality, it could be attractive for the agro-exporter or importer to buy the asparagus directly from the farmer. The result is that the farmer gets a higher price for its asparagus than at the processor, and that the buyer has access to more high quality asparagus (Schwarz, 2016). The network of the farmer could also influence the choice to sell the asparagus to, as a farmer with an established relationship between trading companies or importers could sell their asparagus directly to them for a higher price.

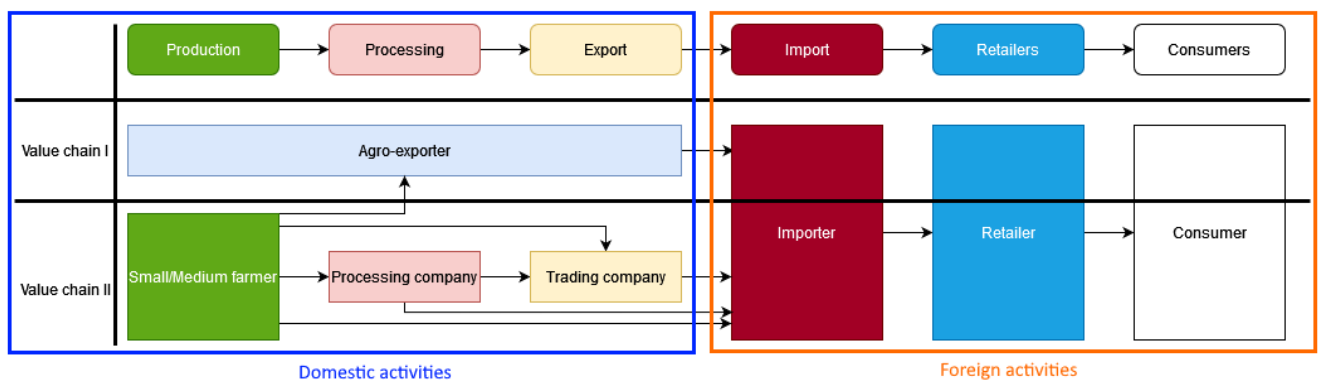


Figure 6: The value chain of the Peruvian asparagus industry

5. Results II: Regulations that transformed the agriculture in the Ica region

For answering the second sub-question: "How has governance and regulations transformed the agricultural landscape of the Ica region?" different policies and regulations need to be analyzed in order to find the political and regulatory implications that led to the changes in the region of Ica.

5.1 International regulations

5.1.1 Trade regulations

Trade regulations are agreements between countries for trade, herein the terms and conditions of the trade are captured in a treaty. Countries could discuss the terms and conditions of the treaty, and negotiations can be about tariffs, movements of goods, transport, or other trade related things. Trade agreements are important for setting up trade relations between countries and could improve the market position of countries. Trade agreements are essential for the realization of an export focused industry as the asparagus industry, as they allow free movement of goods between markets. Besides goods, trade agreements also allow funds to move freely between countries, which allows foreign investors to operate in Peru. However, trade agreements are also a way in which foreign countries could express influence on the domestic market. The foreign country could include obligations in the trade agreement such as market liberation, industry standards, combat organized crime, or other commitments.

Since the 1990s the Peruvian government has signed multiple trade agreements with many countries in order to set up a trade relation with these countries. The political reforms in the 1990s opened the Peruvian markets, which allowed Peruvians to trade with other countries. This has also led to free trade agreements with tax and tariff benefits, leading to cost savings for exporting and importing products between countries. Besides cost savings, these trade agreements have increased the amount of available products and services in both countries, which potentially improves the food security for them both.

The most important trade agreements are the free trade agreements between Peru and the US, as it allowed Peru to export its products freely to a major market. The first trade agreement between these countries was the Andean Trade Promotion and Drug Eradication Act (ATPDEA) in 1991. The ATPDEA was a collective trade agreement of four Andean countries with the US, wherein the Andean countries agreed to combat its drugs-crop production in trade of tariff-free export of products to the US. The ATPDEA opened the US market for Peruvian agricultural products, as it lowered the trade barriers between Peru and the United States. The ATPDEA was considered a success for Peru as it has led to a drastic growth in export for Peru, and created many export related jobs for the Andean countries. Popular Andean export products were natural resources such as oil, metal and minerals, and agricultural products such as cotton, flowers, sugar, fruit and vegetables. For Peru the export of asparagus was very successful, as they could offer them on the US markets for a much lower price than what the US farmers were able to offer.

When the ATPDEA expired in 2006 it was followed up in 2007 with a more specific trade agreement, which is named the United States-Peru Free Trade Agreement (PTPA). The agreement was created in 2007 to increase agricultural exports between Peru and the US further, and would make more than

66% of Peru's agrarian products to become duty-free (USTR, 2009). In the end the goal is to make 100% of Peru's agrarian products duty-free before the year 2026. Besides trade benefits, the PTPA also regulated strict regulations on the protection of the environment and labor rights (USTR, 2009). These regulations are set to ensure that every imported product is produced in a sustainable and ethical way, without harming people and the ecosystem. Products that are produced through illegal activities are not allowed to be exported, and countries have to put effort in stopping these activities. Examples of illegal activities are illegal logging, forced labor and poaching.

Besides trade agreements with the US, Peru has also signed comparable trade agreements with many other countries. For the asparagus industry the most important trade agreements are those with countries in which the industry has a sales market in, which are the EU, European Free Trade Association, and Canada. Especially the trade agreement between the EU is important as it has led to a massive growth of agricultural export. It has allowed the asparagus industry to reach multiple international markets at once, which accounted for 490 million potential consumers. However, the strict quality regulations of the EU could form a trade barrier for some producers. The EU has strict regulations on production methods, used substances, environmental impact and other requirements. This means that the asparagus producers have to change their production methods in order to meet the EU requirements. Some small asparagus producers are not able to adjust their production methods due to a lack of funds, the result is that the EU market becomes unreachable for them.

5.1.2 Trade organizations

International trade organizations are associations whose members consist of states that have agreed to develop and promote trade between each member state. The Peruvian government is active in upkeeping its international relations, and is a member of several important trade organizations. Peru has formed a trade coalition with Latin-American countries through the CAN, and is an active member of the WTO (WTO, 2019). Peru is currently in active negotiation in becoming a member of the OECD, in which it has a promising position.

Peru's membership of the Community of Andean Nations (CAN) has contributed to the realization of the asparagus industry in Ica, as it was one of Peru's earliest commitments to market liberation (Limaeasy, 2021).

The CAN is a trade bloc consisting of Peru, Bolivia, Columbia, and Ecuador. Peru was one of its founding members when it was established in 1969 as the Andean Pact, which was renamed as the CAN when institutional reforms were implemented. The goal of the CAN is to establish a common market wherein most trade barriers are removed, which allows free trade between member states (Limaeasy, 2021). This sub-regional market liberalization is only possible if member states are committed to implementing the rules and regulations of the CAN into their own legislation. In order to optimize trade the member states have agreed to equalize their taxes, standards, and customs. The formation of a trade bloc such as the CAN has competitive advantages for the nations due to economies of scale and cost savings, which will strengthen Peru's position on the international market (Limaeasy, 2021). Being a member of a trade bloc could give a member state much more leverage in a negotiation process with other countries, making it easier for them to sign trade agreements with.

The WTO is a global trade organization that regulates and supervises the trade agreements between member states. The WTO was founded in 1995 as a follow-up of the GATT, and with its 164 member states the WTO is one of the biggest and most important trade organizations in the world (WTO, 2019). Its goal is to enhance global trade and to reduce trade barriers, this is done by providing a framework for trade agreements between member states. The WTO also facilitates mediation between member states in order to ease the negotiation process of trade agreements between member states. The WTO has helped in the realization of many trade agreements between its member states. Being a member state of the WTO is considered essential for countries in order to participate in global trade on the international market, as it allows the country to be connected to this huge network of markets (WTO, 2019). Peru became a member of the GATT agreement in 1951, when in 1995 the GATT agreement became the WTO all its member states became a founding member of the WTO. Peru took its responsibilities as a founding member seriously and was committed to trade liberalization and open markets in order to expand its economic activities (WTO, 2019). Peru has signed trade agreements with several member states, which strengthened its relation with international markets.

The OECD is a global economic organization that pursues to stimulate world trade and economic progression through its forum of countries (OECD, 2022). During these forums the member states discuss policies, global problems and economic programmes, in order to improve global economy and democracy. The OECD was initially started in 1948 as the OEEC in order to assist with the Marshall Plan, where it helped implement economic programmes in European countries after World War II. After rebuilding the European countries, the OEEC changed to the OECD in order to help countries globally to develop their economy. The OECD started with 20 member states, which were the US, Canada, and 18 European member states. Currently the OECD has 38 member states, which are in general developed countries that have been well integrated into the global economy (OECD, 2022). In order to become a member state, countries have to adhere to strict policies, standards and practices, and have to undergo extensive political, economic and social reforms (Serrano, 2022). Peru is currently in the negotiation process of becoming a member of the OECD, but due to the strict conditions for membership this negotiation is taking a lot of time. The assessment of potential member countries is very strict in order to ensure that the country adheres to the visions, values, and priorities of the OECD. In order to be accepted as an OECD member, Peru has put a lot of effort in economic growth, public governance, environment, human capital, and combating corruption (OECD, 2022). However, in Peru's history of land reforms the government has expropriated many landowners without compensation. Instead, these landowners were given government bonds in which the government stated that the government owed their money. The Peruvian government has failed to repay these bonds, which do not match with the OECD's principles of debt management, rule of laws, and creating a friendly environment for foreign investors (Roman, 2022). Peru has to solve these disputes in order to have any chance of becoming a member of the OECD.

5.2 National regulations

5.2.1 Agrarian regulations

Agrarian regulations have had a big influence on the development of the asparagus industry, as regulations in the past have set up the stage for intensive agricultural activities. The Peruvian has a

history of implementing agrarian reforms that were met with varying results, from rightout disastrous to incredibly successful (Azimi, 2012). Some of these agrarian reforms were drastically different from the previous reform, as they were initiated by political leaders that had their own vision on agriculture.

The most important type of agrarian regulation is land reform, which involves the redistribution of ownership on agricultural land. Laws, regulations and customs are changed, which enables the governing authority to transfer the ownership of land to different owners (Damonte, 2019). Ownership of land is understood as the formal right to access and control land, in order to use it for activities such as agriculture and living. Land reform can happen on a national scale, wherein the ownership of land in the whole country is transferred to certain groups. Transfer of ownership can happen with or without compensation of the previous owner, and it can happen on a voluntary basis or through force (Damonte, 2019). When large plots of land are acquired by a single party it is called land grabbing, which makes it unavailable for other parties to use. Land grabbing has occurred in many situations of agrarian reforms, which has led to an unfair distribution of land ownership. Land grabbing can occur under the name of investments, in which an investor wants ownership over the land in order to exploit activities on it.

Before the 1960s Peru had two types of land ownership, private ownership through a system of haciendas, and community-based ownership on indigenous land (Azimi, 2012). Many regulations on land ownership and agricultural management were based on the colonial rules from the Spanish Empire. The hacienda system was a type of land distribution where conquistadores and people who serviced the Empire were given large plots of land to own, on which they could perform economic activities (Azimi, 2012). This early type of private land ownership was profit driven, and depended on forced laborship from slaves. Haciendas were allowed to expand and exploit their land without limits, and many haciendas were plantations that produced crops for export such as sugarcane and corn. The community-based land ownership was a system where the indigenous group was seen as a legal entity, which allowed the communities to own land that was protected from the haciendas. These communities had claim on these traditional lands, as the land that was owned by the indigenous communities for generations.

