



Universität für
Bodenkultur Wien



Department für
Nachhaltige Agrarsysteme

Institut für Ökologischen Landbau
AG Wissenssysteme und Innovationen

Management of agrobiodiversity and of food sovereignty in a tropical food system, Oxapampa, Peru Masterthesis**

Eva Arhar

01205710

UH 066 500

Organic Agricultural Systems and Agroecology
Bernardgasse, 29/22; 1070 Wien; 0680/2318899

Norberggasse 69d, 8045 Graz, 0680/2318899

eva.arhar@students.boku.ac.at

Version: 28.09.2020

Table of content

1. Introduction	6
2. State of the Art.....	7
2.1. Agrobiodiversity	7
2.2. Food Biodiversity	8
2.3. Food Sovereignty.....	9
2.3.1. Food Sovereignty and Agrobiodiversity	11
2.3.2. Food Systems.....	11
2.4. Discourse on Food Sovereignty and Food systems	12
2.4.1. Food Policies	12
2.4.2. Connection of the Urban and Rural Hinterland	14
2.4.3. Diversity in Food Systems	14
2.4.4. Case Studies on Urban Food Systems and Food Sovereignty	15
3. Research Objectives and Research Questions	18
4. Method.....	20
4.1. Literature Research	20
4.2. Study Area	20
4.2.1. The Biosphere Reserve Oxapampa-Ashaninka-Yanesha (BIOAY)	20
4.2.2. Oxapampa	22
4.3. Sampling	24
4.4. Data Collection	26
4.4.1. Local Consumption.....	27
4.4.2. Local Gastronomy	29
4.4.3. Local Commercialization.....	30
4.4.4. Local Production.....	31
4.4.5. Local Food Processing.....	31
4.5. Data Storages and Data Analysis.....	31
4.5.1. Literature Review	31
4.5.2. During Data Collection	32
4.5.3. After Data Collection.....	32
4.5.4. Social Network Analysis	33
4.6. Returning of Results and Considerations of Ethical Questions	35
4.7. The Food System Oxapampa	35
4.7.1. Restaurants in Oxapampa	35
4.7.2. Points of Sale in Oxapampa.....	35
4.8. Sample Description of the Surveys	37
4.8.1. Sample Description of the Consumer Survey	37
4.8.2. Sample Description of the Restaurateur Survey	38

4.8.3. Sample Description of the Salespersons Survey	39
4.8.4. Sample Description of the Farmer Survey	40
4.8.5. Sample Description of Food Processor Survey	42
5. Results	43
5.1. Local Consumption	43
5.1.1. Origin of Food Products consumed	43
5.1.2. Food Products consumed	44
5.1.3. Social Network Analysis of Local Consumption	45
5.2. Local Gastronomy	45
5.3. Local Commercialization	46
5.3.1. Origin of Food Product sold	46
5.3.2. Supply of Food Products	47
5.3.3. Food Products Sold	48
5.4. Local Production	49
5.4.1. Commercialization of Food Products	49
5.4.2. Food Products produced	49
5.4.3. Social Network Analysis of Food Production	50
5.5. Local Food Processing	52
5.6. The Local Food System Oxapampa	52
5.6.1. Transfer of Food products	52
5.6.2. Social Network Analysis of the Food system Oxapampa	53
6. Discussion	55
6.1. Agrobiodiversity and Food Biodiversity in the Food System Oxapampa	55
6.2. Implications for Food Sovereignty in the Food System Oxapampa	57
6.2.1. Consumption in the Food System of Oxapampa	57
6.2.2. Commercialization in the Food system of Oxapampa	58
6.2.3. Production in the Food System of Oxapampa	58
6.3. Methodological Limitations and Potential Biases	59
6.3.1. Sample Design	59
6.3.2. Method	59
7. Conclusion	61
9. Figures	67
10. Tables	69
11. Appendix	71

Acknowledgment

A warm thank you to ...

...my supervisor Christian R. Vogl who supported me with his comments, ideas, recommendations and his encouragement to help make this happen.

...my supervisor Gabriela who gave me the right opportunity at the right time to make this experience possible for me.

...Peruano Suizo which supported me and gave me the opportunity to get in contact with interview partners.

...Rocio Huidobro, Annie Palacios, Cecilia Martinez Mesias who have been my helping hands finding my way around Oxapampa.

...SERNANP Biosphere Park Management who made my stay possible and supported me.

...my loving family and friends...who supported me in their own way

Kurzzusammenfassung

Arhar, Eva. 2020. Management der Agrobiodiversität und der Ernährungssouveränität im Ernährungssystem Oxapampa in Peru; Masterarbeit an der Universität für Bodenkultur Wien.