In 1969 Peru had introduced its first national land reform policy the 'Decreto Ley N° 17716 de Ley de Reforma Agraria', which was introduced by the socialistic dictator Velasco (Azimi, 2012). The law abolished haciendas and redistributed the land to the peasants who previously worked on the haciendas as slaves. This allowed for smallholders to own land in the form of production cooperatives. These peasant production cooperatives had to produce cash crops for the domestic market, such as sugar, cotton and rice (Damonte, 2019). However, these cooperatives were not very productive due to a lack of coordinated management, as the appointed leaders did not have any experience in managing the corporations. The high costs and low revenue of this land reform has led to high debts and hyperinflation in Peru (Azimi, 2012).

New democratic agrarian reforms came in the 1980s which were aimed to restore agricultural productivity in Peru. Land ownership was revised again, with the land distributions being restructured into smallholders and indigenous communities. The peasant corporations were allowed to exist, but most of them would be transformed to independent enterprises (Damonte, 2019). In order to revive the agricultural sector, efforts were made by the Peruvian government in finding a new profitable crop, productive lands, and actors that had enough funds and experience to make agriculture profitable again.

In 1991 liberal land reforms were introduced to Peru by the newly elected president Fujimori. Land ownership became privatized which allowed foreigners to own land in Peru. All the state-owned land was being auctioned off, which opened the door for land grabbing by foreign companies (Damonte, 2019). The Peruvian government welcomed these foreign companies as they would bring economic development to the country, which would be beneficial for Peru's economic position. The Peruvian has directly helped several foreign companies in the acquisition of large plots of land, which is done through subsidies and irrigation projects (Damonte, 2019). Many plots of land were designated for foreign agricultural production, which gave them a favored position in acquiring the best land for agricultural production.

The Peruvian government was the initiator of several irrigation projects that led to the creation of land that became suitable for large scale agricultural activities. Ica was such a region where the amount of arable land has been greatly increased by government projects (Azami, 2012). The dry land became arable through the building of irrigation channels, water wells, and underground water pumps. The newly created agricultural land was very suitable for agricultural activities, which has led to the attraction of many foreign companies to the Ica region. However, this new land was not available for the same price for domestic actors, as they won't receive any government subsidies for the sale of it. This created a situation of inequality on access to land, as the Peruvian government favored the foreign investors over the local farmers and population (Damonte, 2019).

Currently the position of the foreign companies has become even stronger in the Ica region, with the agro-exporters possessing a large part of the farmlands in the region. However, due to the over extraction of water sources, water retaining areas are needed in order to protect the region's hydrological quality. Agro-exporters do not want to sacrifice any of their valuable agricultural land for the construction of water retaining areas (Damonte, 2019). Instead, the agro-exporters are buying up the land of the nearby small farmers, in order to use their land for the construction of water retaining areas. Although the agro-exporters are paying a reasonable price for the land, the displacement of the small farmers has consequences for the land ownership of the region.

5.2.2 Water regulations

The political reforms in the 1990s have also resulted in a liberal policy on water management. The government wanted to create a water management policy with minimum governmental interference. The existing water authorities were replaced by the privately regulated Junta de Usuarios, which consisted of local water users (Loza, 2018). The Junta was during this period responsible for the management and pricing of water, but due to the Junta's economic orientation the water prices were set low for industrial users. The low water prices has led to low production costs which made agricultural activities profitable, resulting in wealthy and economically powerful companies. The privatization of land ownership has led to the situation where large agro-exporters could own large plots of land that it could exploit without any limitations (Loza, 2018). Massive asparagus fields were allowed to be built, and irrigation systems were allowed to have powerful water pumps that had access to an unlimited amount of groundwater. Existing regulations on land and groundwater uses were relaxed during this period, leading to the loss of power of the water and agricultural authorities. Most of the responsibilities were moved to the water users themselves who formed the Junta (Hepworth, 2010).

The 2000s was a period of new reforms in which the Peruvian government had decided to roll back some of the liberal reforms, and had set up a new regulator for water management that operates semi-autonomous. This resulted in 2009 into a new water resource law, this was the National Water

Resources Policy and Strategy of 200989 (Ley de Recursos Hídricos, Nº 29,338) (Hepworth, 2010). This new law set the framework for Integrated Water Resource Management (IWRM) that led to the creation of the national water authority with the ANA, the regional water authority with the AAA, and the local water authority with the ALA (Hepworth, 2010). The new regulations were needed to solve water issues such as deteriorating water quality, water stress, low irrigation efficiency, poor access to water supplies, and a limited institutional capacity.

The implementation of IWRM allows for economic activities and social welfare to thrive, but that it should not come at the expense of the ecosystem and sustainability. This framework is built on three principles: social equity, economic efficiency, and ecological sustainability (Hepworth, 2010). These three principles need to be balanced, and water management should be aimed at the long term in which it can be improved and overcome new challenges.

For the asparagus industry this new regulation means that agricultural water usage has to be limited to maintain a sustainable water level, and that the agricultural sector should lose its preference position in favor of other sectors. This policy translates in a higher taxation of the water use of agricultural companies and a cap on the maximum amount of irrigation water that is allowed to be extracted. As the high amount of water wells in the region contribute to the water issues, the amount of wells needs to go down and no new wells are allowed to be dug (Hepworth, 2010).

While these new plans are a step in the right direction, in practice the enforcement of the new policy has not been very effective (Hepworth, 2010). Enforcing the new regulations is a task for the ALA, which suffers from a lack of institutional capacity. Because many government institutions were stripped down during the liberal period of the 1990s, the ALA has to be rebuilt in order to have enough capacity to perform their tasks. Also legislative gaps between governing institutions hampers effective enforcement, as there is an overlap in the tasks between the AAA, ALA, and the Junta (Hepworth, 2010). The boundaries between regional and local level have not been drawn clearly, causing an overlap between both legislative areas. This makes it hard to divide tasks between the ALA and AAA, resulting in inefficiencies as both organizations have to discuss who is allowed to perform which task. The same overlap can be found between the ALA and the Junta, as both organizations operate on the local level (Hepworth, 2010). The ALA is here the newly introduced organization that still has start-up problems, while the Junta is the established order. The ALA has been given tasks that were previously the responsibility of the Junta. However, the transition of responsibility has been unclear, as some parts of the tasks still remain the responsibility of the Junta. These uncertainties lead to confusion, and has resulted in that neither of the organizations have picked up these tasks (Hepworth, 2010).

5.3 Local regulations

5.3.1 The government of Ica

The local government of Ica shares the same neoliberal ideas as the national government, and are also in favor of export focused agriculture. The region has profited from these economic activities a lot, and the agro-exporters have been given a lot of political and economic power because of it. Because of the high power of the agro-exporters, they are in a situation of political settlement with the local government of Ica (Damonte, 2019).

Political settlement is a situation where a powerful actor has agency over the governing actor, this agency is based on the actor's influence on the local societies and networks. The actor is considered a local elite due to its economic and political capabilities, as it could exert its influence in order to steer the political agenda (Damonte, 2019). This steering can be done incrementally in an evolution-like way or non-incrementally through radical change and disruptions. In many cases political settlement changes the outcome of economic and political regulations, which makes formal rules such as tax laws to be of the benefit of the powerful actor.

In the region of Ica the interests of the agro-exporters tend to align with the interests of the local government, as both have a neoliberal vision and a desire for economic growth. The local government is willing to provide the agro-exporters in Ica many privileges that fit a case of political settlement, such as tax benefits, unlimited resource extraction, land ownership and other preferential treatments (Damonte, 2019). When it became apparent that the agro-exporters were suffering water scarcity issues, the local government pledged \$195 million to build infrastructure that would restore the groundwater resources (Damonte, 2019). Instead of punishing those who have caused the problems, the government has rewarded them with financial support. When small water users experienced the same problems the local government did not offer any financial support. This has led to much discontentment of the local population, as the government has done nothing to address the causes of the water issues. This means that the negative consequences are only for the poor and vulnerable instead.

5.3.2 The ALA in Ica

The ALA is the local water authority in the Ica region, it is responsible for implementing regulations of the ANA on local level. Other tasks of the ALA are to enforce and monitor the local water users, in order to detect regulatory violations. When the ALA detects such a violation it is allowed to hand out hefty fines, or even to close the activities of the violator. Protecting the water sources is an important part of water management, and the ALA has to make sure that problems such as water scarcity are prevented. When in 2011 the 'Resolución del jefe Número 330' law was passed, it banned drilling for new water sources (Damonte, 2019). In order to enforce the new law the ALA was tasked to check strictly on water flow meters, illegal wells and water pumps, and other violations.

Agro-exporters do not want to pay more for water extraction, or to close any of its wells and water pumps. In order to protect their access to water, the agro-exporters do their best in hampering the inspections of the ALA (Damonte, 2019). Although the ALA tries its best in enforcing the law, many agro-exporters are able to circumvent these inspections through different means. One of the ways in which inspection was prevented was by simply denying the enforced access to the company. Because the agro-exporters operated on private property, the enforcers were not allowed to access the lands without a permit (Damonte, 2019). When a permit is drafted, explicit permission from the agro-exporter is needed in order to notify them of a future inspection. The ALA has to give agro-exporters a three day notice before starting the inspection, but agro-exporters are allowed to reschedule these inspections indefinitely (Damonte, 2019). In some cases the agro-exporters have reported the ALA's notification of inspection as a case of abuse of authority. This has made

inspections a laborious and time-consuming process, which discouraged the enforcers to inspect the many agro-exporters in Ica.

In the past the inspectors of the ALA have had surprise visits which were performed without explicit permission of the agro-exporter. However, this did not work well for the ALA, as the agro-exporters reported these inspections as abuse of authority (Damonte, 2019). This made the inspection inadmissible, and the ALA could not enforce the violations that were found during these inspections.

When ALA inspectors are able to inspect the agro-exporters with permission, the inspectors have to go through a predetermined route with many checkpoints and closed-off areas. Inspectors are intimidated by signs with ‘trespassers will be shot’, and armed guards that escort them throughout the whole inspection (Damonte, 2019). This makes the inspectors vulnerable to aggression, which makes them less effective in their inspection. The agro-exporters state that these measurements are legitimated, and that they are needed in order to protect its private property. As a result of privatization of land, property laws in Peru allow a lot of liberties in order to protect private land, which makes it impossible for the ALA to perform inspections without heavy security.

When the ALA is able to perform its inspection and have detected violations, it has to report these violations to the water dispute tribunal ‘Tribunal de Controversias Hidricas’. This tribunal is a court of law where a judge decides over the sanction for the violator. Because the agro-exporters have a lot of financial funds, it makes it possible for them to hire the best lawyers available. These lawyers work very thoroughly and could find small errors and mistakes in the violation claim, which affects the effectiveness of the claim (Damonte, 2019). Pointing out these procedural mistakes could change the decision of the judge, as it could make the case inadmissible. The result is that in 70% of the cases the judge has reduced or even canceled the demanded sentence. Due to the ineffectiveness of the ALA’s enforcement, many agro-exporters are able to get away with their violations. This means that the causes of water scarcity are not addressed, as over extraction of water in the Ica region still continues.

5.3.3 The Junta de Usuarios of Ica

The council of water users in Ica is named ‘Junta de usuarios de aguas subterráneas del valle de Ica’ (JUASVI), and used to consist solely of commercial water users from Ica. Since the reforms of the Peruvian water authorities in 2009, the Junta has included governmental representatives from the ALA in its board (JUASVI, 2021). Before the reforms the JUASVI was the only water authority in Ica, and was responsible for managing the water regulations for the region of Ica. During this period the JUASVI has allowed water users to extract unlimited water, leading to depletion of the underground water sources. When the problems of water depletion became apparent, the JUASVI became concerned about the availability of water in the region (JUASVI, 2009).

In 2009 the Peruvian government reformed the water authorities and gave the JUASVI new tasks. The JUASVI is tasked with monitoring the water levels of the Ica region, assisting the ALA with inspections, and the finance and building of water related infrastructure (JUASVI, 2021). The primary goal of these tasks is to restore the aquifers of Ica, in order to ensure the water sources of the Ica region in the future.

The JUASVI consists of many water users whose income are dependent on the region's water availability, in order to protect their interests the JUASVI has to secure the region's water sources. When the water resources in Ica become depleted it will not only lead to ecological damage, but also to economic damage that could put these water users out of business. In order to protect the water resources better the JUASVI is performing a lot of research on understanding the dynamics of the underground aquifers (JUASVI, 2009). This knowledge will help in improving the renewal rate of the aquifers, which could contribute towards the replenishment of the region's water sources.

6. Results III: Sustainability implications

In order to answer the third sub question: "*Which sustainability implications are related to the asparagus production in the Ica region?*" different issues in the asparagus industry related to sustainability are analyzed.

6.1 Water implications

6.1.1 Water scarcity

Water scarcity is one of the biggest threats for Ica's ecosystem. This issue affects the economic production of the whole region, as water is used in many industries. In the Ica region two types of water scarcity can be found, physical water scarcity and economic water scarcity (Hepworth, 2010). Physical water scarcity is the absolute shortage of water in the region, which is caused by a combination of intensive water use and a limited availability of water found in the region. The harsh natural conditions of the Ica region is one of the causes for a limited availability of water, as the desert climate results in a low precipitation level (Beutler, 2016). Economic scarcity is based on the access to water instead of the absolute availability of water in the region. This is mostly price related, where the cost of water limits the access to water sources. Physical scarcity also plays a role in the price of the water, as a limited supply tends to lead to higher prices. Besides the price of the water itself, economic scarcity can also be found in the need for equipment that is needed to access the water (Hepworth, 2010). When expensive pumps are needed for accessing the water, only actors that have sufficient funds can buy these pumps and access the water.

6.1.2 Underground water aquifers depletion

The main sources of freshwater in the Ica region are the underground water aquifers and the rivers on surface level. Water extraction from the underground aquifers is done through wells and underwater pipelines, which are expensive and labor intensive structures to build (Hepworth, 2010). Water pipelines are mostly used by agro-exporters to irrigate their crops, while small/medium farmers are using wells for their irrigation. The intensive use of wells and pipelines has stressed the underground water system. In order to prevent the depletion of these water sources regulations should be set. Possible regulations could be a cap on the water extraction, and limitations for building new wells and pipelines. As the underground water level is declining, wells need to be deepened and pipelines need to be extended in order to provide sufficient water for irrigation. However, the costs become higher when deeper digging needs to happen, which will become

unavoidable when the water level of the underground aquifers drops (Hepworth, 2010). When the aquifers become depleted it will mean the end of many economic activities in the Ica region.

6.1.3 Surface water availability

Water extraction on surface water sources is mainly done by the small/medium farmers, which use irrigation channels to divert the river water to the asparagus fields. But surface water is not used by the agro-exporters for irrigation as underground water is much more reliable than surface water in quality and quantity (Beutler, 2016). The occurrence of dry periods in the region affects the quantity of surface water, as many surface water sources have become dry in these periods. Agro-exporters want to irrigate their crops regularly to maximize production and quality, which becomes impossible when they use surface water. The quality of the surface water is also lower compared to groundwater due to sedimentation (Beutler, 2016). The advanced drip irrigation system uses small holes that would be clogged up by the sediment when using surface water. In order to be able to use surface water for their irrigation, this water needs to undergo an expensive treatment to filter the sediment (Hepworth, 2010). The costs are currently too high to make this profitable, but when the price of water increases it could be seen as a potential water source for the agro-exporters.

The Ica river is the main source of surface water, but it does not contain water the whole year due to the region's desert climate. When the river has dried up in the dry period the small farmers have to rely on alternative water sources to supplement their irrigation. This is mostly done with the public wells in the region, which are limited in number. The use of water trucks or underwater pipelines is too costly for most small/medium farmers, as most small farmers lack any funds (Hepworth, 2010).

6.1.4 Irrigation issues

Another threat of the lower underground water levels is that the land becomes dryer. Many small/medium farmers use flood irrigation for their crops, which relies on that the fields are flooded for an amount of time (Beutler, 2016). However when the land is dryer the water stays shorter on the field, resulting in that the crops will have less water to grow (Hepworth, 2010). Flood irrigation is a relatively simple and cheap method to irrigate crops, but it is also an inefficient irrigation method. More water is used to flood the fields than the crop is able to absorb, leaving a lot of water being vaporized and drained.

Drip irrigation is a method that is expensive but water efficient, the system is designed to give the crops the exact amount of water it needs (Beutler, 2016). The advantage of the system is that the water is only used on the plant with minimal loss of water, and the rate of the drips can be adjusted to the needs of the plants. The agro-exporters are using drip irrigation for their crops, and see themselves as pioneers using this efficient irrigation method (Hepworth, 2010). However, due to the massive scale in which asparagus is produced by the agro-exporters, the absolute water use is much higher compared to the small/medium farmers.

Although drip irrigation is seen as the solution to the water shortage, some theorize that it has unexpected consequences. While flood irrigation is seen as a less efficient irrigation method, the 'lost' water that is drained in the land actually seeps back into the underground water aquifers (Beutler, 2016). This will also keep the land moist, which helps in sustaining the underground water levels. With drip irrigation this cycle of water does not happen, almost all the water will go directly to the crops leaving no water left for moisture in the land (Beutler, 2016). The water retains in the

crops which is exported to different regions, leading to a situation or virtual water trade. As drip irrigation happens on a large scale, the amount of virtual water which is traded is significant and causes big gaps in the natural water cycle of the region.

6.1.5 Virtual water trade

Virtual water is a concept that assumes that when products are traded between two places, it will also be a trade of water (Water footprint network, 2021). The term virtual refers to the invisibility of water that is traded, as the export of water containing products is not always seen as the allocation of water. Water from the Ica region is exported to other countries, and can't be used for its own production or services anymore. The desert climate makes the Ica region vulnerable for water scarcity, and the asparagus industry makes it worse by taking away water from an already stressed water system. Asparagus is a crop that prefers a location that is warm, without precipitation, and with enough water for irrigation. The Ica valley is a desert region with underground aquifers, where the region's asparagus industry is dependent on pumps and wells to provide water for its irrigation (Beutler, 2016). The aquifers are one of the few water sources in the region, making water scarcity a big threat for the region's sustainability. Since the coming of agro-exporters the usage of water in the region has increased tremendously, the rate of water extraction has become higher than the rate in which the groundwater can be regenerated. This led to a deficit in the groundwater level, making it harder to extract water (Hepworth, 2010).

Part of the problem with virtual water trade is the combination of large scale asparagus cultivation and the high water consumption of it. The asparagus is a plant that has a high water footprint as it requires a high amount of water. The asparagus plant stores most of the water in its shoots, which are the parts of the plant that get exported to different countries (Dring, 2014). Virtual water trade occurs, as water that is used for irrigation will not return into the water cycle of the Ica region but is instead traded away to make money. This process has a negative effect on the water availability of Ica, as the asparagus industry has to import water from other regions to compensate for its water shortage (Hepworth, 2010). Other methods to compensate for the loss of virtual water in Ica could be importing products with a high water footprint, or to improve the current irrigation systems for more efficiency and water recovery methods (Water footprint network, 2021).

6.1.6 Inequality in water access

The production of asparagus in the Ica region has also effects on the water availability of the citizens of the city of Ica, as the city's water supply is also dependent on the underground aquifers. The ALA and Junta are the city's water authority that manages Ica's water supply (Hepworth, 2010). Due to an earlier earthquake in the year 2007 the city's water supply has been disrupted for a long time. A lot of infrastructure was damaged and access to water was limited. Rebuilding this infrastructure has been hard due to several reasons (Hepworth, 2010). Inadequate management of the local authorities has delayed the restoration of the waterworks. The rapid migration to the cities has led to the formation of the many shantytowns around the city of Ica. This means that a lot of sanitation and water services were of informal nature, making it hard to map them out and to restore them. As shantytowns are the parts of town where the poorest people live in, it is hard to gather funds for restoring the water supply in these areas (Hepworth, 2010).

In contrast to this situation, agro-exporters and other economically important parties could easily gather funds and were able to rebuild their access to water quickly (Hepworth, 2010). As the government considered them as essential for the economy, they were granted subsidies for restoring their water services. With the extra funds the agro-exporters received, they were even able to expand upon their previous activities before the earthquake.

Besides the inequality in funds, there is also an inequality in the access to high quality of water. The high production standards that are used by the agro-exporters means that the best available resources should be used to maintain a high and consistent quality. Because the asparagus industry has contributed much to the Peruvian economy, it has gained a preference position by the Peruvian government (Hepworth, 2010). This gives them access to the best resources, such as high quality water. There is a critique by many people that this preference position has led to inequalities between the foreign companies and the local population. And that this priority position has resulted in that the asparagus industry has access to better quality of water than the people that live in the region. For the people of Ica it has become clear that the local government prefers economic wealth over taking care of their own population (Dring, 2014).

6.1.7 Water grabbing

Water grabbing occurs in the Ica region, where the agro-exporters have gained access to many of the water resources in Ica. The access to water is unevenly divided in the Ica region. When counting the total number of water users, agro-exporters consist of 0,1% of the number of water users, however they control 33% of the region's water access (Franco, 2014). In contrast to this, small scale farmers consist of 70% of the number of water users, but they only control 9% of the region's water access.

Although it seems unfair, the agro-exporters have appropriated their right to water through legal means when the Peruvian government has granted them unlimited access to water resources. However, this unrestricted water access has led to a mismanagement of Ica's water resources. Due to the intensive water extraction the quality, allocation, and distribution of water has been changed, making water a contested resource (Hepworth, 2010). The local ecosystems have become damaged, causing water depletion and the loss of ecological services. Commodification, and privatization of the water resources have led to the dispossession of local water users, which restricted their access to water (Franco, 2014). The smaller water users became disadvantaged as they were not involved in the negotiation processes.

Water grabbing has occurred in one of Ica's water redirection programs, the Ingahuasi water collector channel which diverts water from the Huancavelica region to the Ica region with channels and viaducts in order to supplement the region's irrigation (Hepworth, 2010). However, the project was met with opposition from the indigenous Carhuancho communities that live near the lagoons from which the water is transported (ELAW, 2007). The authorities did not notify any of the Carhuancho people that the Ingahuasi water collector channel would be built in their territory, and they were kept uninformed on the possible consequences of the new water diversion project (ELAW, 2007). The Carhuancho people were worried about the uncertainties that the Ingahuasi water collector channel brought and their future water access. They were afraid that their water sources would suffer from the new channel, which is something that has already occurred during the

previous water diversion projects (Hepworth, 2010). The previous iterations of the Ingahuasi water collector channel were designed without consulting the people in the area. When the water was diverted it has led to unforeseen consequences as it has disrupted the natural flow of the water springs. Pastures have dried out of it and the quality of the crops and cattle has suffered from it (Hepworth, 2010).

6.2 Land use implications

6.2.1 Land use change

When the asparagus producers entered the region of Ica, the use of land was changed. The primary land use in the region existed of agricultural use with moderate irrigation, as the crops used an average amount of water. However, the land changed from moderately irrigated land to intensive irrigated land, which has had an influence on the ecosystems and resources of the region. The balance of the land has been destabilized by nutrition shortages and surpluses, and could potentially lead to damaged land that becomes unproductive (Hepworth, 2010).

High soil quality is important for cultivating high quality asparagus, as asparagus is a plant that grows the best on sandy soil that allows water to be drained. The desert areas in Ica are very suitable for cultivating asparagus, but only when they are intensively irrigated. This irrigation transforms the dry desert land into green asparagus fields, which changes the general landscape of Ica (Loza, 2018).

6.2.2 Nitrates

Agro-exporters have an intensive agricultural production that requires a lot of resources. Besides water, fertilizers are used on a large scale, which could lead to land pollution. Farmers have to use enough fertilizers to make the asparagus grow, however the plants are not always able to absorb all the components of the fertilizers (Hepworth, 2010). Mostly a small residue of nitrates will be left over when the plant has finished growing, which builds up in the land with every harvest cycle. Nitrates are a compound that is needed to feed plants, it is an essential nutrient that makes plants grow.