Die Machtkonzentration der Agrarunternehmen führte zu Krisen und Versagen unseres gegenwärtigen Ernährungssystems. Die Aufgabe des Ernährungssystems, die Menschen mit gesunder Nahrung zu versorgen und gleichzeitig das ökologische Gleichgewicht und soziale Wohlbefinden zu erhalten, ist nicht gewährleistet. Ernährungssouveränität ist ein gesellschaftspolitisches Konzept, das sich als Folge des Versagens des gegenwärtigen Ernährungssystems entwickelt hat und versucht, den gegenwärtigen Zustand des Systems zu verändern. Das Ziel dieser Studie ist es, einen Beitrag zum Diskurs über Ernährungssouveränität auf der Grundlage der Analyse eines Ernährungssystems zu leisten. Verbraucher, Gastronomen, Verkäufer, Landwirte und Lebensmittel Verarbeiter wurden in der Stadt Oxapampa und ihrer Umgebung auf der Grundlage von non-probability und link-trace sampling identifiziert. Es wurden 167 strukturierte Interviews innerhalb des Ernährungssystems von Oxapampa durchgeführt. Die Daten wurden mittels deskriptiver Statistik und sozialer Netzwerkanalyse analysiert. Die Ergebnisse zeigen, dass eine geringe Anzahl an Kulturpflanzen, die innerhalb des Ernährungssystems angebaut wird, auch vor Ort konsumiert wird. Ein hoher Anteil, der von Landwirten lokal produzierten Produkte wird an Zwischenhändler verkauft und von diesen weiterverkauft und so in ganz Peru verteilt. Tages- und Wochenmärkte sichern der lokalen Bevölkerung den Zugang zu einer großen Vielfalt an Produkten. Es wird gefolgert, dass ein höherer Anteil und eine größere Vielfalt lokal produzierter und verkaufter Produkte, stabilere Preise für die Landwirte erzielen und die Rückverfolgbarkeit der Produkte für die Verbraucher verbessern könnte. Dies könnte zu einer Verbesserung der Ernährungssouveränität im Ernährungssystem Oxapampa führen.

Schlüsselwörter: Ernährungssystem, Ernährungssouveränität, Agrobiodiversität, Soziale Netzwerkanalyse, Peru

Abstract

Arhar, Eva. 2020. Management of agrobiodiversity and of food sovereignty in a tropical food system in Oxapampa, Peru, Master thesis at the University of Natural Resources and Life Sciences Vienna (Austria).

The concentration of power of the agricultural companies has led to crises and failures of our current food system. The purpose of the food system to provide people with healthy food while maintaining ecological balance and social well-being is not guaranteed. Food sovereignty is a socio-political concept that has developed as a result of the failure of the current food system and attempts to change it. The aim of this study is to contribute to the discourse on food sovereignty based on the analysis of a food system. Consumers, restaurateurs, vendors, farmers and food processors were identified in the city of Oxapampa and its surroundings based on non-probability and link-trace sampling. 167 structured interviews were conducted in the food system of Oxapampa. The data was analyzed using descriptive statistics and social network analysis. The results show that a small number of crops cultivated in the food system by farmers are consumed locally. A high proportion of the crops produced locally is sold to intermediaries and distributed throughout Peru. However, daily and weekly markets ensure that the population of Oxapampa has access to a wide variety of products. It is concluded that a higher proportion and greater variety of locally produced and sold products could achieve more stable prices for farmers and improve the traceability of products for consumers. This could lead to an improvement in food sovereignty in the food system Oxapampa.

Keywords: Food system, Food Sovereignty, Agrobiodiversity, Social network analysis, Peru

1. Introduction

The development of agriculture has led to an alteration of biodiversity and landscapes but is nowadays, itself affected by a homogenization process (Perfecto & Vandermeer, 2008). The development into the direction of a high input system demands high yield varieties and leads to a decrease of farmland with local crop varieties (Pereira et al., 2012). Currently, the majority of farmland is used for the cultivation of three crops. The homogenization process and loss of agrobiodiversity favored environmental degradation and led to a transition of diets, affecting quantity, quality, accessibility, and affordability of food (Allen et al., 2014, p. 502). Conservation of agricultural biodiversity has the potential to stop the ongoing homogenization process to maintain a biodiverse and environmentally compatible food system (Mulvany, 2014).

Diversity of crops can be conserved ex-situ, outside the natural habitat, or in situ, as part of the natural habitat. In situ conservation can happen in protected areas, such as national parks, where no human intervention occurs or integrated into the farming system (Perfecto & Vandermeer, 2008). On-farm conservation of crop diversity can enable crops to continuously adapt to a changing environment and variabilities of abiotic and biotic stress (Pautasso et al., 2013). Moreover, high biodiversity in the field is related to several beneficial effects on agroecosystems. The biodiversity, inside the agroecosystem, can be described as agrobiodiversity (Allen et al., 2014; Kahane et al., 2013).

Agrobiodiversity is an essential component for sustaining resilient and sustainable multifunctional farming systems (International Institute of Social studies, 2014; Mulvany, 2014). Agrobiodiversity can provide ecosystem services and nourish people by securing a healthy diverse diet for them (Kahane et al., 2013). The diversification of human diets has the potential to create nutritional enrichment, which is essential to sustain healthy diets and to prevent malnutrition and obesity. There is no single crop, which can provide all the nutrients we need (Jacobsen et al., 2013). Therefore, agrobiodiversity is an essential attribute for the development of a sovereign food system (International Institute of Social studies, 2014; Mulvany, 2014). A sovereign food system offers an alternative to the current food system, which is coupled with failures, crises, and the loss of biodiversity (Akram-Lodhi, 2015). A food sovereign system seeks to secure the human right to food for all people and gives the right to determine the food system by all people involved. A food sovereign system is based on agroecological farming practices used by farmers, which provide high quality and diverse food to consumers (Chappell et al., 2013; Wittman, 2011). Agrobiodiversity is an essential attribute of food sovereignty, because of its high importance for the maintenance of sustainable farming systems. Food sovereignty also seeks to conserve agrobiodiversity by preventing the loss of biodiversity and preserving the high potential held by itself (Mulvany, 2014).

This study aims to contribute to the ongoing debate on food sovereignty and the evaluation of a tropical food system in Oxapampa. The study focuses on agrobiodiversity as an essential attribute of a food sovereign system (Mulvany, 2014) and uses agrobiodiversity as a basic element of the evaluation. Food sovereignty, as a holistic concept, includes all steps in the value chain of a food system (Wittman, 2011), therefore a systemic approach is used to amplify the validity of results on the state of food sovereignty (Ericksen, 2008).