An overuse of fertilizers could lead quicker to high nitrates levels in the land, which has negative effects on the environment. Nitrates could lead to water and soil pollution, which leads to deterioration of the environment (Hepworth, 2010). Because nitrates are a component of fertilizers it could lead to uncontrolled growth of weeds and algae, which could damage the crops of the farmers. The people that live nearby the land of agro-exporters could get health problems when their drinking water is contaminated with high levels of nitrates. High intake of nitrate could lead to methemoglobinemia, which is a disease related to a low blood pressure and has symptoms such as nausea, headaches, cramps, and high heart rates. Methemoglobinemia is especially dangerous for pregnant women, as babies with this disease become blue and could die from it (Hepworth, 2010).

Although high concentration of nitrates is associated with intensive agricultural activities of the agro-exporters, this problem cannot be pinpointed on these producers solely (Hepworth, 2010). There are several other sources that could also lead to high concentrations of nitrates in the soil. The

small/medium asparagus farmers and the traditional food farmers both use traditional fertilizers such as manure to make the soil fertile again, which is less efficient than artificial fertilizers and will leave more residual nitrates. However the scale in which traditional fertilizers are used is still much lower than that of artificial fertilizers. The difference in scale is much bigger than the difference in impact, meaning that the agro-exporters still have a very big share of the pollution of nitrates (Hepworth, 2010). Therefore the agro-exporters should limit their use of fertilizers, in order to help reduce the levels of nitrates in the area.

6.2.2 Salinization

Another soil issue is salination of the land which happens as a result of high water usage and the use of fertilizers. Many artificial fertilizers use salts such as potassium chloride and ammonium sulfate to help the plants grow. However this will lead to a buildup of salt in the land over time, as salts move deeper into the land when it is wet (Hanson, 2011). When the land is not treated properly, the salt remains under the land, making it harder for plants to grow when the salinity levels increase. Salinity is harmful for plants, as salt could disrupt the osmosis for plants (Hanson, 2011). Osmosis is the mechanic in which the plants take up water through membranes, but when salt water comes into contact it becomes harder for the membrane to let water into the cells of the plant. When the salinity level becomes high enough it even withdraws water from the cells, resulting in drying out of the plant. The plant is not able to absorb water anymore, and eventually it withers. This is undesirable for asparagus farmers, as it makes it harder to grow for the crops (Hanson, 2011). When salinization levels become too high it could make the land unsuitable for cultivation, which leads to crop failure.

The asparagus plant itself is a rather resistant plant against salty land, as it is able to grow in salt stressed soil (Gao, 2021). The higher salinization threshold means that the effects of salinization are not quickly reflected in the quality of the asparagus. Asparagus farmers will only notice salinization problems when the salt stress of the land is relatively high. Local crops on the other hand have a lower threshold for quality loss by salinization, and the farmers of these crops will start to notice salinization problems when the salt stress of the land is already moderate. This makes salinization a sustainability issue that mainly affects the small scale farmers, as the agro-exporters only suffer a little from salinization issues (Gao, 2021).

6.2.3 Pesticide use

Pesticides are a substance that deters or eliminates pests and diseases that affect the crops. Pesticides are commonly used in agriculture to protect plants from pests and diseases, but the intensive use of pesticides could lead to soil pollution (Gomez, 2015). The chemicals in the pesticides could spread into the drinking water, causing unforeseen health issues.

Many pesticides contain poisonous components that are designed to exterminate pests. However, these poisonous components could also affect other plants and animals. When pesticides are spread through the ecosystem it could be absorbed by animals through food that is contaminated by pesticides. Small animals such as insects and prey animals will not suffer much from this pesticide intake, predators on the other hand could suffer more from the intake of pesticides through build-up. The build-up of pesticides happens through the dynamics of the natural food chain, wherein animals that are low on the food chain only absorb a little amount of pesticides through their food. Animals that are higher on the food chain will eat a lot of the animals on the lower food chain,

meaning that their level of pesticides absorption will be higher. This could lead to the massive death of these predators when their pesticide absorption becomes too high.

Another pesticide related sustainability issue is pesticide resistance, which could occur when pesticides are overused. Pesticide resistance becomes a problem when the pest becomes immune to the pesticides (Gomez, 2015). Pests will become harder to exterminate, and when it becomes too hard to contain it could lead to plagues that destroy the crops. Agro-exporters could afford more powerful pesticides to protect their crops further. For small farmers that use less effective or no pesticides this is a much bigger issue. Small farmers are not able to buy more powerful pesticides, making pesticide resistance an issue that affects the poor and vulnerable.

6.2.4 Land grabbing

Besides water grabbing, agro-exporters are also involved in acquiring large plots of land. Land grabbing is made possible by the privatization of land ownership in Peru. The large acquisition of land happened through backdoor deals with the government, wherein the agro-exporter bought large plots of land cheaply (Franco, 2014). The way in which the land is used, could affect the prices of land, as it becomes more valuable when its potential for economic activities are known. This happened also in the Ica region, where the value of land has increased since the introduction of the asparagus industry.

Land grabbing is often related to deforestation wherein large amounts of trees are cut for their wood, and for agricultural development on the land. Although this is not the case in the Ica region, something comparable happened instead (Franco, 2014). The agro-exporters are taking pride in the fact that they have turned dry desert land into large green fields, as it suggests that they are making the region greener. But in reality they are just depleting the available resources through their intensive irrigation practices. Instead of stripping the land from trees, agro-exporters are stripping the land from water resources.

The composition of the land differs per plot of land, making some land more valuable than others. Some plots of land are better suitable for water extraction as they are located above a thinner layer of hard ground, which makes reaching the underground water aquifers easier. This land is desirable for the agro-exporters to own, as it gives them better access to high quality groundwater (Franco, 2014). There are ways to find out where these suitable places are located, such as echolocation, drill measures, and computation models. But when such a location is found on a plot of land that is already in possession of a native farmer, it could lead to land grabbing. These native farmers often have low productivity, and are not very powerful. This makes it relatively easy for the agro-exporters to buy them out, this form of dispossession could displace people from their land, which is a characteristic of land grabbing (Franco, 2014).

7. Results IV Socio-economic implications

In order to answer the sub-question: *'Which socio-economic implications are related to the asparagus production in the Ica region?'* issues on labor, economics and production are researched.

7.1 Labor issues

The region of Ica is known for its many employment opportunities, which has caused a high migration rate towards the city (Wilkinson, 2011). The region's unemployment rate is very low, and the life standard in the city is high compared to the rest of Peru. The agro-exporters offer jobs such as asparagus cutter, machine operator, packer, transporter and many other functions (Adam, 2019). Due to the high job availability people from many classes are able to work in the many functions of the industry, including women in packaging, highly educated in administrative functions, and unschooled people working on the fields (Hepworth, 2010). The economic prosperity of the asparagus industry has helped the region to build a strong middle class which has benefited from the profits of the industry (Wilkinson, 2011).

On the other hand, the region still has a big population of lower class people whose quality of life has not improved at all. These lower class people employ full time jobs, but the pay is so low that they are just able to sustain their livelihood financially (Wilkinson, 2011). In general the working conditions and wages are reasonable, but this differs very much between the different employers. Although the demand for workers is high, the supply of job seekers is also high. The companies that offer jobs with the best working conditions are popular amongst the job seekers, which means that these positions are mostly already taken. This means that many people are forced to take jobs at companies with low wages and bad working conditions (Wilkinson, 2011).

Initiatives to improve the wages and working conditions of the workers have been introduced, but these have been of limited effect (Schwarz, 2016). In times of economic high, inflation has caused the prices of food, products, and services to rise, making life in the city more expensive. While in times of economic low, lay-offs and wage reductions may occur. Since the introduction of two export related laws, it has made the situation harder for the workers of agro-exporters during times of economic low. The Decree Law 22342 is aimed at ensuring the competitiveness of the Peruvian agro-exporters during economic hard times by lowering the labor costs (Schwarz, 2016). Employers are allowed to offer flexible contracts to its workers, where terms and conditions are allowed to change. Hiring workers is allowed with short-term contracts, which allows employers to suspend workers without any reason (Adam, 2019).

The Agricultural Sector Promotion Law 27360 allows employers to lower the labor welfare and working conditions when the economic situation is low (Schwarz, 2016). The wages, rights and benefits are allowed to be lowered, which was seen as a controversial issue. As the work in the asparagus industry is very labor intensive, lowering these working conditions makes the situation of the workers more vulnerable (Adam, 2019). It is claimed that the new law would offer agro-exporters more opportunities to hire new employment while retaining the current workers. However, some say that the law is only issued to increase profits for the companies at the cost of the social security of the workers (Adam, 2019).

7.1.1 The flip side of zero unemployment

Although the city of Ica has a lot of jobs to offer, the problem is not the quantity of the available jobs but the quality of the available jobs (Wilkinson, 2011). Most job offers in the region are in agriculture, while the offer of jobs in other sectors are fewer. This has resulted in highly educated people that take jobs as workers for the agro-exporters, instead of jobs that fit their education. This can be seen as a waste in education, as the potential of these people is not used. Instead of working

at well paid jobs these people are taking jobs with low wages, earning just enough to sustain their livelihood (Wilkinson, 2011).

Because of the high supply of jobs in agriculture, many high school students in Ica are tempted to work in the fields instead of studying (Wilkinson, 2011). The money that these jobs pay is not much, but it still makes more money than just staying in school. This creates a situation where the young people want to earn quick money and become a full-time agricultural worker. This means that they will not finish their education and will become school drop-outs, which negatively affects the region's average level of education (Wilkinson, 2011). As the wages of the jobs these young people do is low, the prospect of earning more money in the future for them is rather low due to a lack of education. As the job they do is physically hard they risk getting health problems at an earlier age, which could further decrease quality of life.

7.2 Competition issues

7.2.1 International competition

Besides Peru, other asparagus producing countries are also able to produce asparagus the whole year long. China is the biggest producer of asparagus worldwide, with export and production levels much higher than the Peruvian producers (Diaz Rios, 2018). Mexico is also a very big competitor for Peru as both countries have similar characteristics for producing asparagus. In addition to this Mexico is located next to the border of the United States, which enables them to export asparagus on land with trucks (Diaz Rios, 2018). As Peru has capable competitors on the international market, it puts pressure on the Peruvian asparagus production to produce better asparagus for a lower price.

Peruvian agro-exporters are doing their best at staying ahead of their competitors, and are trying to reduce production costs through cost savings and efficiency improvements in order to offer a better product for a lower price on the market. This means that they try to get the best resources available, and to produce products for an as low possible price. In order to achieve this, Peruvian producers try to lobby with the Peruvian government in order to get a preference position that gives them the best resources available for a reduced price (Hepworth, 2010). The flip side of this is that they are being favored over the local Peruvian population, which creates inequality on the accessibility of resources. The agro-exporters have also lobbied for the relaxation of laws and regulations regarding labor rights in order to reduce labor costs (Adam, 2019). This has allowed the agro-exporters to give workers a flexible contract and to underpay them, making the wages of Peru low compared to many competing countries. However, as the economy of Peru has grown over time, inflation is occurring on Peru's food and products. The result is that the price of products and food have increased, while the wages have practically stayed the same (Adam, 2019). This has led to a decrease in quality of life for the workers, as they are too underpaid in order to be able to improve their living conditions. However not every asparagus producer underpays its employees, and there are also cases where employers provide good working conditions for their workers (Adam, 2019).

7.2.2 National competition

National competition happens when multiple actors are competing in the same sector, this is something that happens between many industries including the crop producing sectors. In the case

of Peru, competition happens between the traditional crop producers and the export focused food producers (Diaz Rios, 2018). Competition becomes a sustainability issue when the competitors are using resources at a higher rate than the rate in which the resource is renewed. When one of the competitors becomes larger than the other, it could lead to the situation where the small competitor is forced to leave the industry.