Personal designations used in this thesis refer both to male and female persons unless the contrary is evident from the text.

2. State of the Art

2.1. Agrobiodiversity

Agrobiodiversity includes the variety and variability of crop varieties, fodder and tree species, livestock breeds, aquatic and marine species and wild species that are harvested for the utilization of people. Agrobiodiversity also includes all crops and crop varieties which are not harvested, but provide additional ecosystem services for the farming system and all ecosystems at all scales used by people (Mulvany, 2014). *“Agrobiodiversity refers to the biological variety and variability of living organisms that are involved in food and agriculture. It can be considered at three main levels: ecosystem diversity, species diversity, and genetic diversity. [...] Agrobiodiversity comprises the constituents of biological diversity important to food and agriculture as well as for the agroecosystem (Allen et al., 2014)”*.

Agrobiodiversity in the field is the outcome of an interaction between humans and the natural ecosystem. A developed agroecosystem depends on the environment, biological resources, cultural background, local knowledge, and management practiced by humans interacting with ecosystems (Allen et al., 2014). Agrobiodiversity provides resources to produce food, feed fibre, fuel, pharmaceuticals and can be an essential part of cultural, culinary and religious traditions (Mulvany, 2014).

The exchange of seeds and cultivation by farmers can contribute to the conservation of agrobiodiversity and prevent crop varieties from disappearing. Varieties adapted to local conditions are often created and bred by farmers. Seeds are exchanged with neighbours or family members and thereby conserved (Pautasso et al., 2013). The integration of crops into a farming system also sustains practices and knowledge linked to crop varieties. (Kahane et al., 2013). Especially extensive agricultural production and agroforestry can be linked to high agrobiodiversity (Beenhouwer et al., 2013).

Diversification of crops cultivated in the farming system is not just important to conserve crops and agroecosystems, but also can be highly beneficial for farmers. If farmers are dependent on only one single crop, they are strongly affected by crop failures. By the diversification of crops, cultivated in the field, single crop failures can be compensated for by other crops and are less harmful to the income of farmers. Therefore, a biodiverse-rich farming system can increase the buffer capacity of the agroecosystem and decrease the risk of total yield losses (Powell et al., 2015), which leads to increased resilience of agroecosystems (Kahane et al., 2013). An increase of resilience is referred to as an improvement in *“the ability of a system, in this case agroecosystem, and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner by ensuring the preservation, restoration, or improvement of its essential basic structures and functions (Allen & Proserpi, 2016)”*.

Different crops have different rooting systems and can extract water and minerals from different depths. Thus, through the cultivation of diverse crops, higher nutrient contents can be made available for the following crops and soil structure, soil fertility and soil microbial ability can be increased (Allen et al., 2014). Nitrogen-fixing plants can be implemented to ensure an increase of nitrogen content in the soil (Perfecto & Vandermeer, 2008).

By an increase of Agrobiodiversity susceptibility of crops to pests and diseases can be reduced. Alley cropping, agroforestry, and intercropping are examples of diversification and cultivation of various crops at the same time. Alley cropping, agroforestry and intercropping can decrease the frequency and severity of yield losses by plant damage, pests and diseases (Kahane et al., 2013). The severity can be decreased, because pests cannot find a host on which to establish themselves nor can natural enemies be supported in the agroecosystem. Due to the beneficial effects on the agroecosystem, farmers can reduce the application of pesticides, which can harm biodiversity (Perfecto & Vandermeer, 2008).

Agrobiodiverse rich agroecosystems are less vulnerable to extreme weather events and annual climate variations. With an agrobiodiversity increase, annual differences of climatic conditions can be evened out, especially damage caused by a higher amount of weather extremes, due to climate change, can be reduced (Kahane et al., 2013). Sustaining yields and preventing crop failures in the field is not just crucial to the income of farmers, but also to maintain the availability of food for people. There is no single crop that can provide all the essential nutrients needed for human nutrition. Nutritional diversity is a key factor in sustaining a healthy diet for humans (Allen et al., 2014).

Still, traditional and locally adapted food crops are disappearing and are being displaced by modern high yielding crops (Kahane et al., 2013). Food habits are changing. Preference for highly-processed foods and increased consumption of animal products plus decreased consumption of grains leads to a transition of nutrition (Zimmerer et al., 2019). Farmers are forced to concentrate on fewer crops and lose knowledge about traditionally grown species (Kahane et al., 2013).

To sustain the availability of a high diversity of crops and food products it is important to prevent the loss of biodiversity, agrobiodiversity and the loss of the related local knowledge. High agrobiodiversity can contribute to food security providing food and nutrient diverse diets (Allen et al., 2014; Zimmerer et al., 2019), which can nourish households over the whole year (Powell et al., 2015). To enable diversification of diets it is necessary to understand its relation to agrobiodiversity and the main driving factor that leads to its increase.

2.2. Food Biodiversity

Locally produced and food from more distant areas, marketed locally and globally, sustains food provision for people with diverse food biodiversity. Accessibility to food diversity is crucial to prevent nutritional deficiencies and related negative health impacts (Zimmerer et al., 2019). Food biodiversity is used as a term to describe the diversity on the plate. Food biodiversity is defined as *“the diversity of plants, animals and other organisms used for food, covering the genetic resources within species, between species and provided by ecosystems* (Bioversity International, 2017).

Studies show a controversial picture of transition from cultivation to consumption of diverse crops (Sibhatu & Qaim, 2018). On the one hand, agrobiodiversity is claimed to be highly connected to food biodiversity (Jones et al., 2018). But other studies draw different conclusions (Fernandez & Méndez, 2019; Sibhatu & Qaim, 2018) and have argued that the high potential of agrobiodiversity to increase food biodiversity is highly unutilized by farmers. Although there was a high agrobiodiversity in the field, only a small amount of agrobiodiversity was used for consumption by the majority of farmers (Fernandez & Méndez, 2019; Ntwenya et al., 2017).

The differences in transition from agrobiodiversity into food biodiversity can be linked to different local circumstances for farmers. Especially in remote areas, high agrobiodiversity was linked to high food biodiversity (Luckett et al., 2015). The higher effect in remote areas can be related to limited access to the markets. Therefore, the lack of agrobiodiversity cannot be compensated for, and no additional products can be purchased in markets. Therefore, food biodiversity is directly affected by agrobiodiversity if farmers have little or no access to markets and are focused on subsistence farming (Sibhatu & Qaim, 2018).

In communities that have market access, agrobiodiversity in the field and food biodiversity are not necessarily related. Studies show that agrobiodiversity can be decreased by access to markets. Farmers living in nearby cities consume a lower amount of self-cultivated food compared to farmers in isolated areas in the mountains (Fernandez & Méndez, 2019). Smallholder farmers often purchase more than half of all food consumed from markets. Farmers especially purchase higher nutritious foods and compensate thereby lowering agrobiodiversity in the field (Sibhatu & Qaim, 2018). They can use the higher income produced by specialization on single crops and the sale of the single crops, to buy additional food

products in markets. Therefore, food biodiversity in some studies negatively correlates with agrobiodiversity (Gitagia et al., 2019; Koppmair et al., 2017).

Still, food biodiversity does not always correlate negatively with agrobiodiversity. Agrobiodiversity can also be increased by easier access to markets. The increase in marketing opportunities for farmers can increase diversification rather than specialization. Access to market was linked to a better possibility to market diverse products in local markets (Ntandou-Bouzito & Bellon, 2016).

However, both marketing strategies of farmers, specialization, and broadening, have a positive effect on food biodiversity, if market access is sustained. So, market accessibility can be identified as a key factor to increase food biodiversity. However, that does not apply to agrobiodiversity. Access to a market can lead to an increase or decrease of agrobiodiversity (Koppmair et al., 2017; Lockett et al., 2015).

Another factor influencing food biodiversity is education (Gitagia et al., 2019; KC et al., 2018). Nutritional education and knowledge about plants play a major role to make people aware of the beneficial effects of food biodiversity (Kahane et al., 2013) and thereby increase the diversification of diets. The level of educational opportunities is especially linked to higher food biodiversity in households (Gitagia et al., 2019; Koppmair et al., 2017).

Also, the effect of wealth of farmers on food biodiversity was examined. No correlation between wealth and food biodiversity was identified (García-Sempere et al., 2019; Gitagia et al., 2019; Jones et al., 2018).

Education, as well as market access, can be identified as key factors to increase food biodiversity. Scientific research is focused on the direct connection between agrobiodiversity in the field of farmers and its influence on food biodiversity composing diets of farmers. Scientific research focused on the relation between agrobiodiversity in rural areas and the urban population is still missing.

2.3. Food Sovereignty

Food sovereignty was developed as a consequence of failures and crises in the current food regime. Food sovereignty was initiated by the Via Campesina and further developed by the Nyeleni Forum for Food sovereignty in 2007. Food sovereignty is a socio-political concept that should offer an alternative to the current food system (Akram-Lodhi, 2013, 2015; Wittman et al., 2010). Food sovereignty is defined as *“the right of nations and peoples to control their own food systems, including their own markets, production modes, food cultures and environments (Wittman et al., 2010)”*.

The concepts include a shift from the current decoupled neoliberal production to food production, distribution and consumption adapted to human needs. The power within the food system should lay on local producers. The food production should be focused on the empowerment of peasants and sustain a social, economic and environmentally sustainable production, consumption and distribution (García-Sempere et al., 2018; Nyeleni, 2007).

Food sovereignty is based upon the following six components (Akram-Lodhi, 2015):

- **Food for people:** the right to sufficient, healthy and culturally appropriate food for all individuals
- **Valuing of food providers:** valuing and supporting of people cultivating and processing food
- **Localized food systems:** food providers and food consumers should be at the centre of decision-making on food-issues, fair income for producers as well as healthy food for consumers should be sustained
- **Puts control locally:** the control over territory should be held by food providers and used in socially environmentally and sustainable ways

- **Building knowledge and skills:** food sovereignty should be built on skills and local knowledge of food providers, and should support localized food production systems
- **Works with nature:** farming systems should be based on low-input systems, which are not harming ecosystem functions and improve resilience

In a food sovereign food system emphasis should be put on local markets and local agricultural production to sustain the supply of local populations with healthy food (Wittman, 2011). Local markets and production should ensure access to food for all members of the food system. Local production should increase the resilience of systems and not require long-distance transports of products, which decreases greenhouse gas emissions. Local food systems enclose a smaller area and include less actors involved, and thereby are easier to manage and therefore allow consumers and producers to get involved in the democratic processes (Akram-Lodhi, 2015). Agricultural production should be based on sustainable farming systems, which sustain food security of the population, and also ensure health of the ecosystem. Food sovereign farming system should be based on the use of agroecological practices to minimize external inputs. Conservation of biodiversity should not happen separately in protected areas, but integrated into the landscape inside farming systems by sustainable farming (Wittman, 2011).