The Peruvian export-focused crop industry has grown enormous in size since the 1990s, and has become bigger than the traditional producers. When resources become scarce it could lead to higher costs, which might lead to a situation where one of the producers is forced to leave the industry. When looking at the current crop production, both the traditional and export focused crop industry has grown since the 1990s (Salmoral, 2020). However, this has led to a situation where certain crop producers were driven out of the industry as a result of increased competition. Many Peruvian farmers cultivated coffee, sugar and cotton until the 1990s. However, this started to decline after the introduction of new crops by newcomers in the Peruvian agrarian industry (Salmoral, 2020). The rise of the agro-exporters has led to the replacement of the old crops by the newer more popular export crops. Nowadays only the production of cotton exists in Peru albeit on a much lower level compared to the rest of the industry, reduced between 1995 and 2017 from 70000 to 15000 tons (salmoral, 2020).

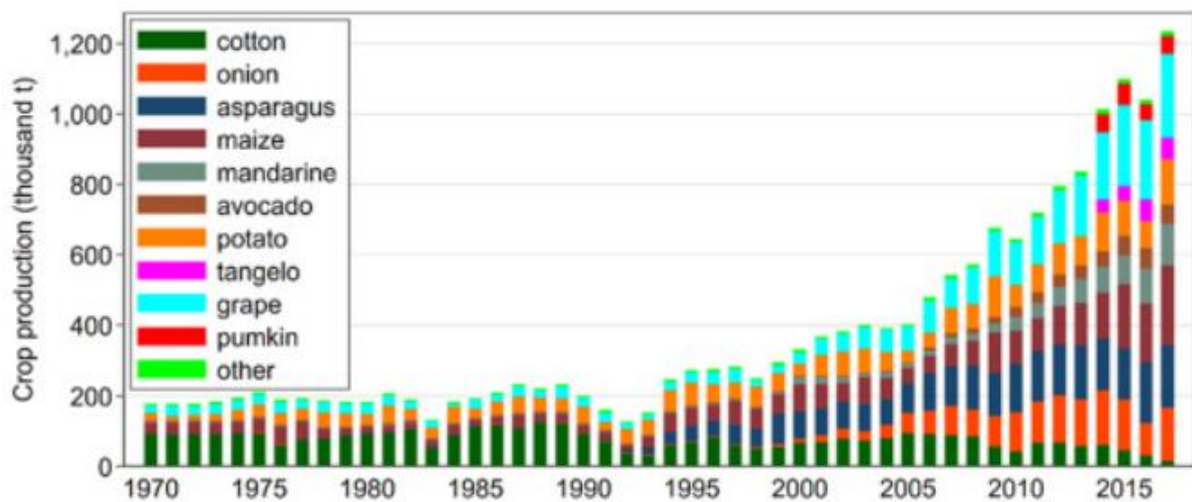


Figure 7: The trend in crop production (Salmoral, 2020).

Although every crop other than cotton has increased its production level from 1995 on, the level in which the growth occurs is almost exponential (Salmoral, 2020). This means that resource uses have increased exponentially too, stressing the available resources in the region. When the exploitation exceeds the limit in which the resources are renewed, it would lead to depletion of the resources. When resource scarcity becomes a serious problem it will drive the prices of the resources up, eventually becoming so expensive that producers have to compete against each other. When crop producers are not able to compete against other producers, they might suffer the same fate as the cotton, sugar and coffee producers (Salmoral, 2020).

When the traditional crop production gets driven out by competition, it could become a problem for the local food supply as these crops are eaten by the local population. The region’s availability will deteriorate as a result of increased prices for traditional food, instead of locally grown food the traditional food needs to be imported from other regions (Salmoral, 2020). Such a situation is likely

to happen when the prices of resources are increased, and only producers with a lot of funds are able to buy them. Traditional crop producers have in general access to less funds than the agro-exporters, and are more likely to be forced out of the market.

Regulation could be used to prevent a situation where the traditional is forced to leave the market. When the traditional food production is reduced to such a low level that the local food availability suffers greatly from it, the government could prioritize local food production. To prevent the depletion of resources, the government could ultimately abolish the activities of the agro-exporters.

When the agro-exporters are forced to leave the region it would be a big loss for the region's economy. The economic success of these export driven industries has improved the food security of the Ica region, and have attracted a lot of migrants from the rural regions toward the city. As the agro-exporters offer a lot of income for the agrarian workers and farmers, it means that a lot of people won't be able to sustain their life financially when these producers cease their activities.

Although a high competition between crop producers has led to sustainability issues in the region, the activities of these producers has also resulted in a big improvement in the region's economy. Therefore, the economic sustainability would be worse if any of the crop producers had to stop its activities. In order to protect the ecosystems in the Ica region, competition has to take place on a sustainable level. Resource use should not exceed the renewal rate, while profits have to be high enough to pay the workers sufficient to live from.

7.3 Covid-19 related socio-economic issues

7.3.1 Covid-19 related economic issues

The focus of this research has been on and how the asparagus industry plays a role in this. Here it is theorized that the industry should be able to resist shocks that endanger its economic activities. As the production and export of asparagus is an important industry for Peru, any shocks that disrupt the export of asparagus could be seen as a threat for Peru's economy (Venesky, 2021). The recent Covid-19 crisis can be seen as a shock that threatens Peru's economy, as it has disrupted many activities in Peru's asparagus industry (Cortes, 2020). The shock of Covid-19 has affected the production of asparagus in two ways, through transportation issues and through production issues (Higgins, 2020). The transportation of asparagus was mostly hindered by the global export ban, while the production of asparagus was mostly hindered by the risk of workers spreading the virus. These issues affected the food security of Peru, through losses of income for those involved in the asparagus industry (Cortes, 2020).

7.3.2 Transportation issues

The global export ban is a measure where many governments have closed their borders for export products in order to prevent the spreading of the Covid-19 virus. This has resulted in transportation issues that caused disrupted supply lines and unsold products (Higgins, 2020).

There are different ways to transport asparagus to exporting countries, through air, and sea. Air transport happens in two ways, which are both affected by the travel bans (Higgins, 2020). The first

way is with freight planes, this is rather expensive for most asparagus producers and is only suitable for very large batches of asparagus. During the first phase of the pandemic every type of export was banned including freight transport, this made it impossible for the asparagus to reach the consumers in North America and Europe (Higgins, 2020). Because the batches for this type of transportation are big, large freezing cells were needed to keep the asparagus fresh (Irrigazette, 2020). Over time it became clear that freight transport did not contribute to the spreading of the virus, and the ban on exporting products through freight was lifted (Venesky, 2021).

Most asparagus producers are using a different type of air transport, instead of specialized air freight they make a deal with commercial passenger airlines. In this type of transport asparagus batches are transported in the belly of passenger planes (Higgins, 2020). These flights are cheaper compared to the specialized air transportation, because airlines are able to make money through passenger tickets and freight contracts. These flights are much more efficient for the airline as the plane's free space is used for additional freight. This system however comes with a caveat, as the amount of flights is dependent on the amount of passenger bookings (Higgins, 2020). Under normal circumstances this would not be a problem, as the amount of passenger flights is usually consistent. However, during a situation such as a pandemic things are very different. As a measurement against the spreading of the coronavirus a ban was also put on commercial flights of passengers, which was of a much longer duration than the ban on aerial freight transportation (Higgins, 2020). When it became clear that passenger flights were a contributor to the spreading of the virus, it became uncertain when these flights would continue again.

A third type of transportation is by shipping with freight ships, this type of transportation is used by small asparagus producers as it is a rather cheap transportation method. It allows for big batches of asparagus to be transported cheaply, but it's biggest disadvantage is its long transportation time (Shimizu, 2009). The measurements against the coronavirus were comparable to those with aerial freight transportation. Because the COVID-19 crisis happened suddenly, it had led to the situation where fresh products that were ready for export were held back (Higgins, 2020). However, due to the long transportation time, many batches were already sent when the transportation bans were set. This means that a lot of batches were stuck on sea between countries, as they were not allowed to enter the harbors of the countries (Irrigazette, 2020). As ships have limited means for preserving their freights, this means that a lot of batches were spoiled when they were waiting for permission to enter the harbors. The waste in asparagus caused big financial damage for many small farmers, as they were not able to recover costs from these lost batches.

7.3.3 Production issues

7.3.3.1 Halt of production

Besides transportation, the coronavirus also caused a lot of problems for the production of asparagus. As there were a lot of uncertainties about the virus during the first phase or the pandemic, people were not allowed to work and travel in Peru (Haraldsson, 2020). The advice to stay at home has led to work on the fields that has halted, resulting in that there was nobody to harvest and cut the asparagus. This has turned some asparagus batches unsuitable for consumption, resulting in food waste (Antonacci, 2020).

Asparagus is a product that needs to be harvested when the shoots are fully grown, the shoots will turn into wood when they are not timely harvested (Adam, 2019). This means that production

cannot be stopped as farmers were not able to postpone the harvest, which could be problematic when they were not able to export them. Farmers were forced to harvest the asparagus when they wanted to keep the asparagus crown healthy for the next production, which costs money and labor. When the asparagus was harvested it needed to be processed, packaged, and stored in order to prevent spoilage (Irrigazette, 2020). At the beginning of the pandemic it was unknown how long the global ban on export would endure, and how long the asparagus needed to be stored. Many producers were afraid that if the ban would endure longer, it would lead to higher costs. The hire of more storage space and the further processing of asparagus was needed in order to make them longer storable (Irrigazette, 2020). As the market was closed during this period farmers were not able to earn money, leading to economic issues for those who are financially vulnerable.

7.3.3.2 Hygiene issues

When more was known about the causes and spreading of the Covid-19 virus, hygiene and social distancing rules were set that ensured the worker's safety. These rules had to be strictly followed, as companies that did not follow these rules were forced to be closed. In practice the enforcement of these rules was not checked, and workers still worked in unsafe situations (Haraldsson, 2020). Social distancing of workers was possible on the asparagus fields, but the transportation that brought workers to work was crowded and it did not allow workers to stay at a safe distance (Haraldsson, 2020). For the personnel that worked in the processing and packaging factories the situation was even more unsafe, the spaces in which they worked were much more confined and the personnel had to work closely together on the same machines. This made the factories a source of infection where the virus could easily spread if one of the workers contracted the virus (Haraldsson, 2020).

In order to protect the workers and to ensure hygiene, the use of face masks and disinfectants had become mandatory, and workers were not allowed to share food and materials with each other (Haraldsson, 2020). However, many producers lacked the funds to buy face masks and disinfectants for its personnel, as the price of these hygiene products skyrocketed since the outbreak of the virus. The producers were also not able to stop the sharing of food and materials between workers, as there was a lack of tools and utensils for every single worker (Haraldsson, 2020). As many workers had to do their job unprotected, the working conditions were unsafe and had a high risk of spreading the virus.

Some workers were worried about their health and the unsafe conditions in which they were working. They demand that the employer would give them more face masks and disinfectants so that they could work more safely. The workers also demanded paid leaves when employees showed symptoms of the virus, in order to prevent the spreading of the virus, and to recover from it (Haraldsson, 2020). However, some employers did not allow the workers to stay at home, as they did not see the importance of their worker's health.

Because the workers had signed a flexible working contract, they had little negotiation power. Employers could easily fire workers when they complained about the lack of hygiene measurements, and could replace them with new workers. When workers were getting sick they could get fired when they did not show at work, which scared many of the workers off and made them decide to go to work anyways (Haraldsson, 2020). These violations brought the health and livelihood of workers in danger, as they could easily get sick and lose their jobs. Before the pandemic the farmers were already in a disadvantaged position, but the pandemic has made these people even more vulnerable than before.

8. Results V: Sustainability strategies

In order to answer the fourth sub-question: “Which options are available to solve the sustainability and socio-economic implications of the asparagus industry in the Ica region?” different strategies for improving sustainability are analyzed. This chapter discusses which situations need to be changed in order to ensure that the asparagus industry in Ica operates in a sustainable way.