Food sovereignty includes food security but also can be seen as an alternative concept to it. Food security is used by market-based monetary solutions. Food security focuses on an increase of food production and food availability (Akram-Lodhi, 2015; Wittman et al., 2010). Food security seeks to increase the resource food to prevent people from hunger. Food security is criticised for not solving social inequities which hinder people from accessing food produced by farmers (Wittman, 2011). Food sovereignty seeks to give the right for decision making to food producers and food consumers and thereby seeks to sustain access to healthy and nutritious food independent from social status and wealth. Food sovereignty aims to create a food system free of inequalities, which gives all actors involved the possibility to access the produced food (Akram-Lodhi, 2015; Wittman et al., 2010).

Food sovereignty is a highly complex concept, which includes all actors and activities which are part of the food system. Therefore, all activities inside food system and their connects have to be assessed to evaluate the state of food sovereignty. Ortega-Cerdá et al. (2019) breaks down the complexity to 6 indicators characterising food sovereignty on an international level (Figure 1), including the resource categories, production models, commercialization, food security and consumption, agrarian policies and gender (Ortega-Cerdá & Rivera-Ferre, 2010; Ruiz-Almeida & Rivera-Ferre, 2019).



Figure 1 - Food Sovereignty: Categories and attributes (in grey) for the analysis of a food system on the international level. (Ortega-Cerdá & Rivera-Ferre, 2010; Ruiz-Almeida & Rivera-Ferre, 2019).

The food sovereignty model points out the difficulty to assess food sovereignty in a food system from a political ecological approach. The food sovereignty model can be seen as a basic model, making complexity of food sovereignty visible. The model should serve as a baseline by creating indicators to access the food system and food sovereignty (Ruiz-Almeida & Rivera-Ferre, 2019). The model shows that agrobiodiversity (agricultural biodiversity) is an essential attribute to sustain food sovereignty inside a food system.

2.3.1. Food Sovereignty and Agrobiodiversity

Agrobiodiversity is crucial for the development of a food sovereign food system. Agrobiodiversity is an essential component for sustaining resilient and sustainable farming systems. High agrobiodiversity is related to various beneficial effects for health and productivity of farming systems. Farming systems ,at the same time, can contribute to the regeneration and development of agrobiodiversity in farmers' fields and foster the conservation potential of agrobiodiversity (Mulvany, 2014). Therefore, access and control of agrobiodiversity by farmers should be sustained to facilitate the development of local seeds and breeds which are adapted to the local ecosystem. Access to agrobiodiversity can empower farmers by giving them control over natural and reproductive resources (Fernandez & Méndez, 2019). Food sovereignty should contribute to the development of farming systems into diverse multifunctional systems. Multifunctional farming systems provide a wide range of ecosystem services such as improving the yields of farming systems and creating additional beneficial effects to the health of the ecosystem (Chappell et al., 2013).

2.3.2. Food Systems

Studies about the relation between food biodiversity and agrobiodiversity show that agrobiodiversity can influence food biodiversity, but agrobiodiversity and food biodiversity are not necessarily related. Local circumstances like market access and access to nutritional education have a greater effect on food biodiversity in the diets of farmers. A lack of studies

focusing on the effect of production in rural areas and on non-farming populations in urban areas needs to be addressed. Food sovereignty is addressing the food system from a holistic approach including farmers, consumers and all actors along the food chain. Therefore, to assess the state of agrobiodiversity and food sovereignty a systemic approach is needed, which includes all actors of the food system.

A systemic approach is a multidisciplinary approach that tries to analyze the food system holistically. A systemic approach gives the possibility to see the relationship and complexity of the system and hence to not split them apart in isolated issues. Food consumption is thereby not reduced to a simplified model which just includes decision making by consumers, but seen as a result of different interactions and relations of system elements (Sonnino et al., 2019).

The definition of food systems seeking to sustain food security includes “(1) *the interactions between and within bio geophysical and human environments, which determine a set of activities*; (2) *the activities themselves (from production through to consumption)*; (3) *outcomes of the activities (contributions to food security, environmental security, and social welfare)*; (4) *other determinants of food security (stemming in part from the interactions in bullet one)* (Ericksen, 2008)“.

The activities within a food system can be grouped into producing, processing and packaging, distribution, retailing and consuming (Ericksen, 2008). The food system is influenced by the amount, type, and relations of elements/actors involved, which are part of the chain between production and consumption (Vaarst et al., 2018).

A systemic approach emphasizes the connections and relations between actors which are connected by the activities mention rather than on the characteristics of each element (Sonnino et al., 2019). Changes inside the system as well as outside factors such as economic and environmental circumstances surrounding the system influence the dynamics in the system. The effects on the dynamics in the system have to be well understood to understand system changes and outcomes (Allen & Prospero, 2016).

2.4. Discourse on Food Sovereignty and Food systems

The discourse on the state of food sovereignty, food security, and food systems can be grouped into two dominating topics. Food policies are analysed, which seek to foster food sovereignty and food systems inside the urban food systems by governmental intervention. The second topic focuses on the connection between the urban area and rural hinterland and the emphasis on its importance to develop food security and sovereign food systems.