Sustainability strategies are measurements that try to improve the sustainability for the environment or a certain group. It is important to safeguard sustainability as it affects people's certainty on their future. The arrival of the asparagus industry in Ica has led to a deterioration of the region's sustainability. This chapter suggests several strategies that should contribute in resolving some of the sustainability issues caused by the asparagus industry. The strategies should be specially aimed at groups that are considered vulnerable, as they are the most affected by the sustainability issues. Vulnerable groups that were found in this research are: workers for the agro-exporters, small/medium farmers, the population of Ica, and the native population of the nearby regions.

8.1 Sustainable resource use

One of the biggest sustainability issues in the Peruvian asparagus industry is the high use of resources, especially the high water use has led to water scarcity in the region (Hepworth, 2010). In order to improve the region's sustainability, strategies that increase water availability need to be developed. There are many strategies possible to increase water availability, such as making the water use more efficient, importing water from other regions, and regulating agrarian water use.

8.1.1 Increasing the efficiency of water use

The asparagus industry uses a lot of water for its irrigation, but not all the water that is used for irrigation reaches the plant as some of the water is drained through the land. The agro-exporters are putting a lot of their investments in the reduction of water loss, which has led to a highly efficient irrigation system with drip irrigation (Beutler, 2016). However, due to the large scale in which it is irrigated, the agro-exporters are still big water users. Further improvements on the efficiency of their irrigation system are possible, but they require investments that are not always cost effective enough to be considered profitable. These improvements can increase the precision of the irrigation system, so that fewer water is lost through drainage (Beutler, 2016). Although improvements in efficiency leads to lower water usage, it could have unaccounted consequences for the moisture of the land as less water seeps down to replenish the underground aquifers (Beutler, 2016).

8.1.2 Crop switching

Instead of looking at water loss through drainage, producers could look at water loss through evapotranspiration. Evapotranspiration is the process of plants in which they take up water from their roots, and emit these in the air with their leaves through evaporation. The level in which evapotranspiration occurs differs per type of crop and its variants. Many producers cultivate asparagus variants that are selected to produce the most and biggest asparagus shoots, instead of variants that have a low water use (Shimizu, 2009). They don't select variants based on their

evapotranspiration efficiency as they consider its impact on water efficiency negligible. Some researchers have argued that the water use can be halved when producers switch to more water efficient asparagus variations, but many producers dispute that so much savings can be reached through crop switching alone (Hepworth, 2010). They state that other factors also play a role in the level of evapotranspiration, such as temperature, solar radiation, air humidity, and wind. These are factors that cannot be changed easily by the producers, especially in Ica's harsh desert environment that causes a lot of evapotranspiration (Shimizu, 2009). However, when asparagus is produced on a big scale these small losses in water could still have a big impact on the total water usage of the producers, making crop switching a sensible option.

For smaller asparagus producers, switching to more efficient asparagus variations might not be an affordable option as the seeds of water efficient asparagus variations are expensive. Instead, they could switch to other crop types that use less water, such as corn, grapes or pomegranate (Shimizu, 2009). Small farmers are much more flexible than agro-exporters in switching their crops, due to the relatively low investments in their crops and materials. Often many of their materials can be repurposed for the new type of crop, as these consist of simple tools and equipment (Shimizu, 2009).

Some small farmers have become aware of the high water use of asparagus and have taken action to prevent the drying up of their land. They have reduced the amount of asparagus on their land, with some farmers even killing off all their asparagus plants in favor of more water efficient crops (Hepworth, 2010). They don't find the extra money that asparagus earns worth the ecological damage it causes, as they don't want to contribute to the destruction of their own land. Their survival depends on the availability of water, as they lose all their source of income when the aquifers become depleted (Hepworth, 2010).

8.1.3 Regulating agrarian water use

Through water grabbing the agro-exporters have gained privileged resource access in the form of unlimited water extraction, tax benefits, and legislative relaxations (Hepworth, 2010). These privileges are seen as unfair compared to the access of the local population and small farmers, which live in a subordinated position. The government's preference for economic growth over social welfare has caused this disparity in the first place, but through lobbying and corruption the gap in privileges between the agro-exporters and the Peruvian population has become much bigger (Adam, 2019). In order to narrow this gap and to improve the socio-economic position of the Peruvian population, existing regulation needs to be changed and new regulations should be proposed. Political settlement should be reduced in order to make the Peruvian population equally as important as the agro-exporters (Hepworth, 2010).

This means that many of the agro-exporters benefits should be rolled back, and that their prioritized water access should be constrained. These privileged rights have allowed for unlimited expansion of their activities, which made farms grow so big that they are harming the environment. Their licenses for unlimited water pumping should be revoked, and should be replaced with new licenses that clearly states how much water the company is allowed to pump for irrigation (Salmoral, 2020). These

new licenses should contain an expiration date, so that a periodic cap can be set that is adjusted to the current water level of the aquifers. Other licenses should be added such as regulations for the maximum size farms and fields are allowed to grow, to prevent uncontrollable growth of the agro-exporters (Salmoral, 2020).

These new regulations can only be effective when the political settlement of agro-exporters is reduced and corruption is combated (Beutler, 2016). The current enforcing authorities on agriculture and water use are understaffed, and vulnerable for corruption. The government should invest much more money into enforcement to increase the capacity of these authorities. Increasing the wages of the enforcement officials should attract more people to work for these authorities, while it also makes officials less tempted to give in on bribes. Because many violations go unnoticed, more regular enforcement is needed in order to detect these violations earlier (Beutler, 2016). Methods such as random sampling and unannounced checks should prevent violators from preparing for the checks and hide their violations from the overseers.

Current punishments are not heavy enough to scare violators, as these consist mostly of fines that are not in proportion to the seriousness of the violation (Beutler, 2016). The government should scare off those that are involved in violations or corruption with more severe penalties. The stricter law should hold the owners of the company accountable for the violations, and appropriate measures should be taken to punish them (Hepworth, 2010). Penalties such as fines can be given, but heavier punishments such as revoking licenses, closing businesses, and imprisonments should also be possible. These measurements should ensure that the water use of agro-exporters is kept within sustainable limits, so that more water becomes available for the other water users (Hepworth, 2010). Those users should have access to the same water resources as the agro-exporters for a reasonable price, which gives them the opportunity to improve their socio-economic position

8.1.4 Aquifer replenishment

Aquifer replenishment is a strategy where additional water is used to increase the renewal rate of aquifers. This prevents the water level of the aquifers to become too low, and allows the aquifers to restore their water levels (Beutler, 2016). Plots of land can be designated for flooding, which causes drainage that allows for infiltration of the water through the land. This water makes the land wet which increases the moisture in the land. Eventually the water seeps further down until it reaches the underground aquifers (Beutler, 2016). The higher water levels of the aquifers prevents water scarcity, which can be used for improving the quality of life of the local population.

The agro-exporters have become aware of the land moisture deficits in the area, and have found a way to replenish the aquifers. By buying out the farmers in the surrounding area and flooding this land with water, the land moisture can be restored (Beutler, 2016). This improves the quality of the soil in which the asparagus grows in, which makes them more profitable. However, this form of water grabbing will only help the agro-exporters, and not the small farmers. Because the farmers are not allowed to cultivate anything on the flooded land, their socio-economic position will not improve

from the sale (Beutler, 2016). The small farmers only receive a small price for their land, and have to find a new place to cultivate their crops in.

8.1.5 Importing water from other regions

The water deficiencies in the Ica region can be reduced by bringing in more water to the region, which can be done in different ways. Regions that have an abundance of water could provide the region of Ica their water, through the use of water trucks, and by redirecting the rivers towards the Ica region (Shimizu, 2009).

8.1.5.1 Water truck transportation

The use of water trucks is mostly done by the agro-exporters, where trucks pick up water from other regions and bring it to their fields in Ica to irrigate their crops (Shimizu, 2009). Because of the limited size of the trucks this method of water import is only applicable on a small scale, as only a single farm can be provided with water by this method (Shimizu, 2009). When water needs to be imported for the whole region, a lot of water trucks are required to provide enough water for everyone. The use of water trucks is considered unsustainable as they use fossil fuel which contributes to climate change, which would lead to a very high CO₂ emission when they have to provide water for the whole region. Therefore this strategy is considered unfeasible on a regional scale.

8.1.5.2 Prevention of water grabbing in other regions

Redirecting the water of rivers from other regions to the Ica region is considered a feasible water transportation method as it allows large volumes of water to be transported. This method has already been in use by the Peruvian government since the 1960s, but it has also led to a situation of water grabbing. Ica's main water redirection program was the Tambo-Ccaraccocha Project (PETACC), which diverted water from the Huancavelica region to the Ica region with channels and viaducts (Hepworth, 2010). The main infrastructure of this project was built between 1940 and 1960, which diverted water from the upper regions to the Ica region to supplement the region's irrigation. This project solved water issues in the Ica region for some time, until it was insufficient for the region's demand for water. The Ingahuasi water collector channel was the newest expansion of the PETACC project and would provide Ica with more water. The new infrastructure consisted of channels and aqueducts that drained water from Huancavelica's Choclococha, Orccoccocha and Ccaraccocha lagoons (Hepworth, 2010). However, the announcement was met with opposition from the indigenous Carhuancho communities that lived near the lagoons from which the water was transported (ELAW, 2007).

The authorities did not notify any of the Carhuancho people that the Ingahuasi water collector channel would be built in their territory, and they were kept uninformed on the possible consequences of the new water diversion project (ELAW, 2007). The Carhuancho people were worried about the uncertainties that the Ingahuasi water collector channel brought and their future water access. They were afraid that their water sources would suffer from the new channel, which was something that had already occurred during the previous water diversion projects (Hepworth,

2010). The previous iterations of the Ingahuasi water collector channel was designed without consulting the people in the area. When the water was diverted it had led to unforeseen consequences as it had disrupted the natural flow of the water springs. Pastures had dried out and the quality of the crops and cattle had suffered from it (Hepworth, 2010). As the people were dependent on these water sources, they feared that their food security would suffer from the new project.

The Carhuancho people consisted mostly of petty farmers that herded alpacas and sheep for their wool and meat as their primary economic activity. Other economic activities were crop cultivation and fishing. Crop farming happened on subsistence level with traditional crops that are cultivated on small plots of land (ELAW, 2007). Fishing happens at the nearby lakes and rivers and consists mainly of trout that were caught with traditional fishing tools. Both economic activities were done on such a small scale that they were only suitable for the community's own consumption. Alpaca and sheep herding were the only economic activities that could provide an income for the community as the products from these animals were suitable to be sold in the nearby cities (Hepworth, 2010). Alpaca and sheep wool could be sold for a reasonable price if it is of high quality, and the meat could be sold for a good price when it contained enough fat. In order to produce wool and meat of high quality, the animals needed to have enough grass to feed from. When the quality of the grass deteriorated, it was also reflected in the wool and meat these animals produced (ELAW, 2007). Therefore it was important for the animals to have access to green pastures, which was influenced by the availability of water sources in the area.

Some researchers had argued that water diversion would not solve the water deficiency problems in Ica, but that it would move the problems to the mountain communities of the upper regions such as the Carhuancho people (Hepworth, 2010). These people were much more vulnerable than the people in the Ica region, and when their primary water sources would be diverted it threatened their socio-economic position directly. The quality of their crops and cattle suffer from water deficiencies, and their livelihood could be endangered by it. The Carhuancho people's productivity was very low compared to the production level of the agro-exporters in the lower regions, but the crops and cattle were the Carhuancho people's main economic asset which they needed to survive from.

The Carhuancho people had taken action against the plans of the Ingahuasi water collector channel, and had started a lawsuit against the initiators of the channel. The lawsuit illigated up until the Latin American Water Court, which has decided in favor of the Carhuancho people (ELAW, 2007). The judge has stated that there was a case of water grabbing, as there were several factors that were not taken into account when designing the project. The lack of consultation with the local population was one of the important points in which the verdict was given, as it was seen as a violation of the initiator's consultation duty, which is stated in Covenant 169 of the International Labor Organization (ILO)(ELAW, 2007). In this lawsuit it was also given the recognition that the Carhuancho people were considered very vulnerable, as they had the lowest social and economic standard of Peru (ELAW, 2007). The region of Huancavelica had the highest rate of extreme poverty, which means that any deterioration of the people's livelihood will affect them disproportionately.