2.4.1. Food Policies

The discourse on food policies arose as a consequence of food crises and failings inside the current food system. In recent years our food system has greatly changed and each sector inside the system has developed differently. The agricultural sector is nowadays industrialized. Processing and packaging have increased to add a new value to the agri-food chain. Food is distributed globally by retailers; transport has expanded, and distances have increased (Vaarst et al., 2018). The power in our current food system is concentrated on agri-food businesses maximizing their profits (García-Sempere et al., 2018). A transition of consumption habits is taking place. The purpose of the food system, which is to nurture people with healthy diets while sustaining environmental and social welfare, has been pushed back. Shifting paradigms in land ownership and land-use change affect rural and urban actors and lead to an increase of involvement of global players (García-Sempere et al., 2018; García-Sempere et al., 2019; Vaarst et al., 2018).

There is a counter-movement that has been very focused on city regions which try to improve the food system by investing in new food policies. Health and wellbeing as well as environmental and economic community development are getting more and more into the

focus of urban governments (Sonnino et al., 2019). However, food policy has not been addressed by a systemic approach for a long time. Policies focused emphasis predominately on the efficiency of production rather than on the demand. To focus on the demand side would mean to sustain accessibility and equal distribution of healthy and nutritious food to people (Sonnino et al., 2019).

The global north was focused on the production side and followed the central idea of increasing production of food to support the global south and sustain domestic over-consumption in the global north (Sonnino, 2016). The increase of production in the global north is coupled with environmental degradation. People, especially people from the global south, are vulnerable to environmental changes that have an impact on quantity, quality, accessibility and affordability of food. The transition of diets as well as environmental changes have an impact on the state of the food system and the people within the food system (Allen et al., 2014). Nowadays we are facing malnutrition in the global north as well as the global south in terms of over and undernutrition (Allen et al., 2014). Changes in the food system have led to a constant increase of food-insecure people, depletion of resources and environmental and social crises (Sonnino, 2016).

European (London, Amsterdam) and North American (New York, Toronto, Seattle, San Francisco) cities are currently embracing food strategies to increase equality in public health as well as sustainability (Morgan & Sonnino, 2010). European studies show especially that a majority of cities have already implemented or are working towards comprehensive food policies, strategies or plans (Sonnino et al., 2019). Cities can be seen now as one of the most important places, where food is accessed, distributed and consumed, because most of the current world population live in cities (García-Sempere et al., 2018; Morgan & Sonnino, 2010). A large number of people has to organize themselves in a way to consume in a sustainable and healthy way (Morgan & Sonnino, 2010). Therefore, current studies and measurements especially focus on the connection between rural and urban areas. Urban food strategies in the UK, USA, and Canada create policies aimed to change the relationship between food consumers and producers to reconnect urban areas and their surrounding hinterland. Additional projects implemented by FAO aim to sustain resilient and sustainable food systems. Their goal is to increase access to food, generate decent jobs and income, support of rural-urban linkages, promotion of ecosystem and natural resource management and support of participatory governance (Blay-Palmer et al., 2018).

The projects on food systems are implemented in eight cities all around the globe and intervention is based on food strategies and policies. The intervention by projects implemented already led to positive effects on food security and livelihood opportunities for smallholder farmers (Blay-Palmer et al., 2018). However, still most urban and rural areas are separated by a different allocation of tasks. In the global north, there is a clear separation between rural intensive production providing food for mass consumption in the cities (García-Sempere et al., 2018; Sonnino, 2016).

To change the current situation, the investment of firms and governmental institutions are needed to facilitate projects that focus on the improvement of the region rather than new firms that aim to invest in global markets (Forster et al., 2015). The investment can be done to increase employment inside the region and to shorten value chains (Sonnino et al., 2019). Alternative food networks are implemented, which can create a food system that is constructed and organised differently. In the newly organized system capital would be kept in the region and invested in regional food chains by alternative food networks such as CSA, farmers markets and agritourism (Blay-Palmer et al., 2016). Municipality governments are especially needed to use their power to design new types of food systems, which are focused on the connection between rural and urban areas (Morgan & Sonnino, 2010).

2.4.2. Connection of the Urban and Rural Hinterland

Special reconnection of consumer and producer, so basically needed between urban areas and rural hinterland can improve food sovereignty inside the food system (Sonnino, 2013). At the moment, feed, animals, and consumption are taking place spatially separated. Resources are mainly transported from rural to urban areas. Urban areas poorly contribute to the food production, although they could support food production in surrounding rural areas with educational programmes and contribution to finances and organisations aspects. For example by investments of regional governments in local infrastructure to increase connectivity between rural and urban areas (Forster et al., 2015; Morgan & Sonnino, 2010; Vieira et al., 2018). Urban populations often do not know the origin nor the circumstances of production of their food and they often have limited access to fresh high-quality food. Especially in long value chains, food can lose its connection to its origin. Thereby, food can become food from nowhere (Vaarst et al., 2018).

Rural populations often migrate to cities to escape a precarious living situation in the countryside. Consequently, agricultural land, biodiversity and knowledge of peasants get lost (Vaarst et al., 2018). Spatial separation of consumers and producers reduces knowledge of consumers about farming and connection to the origin of their daily food (Moragues-Faus & Carroll, 2018).

In contrast to decoupled food system with large extensions, local organized food system, the potential to give feedback to producers and consumers and connect them by an exchange of experiences, preferences and knowledge has decreased. Large decoupled systems reduce connection and thereby feedback exchange between actors. To reconnect urban and rural areas, an equitable power relationship is needed between all actors of the food system. Urban and rural areas have to be reconnected and direct exchange between actors and producers should be maintained, adapted to specific cultural and ecological circumstances (García-Sempere et al., 2018). The local food system can be improved economically by growing food in urban areas, support local production and by support of shorter supply chains (Vieira et al., 2018).

Moreover, knowledge about food production and nutrition is fundamental to allow responsible decision making by well-informed consumers. Transparency of producers has to be maintained to give consumers access to background information on food production (Vieira et al., 2018). Also, losses of resources in the food system can be reduced by conscious decision-making of consumers as well as reusing and recycling of resources (Vaarst et al., 2018; Vieira et al., 2018).

However, localization of food cannot always be seen as a positive. Every step across the value chain has to be assessed to give implications on food security, food sovereignty and sustainability (Morgan & Sonnino, 2010). Besides, people feel a strong connection to food traditions and places to consume. Food products are consumed that cannot be produced locally (Roe et al., 2016). To be resilient to market failures and crisis a food system also should have access to food from global supply chains as well as local production to maintain supply (Vieira et al., 2018). Therefore, Sonnino (2013) argues *“not to replace the global supply chains that contribute to food security for many countries, but to improve the local management of food systems that are both local and global”*.

2.4.3. Diversity in Food Systems

Diversity inside food systems can refer to the number and configuration of distinct species, organizations, institutional arrangements, activities, and people involved in the system (Hallie et al., 2017). The diversity of food sources and production systems is seen as an essential element to create resilient systems. A local economy that consists of different suppliers and distributors sustains source diversity for consumers (Vieira et al., 2018). Food production can diversify the income of producers. Consequently, their income is not dependent on labour

markets and social services. A diversified income decreases the risk of household impoverishment and the effect produced by economic, political, and environmental volatility. Diversification of labour, as well as crops produced can decrease dependence on one single income (Lerner & Eaking, 2011).

Diversity in the production system and crops can sustain the production of sufficiently healthy diets throughout the whole year. However, tropical, temperate, dry, and wet areas differ between each other in the length of the growing season, biodiversity, and on-site conditions for cultivation. The seasonality of crops can be a constraint to a locally focused food system. Food systems focused on growing locally are bound to seasonal changes in diversity (Vaarst et al., 2018). Due to seasonal changes, to produce all year-round crops in urban areas, can be a challenge in certain regions. Therefore, innovative systems are needed to sustain production in urban and rural areas fulfilling seasonal production and adapted to on-site production (Vaarst et al., 2018).

2.4.4. Case Studies on Urban Food Systems and Food Sovereignty

A small number of case studies which seek to analyze and evaluate food systems concerning food sovereignty and food security could be identified. Although food sovereignty is seen as a more holistic approach to tackle current problems in the food system, literature rather focuses on the assessment of food security in food systems.

Case studies identified (Table 1) are distributed throughout the whole world. Analysis of the food system is mostly focused on the connection between rural and urban areas. The connection between rural and urban area is often assessed by looking at food strategies or policies implemented by governments or by looking at food miles. Food miles focus on the distance between consumption and production of products inside the food system. However, the identified studies show that approaches to analyze food systems are diverse (Partalidou, 2015).

Different approaches and indicators used to describe the state of food sovereignty and food security makes the results of case studies difficult to compare. Still, several aspects concerning the state of the food system relevant to this study were picked out to describe the state and patterns of different food systems. The aspects concern (1) the role of farmers, (2) the role of consumers, (3) the connection between urban and rural areas and (4) the role of local markets. Farmers in the food system were described as mainly concerned about profit and not to sell produced crops locally (Zhou et al., 2012). Local farmers need resources, such as time and organization to participate in local markets. The additional investment by farmers increased the number of working hours, so help was needed by family members. Sale in local markets is also often demanding diversification of farming systems rather than specialization. Local sale can be an opportunity, but also a challenge for small scale farmers (Vasile & Duncan, 2017). Still, access to local markets has highly beneficial effects on farmers. Farmers can directly sell to consumers and do not need to sell to intermediaries, which can sustain a higher income for farmers (Karg et al., 2016).

Consumers have used supermarkets as well as markets to purchase food. Markets were used daily in comparison to supermarkets, which were used just a few times within one year (Battersby, 2011). Supermarkets also were described to be exclusively used by a population of higher wealth. The exclusion of certain social groups implicates inequity in the food system and therefore negatively effects state of food sovereignty. Thus, increase of supermarkets in towns can be related to adverse impacts on state of food sovereignty (Battersby, 2011; Blekking et al., 2017). The rising demands by consumers of crops not produced in the surroundings, increases the import of requested crops into the urban food system (Karg et al., 2016). Locally produced crops are not necessarily preferred by consumers (Vallejo-Rojas et al., 2016). The dependence on imports, also means that prices of products are influenced by volatile prices on international/transnational market (Karg et al., 2016).

Table 1 - Analyses of food systems: this table gives an overview of identified studies focusing on food system analysis. Studies are made all over the globe and strongly focused on the connection between rural and urban areas.

Author	Study Area	Topic of interest	Method
Calori et al., 2017	Turin, Milan, Italy	The efficiency of food strategies	Evaluation of urban food strategies
Wegerif & Wiskerke, 2017	Dar es Salaam; Tanzania	The connection between the rural and urban area	Food miles analyzed via value chain evaluation
Partalidou, 2015	Delphi; Greece	The connection between the rural and urban area	Food miles via interviews and participatory observation
Vasile & Duncan, 2017	Porto Alegre; Brazil	The connection between the rural and urban area	Semi-structured interviews with farmers and key informants
Dubbeling et al., 2017	Quito, Ecuador; Medellin, Columbia	The connection between the rural and urban area	Evaluation of urban food strategies
Blekking et al., 2017	Lukasa, Zambia	The connection between the rural and urban area	Food flow via household, market street vendor survey
Karg et al., 2016	Ouagadougou, Burkina Faso; Tamale, Ghana	Resilience, Food security	Food flow via control of the transport of food products inside the city
Vallejo-Rojas et al., 2016	Jimbilla, San Lucas; Ecuador	Food sovereignty	Questionnaires in households, Interviews with key informants;
Ruiz-Almeida & Rivera-Ferre, 2019	Yucatán; Mexico	Food sovereignty	Interviews, survey, participatory workshops;
García-Sempere et al., 2019	Chiapas, Mexico	Food Sovereignty	Household questionnaire on Food sovereignty indicators
Zhou et al., 2012	Tianjin; China	Food Security	Food flows based on key informant and farmer interviews
Battersby, 2011	Cape Town, South Africa	Food security	Food recall and demographic factors, to create food biodiversity score