The lawsuit had resulted in the government of Ica being held responsible for the damage it has caused on the people of Carhuancho, and the cease the construction of the Ingahuasi water

collecting channel (ELAW, 2007). The construction of the channel was only allowed to continue if the government of Ica composes a comprehensive management plan. This plan should at least include an environmental, social, and economic impact assessment, in which the Carhuacho people have a consulting role (ELAW, 2007). Such a management plan should prevent the Carhuacho people becoming uninformed on the project, and should prevent the deterioration of their livelihood caused by the project.

This lawsuit has provided useful recommendations on the prevention of water grabbing, as it can be used in resource strategies that propose redirecting water from other regions. The main recommendations are to include the local people in the decision-making process, and to carry out an environmental, social, and economical impact assessment. The inclusion of local people in the process will generate unique knowledge on the environment, while it also prevents the people from becoming disadvantaged by the project (ELAW, 2007). Performing an environmental impact assessment is important to prevent damage and side-effects on the ecosystem, which could harm the people and nature in the area. A social impact assessment should be done in order to map out the different actors and interests involved by the project, which prevents important groups from going unseen for the initiators of the project. Just like in the main recommendation these groups need to be notified and heard on the activities of the project, but in addition to this monitoring the impact on these people is also a requirement of a social impact assessment (ELAW, 2007). Thirdly an economic impact assessment needs to be carried out in order to map the costs of the project. This prevents costs that are getting out of hand, while it also assesses the economic damage it causes for disadvantaged groups.

8.2 Strategies that improve the socio-economic condition of workers

8.2.1 Improvements in working conditions

The Ica region has a relatively high employment rate compared to the rest of the region, and has attracted many people from other regions to work in Ica (Wilkinson, 2011). However, when the immigrants arrive in Ica many of them are only able to find work in low positions with low wages and contracts with unreasonable terms and conditions. The workers are full-time employed, but they could just make enough money to sustain themselves and their family. Their quality of life has been improved compared to their previous situation in the rural areas, but their socio-economic situation is still relatively low (Wilkinson, 2011). They have to work hard on the asparagus fields or in the processing factories, and could easily get fired and lose their income. This is due to the flexible contracts that are offered to the workers, which makes it easier for the employer to fire them when they get sick or complain about their employer (Adam, 2019). Besides losing their jobs, the socio-economic situation of the workers is also affected by the amount of their wages they receive. When the employer decides to lower the wages, the workers will be less able to sustain themselves financially. Especially when the workers were already underpaid, a decrease in wages could hit their financial situation heavily (Wilkinson, 2011).

8.2.2 Improvements in working regulations

Strategies that improve the socio-economic situation of the workers consist of regulations aimed at the wages and working conditions in the asparagus industry. New regulations should prohibit flexible contracts in the asparagus industry in order to protect the labor rights of the workers (Wilkinson, 2011). Instead, employers should only give their workers permanent contracts that ensure the labor security of the workers. The contracts should contain default protection and rights for workers on keeping their jobs and income, this means that employers can't decide to cut jobs or lower wages without any reason (Adam, 2019). Regulation that secures improving the working conditions will also lead to improving the socio-economic situation of the workers, as the implementation of safety and health measurements will decrease the loss of employees through accidents and sickness. Workers should also be guaranteed to have a certain amount of breaks and vacation days, which needs to be contractually captured.

The terms and conditions of working contracts differ greatly between employers, with some of them offering many benefits and perks, while other employers are underpaying their employees structurally (Adam, 2019). In order to equalize these differences, regulations should be made stricter to prevent the underpaying of workers. Also many of the relaxations that were aimed at improving the competitiveness of the agro-exporters should be rolled back, as they are harmful for the working conditions of the employees. The current minimum wage of Peru is considered too low by many workers, as life in the cities is rather expensive (Wilkinson, 2011). Therefore the minimum wage of Peru needs to be raised in order to make life affordable for the workers.

8.2.3 Setting up labor unions

Besides regulations, workers themselves could also take action in order to improve their working conditions. By joining a labor union they are able to negotiate on the labor conditions and contracts, which could lead to better wages and contracts. Labor unions are organizations that serve the interests of the workers in a certain industry, which could solve disputes between workers and employers as they provide legal advice on it (Adam, 2019).

However, labor unions have a very different structure and position compared to their western counterparts. Labor unions operate on three levels with the national union CGTP (General Confederation of Peruvian Workers) as the highest union, the sector specific union FENTAGRO (National Federation of Agricultural Workers), and the workplace specific unions (sindicatos). The labor unions are legally recognized by the collective labor law the "Ley 25593 – Ley de Relaciones Colectivas de Trabajo" (Adam, 2019).

Due to the nature of the legislation, the primary way in which workers can join a labor union is through the sindicatos. As these are workplace specific unions, workers have to organize these unions within the company. However, many employers are opposed to these sindicatos and take actions in combating them (Adam, 2019). Workers are being discouraged by the employer for joining these sindicatos, and when they decide to join anyway they are being penalized for it. There were many cases in Peru of employers who discriminated against union members, treated members badly, and denied perks from members (Adam, 2019). Many workers that joined a sindicato were

fired for their membership. Other companies were made aware of the reason for dismissal, which made it hard for the worker to find a new job.

The result was that sindicatos have become a subject of taboo, which makes them unpopular to join for workers. Workers had become skeptical of the advantages of joining a sindicato, and found the risks it brought were not worth it. Across all sectors only 5% of the Peruvian workers have organized themselves in a labor union (Adam, 2019). The lack of members has consequences for the resources of the sindicatos, as they lack political power and legal knowledge. This puts sindicatos in a disadvantage when they participate in labor negotiations, as they have almost no leverage against the employer.

8.2.4 Camposol's method on labor unions

As it is very hard to organize a successful labor union, only a few sindicatos are found in Peru. These sindicatos have been able to defend the rights of the workers, and are actively participating in the labor negotiations. The method on how the workers at Camposol have organized a successful sindicato can be used as a strategy for organizing sindicatos at other agro-exporters.

Camposol is an Peruvian agro-exporter that was founded in 1997, it cultivates asparagus, peppers, mangos, avocados and blueberries for export (Camposol, 2020). Camposol is considered a large agro-exporters as it owns 24000 ha of land, and has 17500 people employed. The company's employees are organized in three sindicatos, SITECASA for the general labor conditions, CAMPO (el Sindicato de Campo) for the field workers, and PLANTA (el Sindicato de Planta) for the processing factory workers. These sindicatos were formed after a strike at Camposol in 2007, where more than 200 workers were fired (Adam, 2019). The management of Camposol was opposed to the labor unions and discriminated against the members of the sindicatos for a long time, however the sindicatos remained strong. In 2014 came a breakthrough when a strike occurred during a crucial point in the harvest of asparagus, it has led to the loss of the harvest and a lot of revenue (Adam, 2019).

Camposol had realized that the situation had become untenable, and decided to listen to its workers. A dialogue was started between Camposol and the sindicatos on how to proceed from then on, and multiple external parties were brought into this dialogue, such as the CGTP and the Dutch Federation of Trade Unions (FNV) (Adam, 2019). The dialogue was aimed at rebuilding trust between the employer and its workers, wherein the external parties acted as mediators. The result was that the parties started to trust each other and that Camposol and the sindicatos agreed to follow training. Camposol was trained to create win-win situations, and how to build a good labor relationship. The leaders of the sindicatos were trained in attaining knowledge on labor legislation, and how to negotiate in a way that benefits both parties.

During these training Camposol agreed to undergo organizational change in order to improve its business operations. The company restructured its management to be more collaborative, and to include the leaders of the sindicatos in key issues of the company. In order to improve the company over time, a roundtable was established which will hold periodic dialogues between Camposol and

the sindicatos (Adam, 2019). After a few years of negotiating the workers have won a big win, Camposol agreed to switch from its flexible contracts system to a system with fixed contracts. Workers were provided a permanent contract when they have worked at the company for over four years, which meant that they stay hired when production levels become lower.

In the end Camposol became a much better company for its employees thanks to these dialogues, the transformational process has led to a working environment that is healthy and profitable for both parties. Complaints in the company were reduced to zero, and has led to a closer relation between the company and its workers (Adam, 2019). These improvements were not unnoticed by others, and Camposol had won several awards for their successful dialogues. Because Camposol has taken the dialogue seriously it has led to a win-win situation, which is important when negotiating with vulnerable parties.

8.3 Strategies that improves the socio-economic situation of small-scale farmers

8.3.1 Improving the production quality of small farmers

When looking at the competitive position of the small asparagus farmers, crop failure and rejected batches hampered their productivity (Feedback, 2017). Crop failure and rejected batches can be caused by quality related issues, where the crops do not meet the expected quality. Some small asparagus farmers are only able to produce crops of low quality, as they lack the knowledge or methods to produce better crops (Saint Ville, 2013). The quality of their production often falls short, resulting in plants that do not fully grow, or are not up to the industry's standards. An increase in knowledge could play a role in preventing these types of food loss, as it also increases the quality of the crops. Crop quality improvements have the potential to increase the price that farmers get for their crops (Feedback, 2017). As the percentage of crop failure becomes lower, the farmer is able to earn more money from their production. The extra revenue can be used for further investments, which will lead to a higher crop quality and more profit.

When farmers are trained to increase their botanical knowledge, it will help the farmer to understand the asparagus plants and to take better care of them (Saint Ville, 2013). They will learn how to create the ideal conditions for cultivating asparagus, and to use techniques that lead to a higher production (Goméz, 2015). Understanding the needs of the asparagus plant ensures that the crops get enough nutrients that are needed to grow shoots of high quality. As the different growing stages require a specific amount of input, the input needs to be adjusted to fit the phase of the crops, this also increases quality of the asparagus and the efficiency of resource use. Asparagus plants are sensitive plants, as there are a lot of factors that would lead to a lower quality crop. Taking care of the plant's health is important as it prevents them from deteriorating, which can lead to crop failure (Goméz, 2015). When the plants are in a bad condition, the farmers need to be aware of how to treat the asparagus plants correctly in order to restore the crops. Farmers should be able to recognize indications of pests and diseases, so that they can treat the plants timely. In order to prevent the spreading of it, pesticides and partitioning techniques could be used.

Knowledge on the many farming techniques could help the farmer in using the right tools in the right circumstances. Farmers could be trained in using more advanced cultivation methods that better suit the needs of the crops (Saint Ville, 2013). Using drip irrigation leads to a more effective and efficient watering of the crops compared to flood irrigation, which prevents overwatering the crops (Beutler, 2016). Overwatering could damage the plant as residual water puddles could cause the rotting in the roots, leading to crop failure.

Harvesting asparagus is best done during a specific timeframe of 8 hours, during this short window the shoots are fully grown but just before they will start to bloom. Farmers have to harvest them quickly but also carefully, as the way in which the asparagus is cut is important for classifying the asparagus. Using the right blades to cut the asparagus is important, as a more precise cut will increase the price of the asparagus (UNECE, 2017).

The implementation of production quality strategies can be done through several ways, central to this is the enhancement of farmers' knowledge. Government funded pilot projects could be a beginning for these initiatives, where a small group of farmers will be trained in using new techniques (Saint Ville, 2013). When these pilot projects become successful, it results in farmers in the area that have an extensive knowledge on farming. These expert farmers could act as an ambassador for other small farmers, and could transfer their enhanced knowledge to them. In this way farming knowledge could be spread among the small farmers in the regions, leading to the improvement of crop quality in the region, thus the improvement of their socio-economic position (Feedback, 2017).

Conclusion

In order to answer the main research question, sub-questions were formulated which were answered in the results.

For the first sub-question the actors and value chain were analyzed. The actors were divided between the public actors and the private actors. The public actors consist of the water authorities and COPRI, where COPRI is the actor that helped initiate the Peruvian asparagus industry with investors. The water authorities consist of the public authorities and the private water authorities. The public authorities are the ANA, ALA and Junta, whose responsibilities consist of regulation and enforcement (Hepworth, 2010). The private actors consist of the investors, agro-exporters, agricultural workers, and small/medium farmers. The investors and agro-exporters are actors that are considered wealthy and powerful, while the workers and small farmers consist of people with a low socio-economic position (Schwarz, 2016).

The value chain of the Peruvian asparagus industry consists of two chains, the value chain of the agro-exporters and the value chain of the small/medium farmers. The agro-exporter's value chain is fully integrated, with each activity done by agro-exporter themselves, which has led to a very optimized production of high quality asparagus (Schwarz, 2016). The chain of the small/medium farmers is not integrated and each activity is done by a different actor, which has led to an unoptimized production where during each step price negotiations are needed (Shimizu, 2009). The differences of the two value chains affect the amount of revenue producers get from the sale of asparagus, as the small/medium farmer has to sell their asparagus to one of the intermediaries for a low price. The agro-exporters are able to sell their asparagus directly to the exporters for a high price, because at this point a lot of value has been added to the product by the agro-exporter (Schwarz, 2016).

In order to answer the second sub-question, regulations were analyzed that had an influence on the agricultural transformation in Ica. The trade regulations were important for the asparagus industry as it opened the Peruvian markets, which allowed for foreign investments. Privatization and trade liberation were central in Peru's policies, and many regulations were designed in order to enhance these liberal principles (Damonte, 2019). Peru's membership of trade organizations have tightened its relation with other countries, which eased trade between countries. Peru has the ambition to become more involved into international trade and is continuing negotiations about new trade regulations and trade organizations.

The agrarian and water regulations had a big emphasis on privatization and resource ownership, which allowed agro-exporters to own large plots of land and to extract unlimited water. This made private ownership a protected privilege, which makes environmental protection and enforcement harder to perform (Damonte, 2019).

Local governance lacked the political will to enforce environmental regulations on the powerful agro-exporters, as the agro-exporters yielded many economic benefits to the region. They were willing to support the asparagus industry, and made deals with them on the sale of land and water access.

Local water authorities lacked the political power to effectively enforce environmental regulations on the agro-exporters. Due to the strict private ownership regulations, agro-exporters enjoyed many liberties in protecting their private properties. Agro-exporters hampered the inspection of water

authority in several ways, which effectively prevented enforcement on the agro-exporters (Damonte, 2019).

In order to answer the third sub-question, sustainability issues were analyzed in the asparagus industry in Ica. Water scarcity issues are affecting Peru's water sources greatly, which is caused by water grabbing from the agro-exporters on Ica's water sources (Hepworth, 2010). The intensive irrigation of the agro-exporters has led to the decline of the water levels of the underground aquifers, as the renewal rate of the aquifers can't keep up with the extraction rate of the industry. Surface water sources are mostly used by the small farmers, but the quality and reliability is much lower than aquifer water (Dring, 2014). Rivers are dried up during the dry periods, making them not usable for a long time in the year. The water issues have made irrigation harder, as the land has become dryer. The agro-exporters have gained priority access to water sources through government settlement, leading to inequality between water users. Peru's population and small farmers have only basic access to water, which is of much lower quality.

Land grabbing has led to intensive agricultural activities of land in Ica, which has led to soil quality issues. Soil quality issues are caused by high levels of nitrates, pesticides, and salinity in the land. The nitrates surplus is caused by the overuse of fertilizers, which could lead to environmental problems such as weeds, and health issues such as methemoglobinemia (Hepworth, 2010). Salination makes it harder for plants to absorb water and grow, which could lead to crop failure. Pesticides can pollute the land and lead to pesticide resistance, which destroys crops that are not properly protected.

Competition from other countries has led to pressure on the Peruvian asparagus production, producers are doing their best to reduce production costs while increasing the quality of their crops (Diaz Rios, 2018). Agro-exporters have expressed government settlement in order to gain priority access to resources. The flip-side is that it creates an inequality between the access of producers and Peruvian people. National competition has led to the exit of several types of crop producers. Coffee, sugar and cotton were formerly great crop producers, but due to competition they were diminished greatly (Salmoral, 2020). It could be problematic when traditional crop producers have to exit the industry, as they are essential for the food supply of the local population. However, losing any of the current crop producers would lead to a decrease in their socio-economic position, as there are always workers whose income are dependent on the activities of these producers.

The fourth sub-question is answered through the analysis of socio-economic issues in the Ica region. Social issues are found in the working conditions of agricultural workers, where many workers are being underpaid and have a high risk of losing their jobs (Wilkinson, 2011). Regulations that improve working conditions are already implemented, but these have become ineffective due to exceptions in regulations. Although the Ica region is proud of its reputation of zero unemployment, there is still a flip-side to this. The quality of the jobs are not very high, due to bad working conditions and low wages.

Covid-19 related issues have exposed underlying issues on labor conditions. Workers were pushed in a vulnerable condition through abuses from employers, especially on the field of health hazards, as the hygiene and social distancing rules were poorly implemented by many employers.

The fifth sub-question is answered by suggesting different sustainability improvement strategies. The main strategies are sustainable resource use strategies, and working conditions strategies. The strategy for a sustainable resource use consists of the increase of water use efficiency, crop switching, regulation of water use, aquifer replenishments, and water import. Crop switching and regulation of water use were seen as the most important strategies to lower the demand for water,

which would lower the pressure on the water resources (Shimizu, 2009). Aquifer replenishments and water import should be implemented in order to increase the supply of water, however these must be done without disrupting the livelihood of vulnerable people. The strategies for improving the working conditions consist of regulating working conditions and wages, and supporting the labor unions and sindicatos (Adam, 2018). The method used at Camposol showed how successful labor unions were organized, and how exceptional this situation was compared to other union organizations.

The production quality of workers needed to be improved, in order to improve the socio-economic situation of the small-scale farmers. The increase of production quality leads to a decrease of crop failure and rejection from exporters, which is reached through increase of knowledge through training (Saint Ville, 2013). Plant knowledge can be used to optimize production, increasing profits for farmers.

In order to answer the main research question ***“How has externally induced asparagus production affected the access of water and land in the Ica region?”*** sub-questions were answered. These sub-questions provided knowledge on the asparagus production of the Ica region and its sustainability implications. The sustainability implications are already displayed above in the conclusion, the asparagus industry has affected the access of water and land in the Ica region through the grabbing of land and water.

Strategies for sustainability and socio-economic development are drawn up, which should reduce the negative impact of the asparagus industry. Strategies are aimed at four groups that are affected by the Peruvian asparagus production: the small asparagus farmers, the agricultural workers, the population of Ica, and the indigenous communities.

When looking at the small asparagus farmers, asparagus cultivation is a way for them to support their livelihood, in addition to their existing subsistence farming. In order to increase their socio-economic situation, access to water needs to be improved, and knowledge on cultivation techniques needs to be taught. This will make them more resilient against the negative impacts caused by the agro-exporters (Saint-ville, 2013).

For the agricultural workers, working at the agro-exporters is their only source of income. In order to improve the socio-economic situation of the workers, work conditions need to be improved to prevent health issues (Hepworth, 2010). Also labor contracts need to be changed in order to secure the labor position of the worker, workers should receive fair wages and an improved job security should guarantee that workers can't be fired without reason.

For the population of Ica, their socio-economic situation can be improved with the improvement of access to water (Hepworth, 2010). Currently the agro-exporters have access to the best water sources, which they don't share with the other water users. Regulations should be set to prevent such a situation, which equalize the access of all water users.

For the indigenous communities in nearby regions, their socio-economic situation can be improved by limiting the adverse effects of water extraction in their regions (ELAW, 2007). Water extraction projects in these regions have been initiated by the municipality of Ica without consulting the indigenous populations there. In order to protect their resource availability, the municipalities should consult them on the propositions of the project, and have to perform an environmental, social, and economical impact assessment.

Discussion

Challenges

Attribution of the sustainability issues

This research has shown the impacts of the asparagus industry on the sustainability of the Ica region. It was found out that the asparagus industry has both its positive and negative effect on the sustainability of Ica. For example, the introduction of the industry to Peru has provided a chance for people to earn money and to support their livelihood. But on the other hand the industry's introduction has been harmful for the region's natural resources, and has led to bad working conditions. This has led to the unique situation where the asparagus industry is both the biggest contributor and biggest threat to the region's economy.

Many of the sustainability issues are attributed to the agro-exporters and their activities, however it is not clear whether every problem in the region is caused by the agro-exporters. An example is the decline of surface water in the region, which many people blame the agro-exporters for causing it. Since the introduction of the asparagus industry in Ica the dry periods of the region have become more harsh, with rivers being dried out more often and for a longer time. Because agro-exporters are the region's biggest water users, many saw them as the main cause of surface water decline.

Many agro-exporters do not allow inspectors from the ALA to measure their water use, this makes it hard to accurately measure their contribution to water scarcity. This makes it hard to pinpoint that agro-exporters are the main causes of the water issues, as much of the data is based on assumptions. The agro-exporters are keeping data on their water use deliberately unclear, as they are afraid that they become limited in their water use. However, when this data becomes clear, it could even lead to evidence that they are causing even more sustainability issues that were not found before. Therefore more research is needed to find out other negative consequences that are caused by the agro-exporters.

Strategies

The goal of this research is to reduce the sustainability impact of the asparagus industry in the Ica region. Central in this are the strategies that are suggested in order to help solve the region's sustainability and socio-economic issues. These strategies can be seen as advice for the involved actors to change its operations, in order to improve the region's food security. However, it can be discussed whether the actors are willing to implement these strategies. Some actors are responsive to suggestions and are willing to improve their operations, while other actors are not willing to change and find their current operations good enough. This could hamper the effectiveness of the strategies, as these are based on the collaboration of actors.

Many socio-economic issues are caused as a side-effect of an existing activity, however there are also some socio-economic issues that are intentionally created by some actors. An example are the

bad working conditions and wages of agricultural workers, which are intentionally created by the agro-exporter to increase its profit. By underpaying their employees and offering them a flexible contract, the agro-exporters are able to save on labor costs. However, this will put the workers in a vulnerable position, as they can easily lose their income. These employers care more about profit than the region's socio-economic issues, which makes them not responsive to strategies that improve the wages and working conditions of its workers.

Externally induced sustainability strategies

This research is suggesting sustainability strategies in how the region of Ica should solve the sustainability issues that are caused by the agro-exporters. However, the ideas from these suggestions originate from articles that are written from a western perspective. This means that when the people of Ica implement these sustainability suggestions, that they are still affected by external influence. Therefore the strategies found in this research are merely suggestions, instead of strict plans that need to be followed.

It is in the best interest that the people in Ica conduct their own research on sustainability strategies, which will then be written in the local context. The local people are the one who understand the cultural context of their own region the best, as they have knowledge and experience on how things are resolved in the region. Therefore the local people are the best suitable for solving the sustainability issues in the Ica region.

Opportunities

Consumers

Consumers are an important actor for the asparagus industry in Ica, but due to the limitations of the scope of this research this actor was not included. This research focused on the situations in the Ica region, while consumers are living in the western countries where the asparagus are exported to. Consumers are the one who buy the asparagus in the retailer stores, and have the liberty to buy different types of asparagus. The presence of labels help the consumer in purchasing a variety of asparagus, which could vary between organic, Class I, Class extra, or other asparagus types. This choice makes them powerful, as they can decide which producer gets their money. The consumer could even boycott a producer, if the producer gets a bad reputation. A bad reputation could occur when people become aware of abuses in a company, such as bad working conditions in agro-exporting companies. When a producer gets boycotted it could hit them hard, as their profit will decrease drastically. In order to restore such a situation, the producer could combat the abuses and convince the consumer to buy their products again. This makes the consumer a powerful actor that has been unmentioned in the results.

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