The connection between the urban area and rural hinterland seems to be highly dependent on the characteristics of each food system and the different circumstances. The rural population is described as highly important for the supply of the urban population (Dubbeling et al., 2017; Karg et al., 2016; Wegerif & Wiskerke, 2017). But other studies show that the importance of rural population for the urban population is just the case for some food systems. Other food systems are dependent on more distant production areas and products produced in agricultural production are mostly exported to other places (Blekking et al., 2017; Zhou et al., 2012). Dependency on more distant areas includes also the import of products into the food system from foreign countries. The dependency on more distant areas is also related to the demands of products, which cannot be met by local production (Partalidou, 2015).

Farmers Markets were organized by the city councils and therefore implemented from top-down. They are also formalized by a permitting process (Blekking et al., 2017). The market's transparency was challenged. There was hardly any labelling used on the products, therefore origin and quality are difficult to assess for consumers (Zhou et al., 2012).

The literature on the general state of food sovereignty is highly limited. Case studies focusing on the analysis of food sovereignty in a food system emphasize a socio-political approach (Ruiz-Almeida & Rivera-Ferre, 2019; Vallejo-Rojas et al., 2016). Besides, in the results of case studies, the high variability of focuses and results could be determined. The difference between

results is linked to a missing uniformity of methodology and indicators used for food system evaluation as well as strongly differentiating local circumstances between the food systems. Therefore, a higher amount of case studies is necessary to find patterns in the food system.

3. Research Objectives and Research Questions

To contribute to the discussion on food sovereignty and capture, the complexity of a food system approach was chosen. This study will focus on agrobiodiversity which is an essential attribute to sustain food sovereignty. An agrobiodiverse rich farming system is crucial to sustain conservation of biodiversity also in the field. An agrobiodiversity rich farming system is especially relevant for biosphere reserves. The cultivation of diverse crops can nourish households over the whole year thereby supporting the well-being of the local population and also guaranteeing social and economic development (Powell et al., 2015). Food biodiversity can contribute to food security and sustain healthy diets (Kahane et al., 2013).

This study also seeks to contribute to the discourse on urban food systems due to an increasing share of the world population living in cities and its high importance to sustain healthy diets. A localized evaluation of a small region was made to better understand the connection between urban and rural hinterland by the transfer of agrobiodiversity. Therefore, the focus lies on ties between actors along the agri-food chain, including processors, farmers, salespersons, gastronomy, and consumers, by the transfer of products. The better understanding of food sovereignty and agrobiodiversity should enable the identification of leverage points to increase agrobiodiversity in the farmers' fields and thereby food sovereignty.

This thesis is designed to contribute to biosphere park management of the biosphere reserve. The study gains knowledge which can be used to fulfill the following objectives stated in the Action Plan for the Biosphere Reserve Oxapampa-Ashaninka-Yanesha:

“Find the balance between conservation, economic, and social development that integrates climate change adaptation and mitigation actions. To this end, the conservation of the biological diversity present in the Natural Protected Areas and Environmental Conservation Areas located in the core and buffer zone of the Biosphere Reserve Oxapampa-Ashaninka-Yanesha will be promoted (SERNANP, 2014).”

Agrobiodiversity can sustain the conservation of diversity also in the farmers' fields. Therefore, agrobiodiversity can contribute to finding the balance between conservation and, economic and social development, especially in the transition and buffer zone.

“Improve the quality of life of the population by generating economic income and employment based on the development of agricultural production, forestry, tourism, and hydrocarbon extraction and mining activities with social and environmental responsibility, within the framework of environmental regulations (SERNANP, 2014).”

A better understanding of the food system of Oxapampa enables one to identify leverage points for the improvement of agricultural production in the study area. Used marketing strategies by farmers were identified, which can be improved to increase income for farmers.

“This axis aims to achieve health services strengthened with human resources, adequate infrastructure and equipment that guarantee quality health care, developing healthy lifestyles, with a clean environment, and a population that consumes safe water (SERNANP, 2014).”

Access to healthy and clean food is a fundamental base for sustaining the well-being of the local population. Therefore, to understand the consumption patterns and purchase habits of consumers is necessary to sustain a healthy diet for consumers. Leverage points can be identified inside the system, which can contribute to activities supporting a healthy diet.

To better understand the food system of Oxapampa the following research questions were developed. Research Question I is formulated to underline the importance of the ties of actors inside the food system. The sub-questions serve as a guideline and basic structure during implementation and should also contribute to easier traceability and comprehensibility of the study. Research question II aims to draw conclusions from the state of the food system of Oxapampa. To identify leverage points for improvement of the food system. Food biodiversity and agrobiodiversity are looked at as the level of species diversity.

The transfer is defined as “to move someone or something from one place to another”. In this study, transfer especially refers to the purchase of food products from an actor inside the system of another or from an actor outside the system. An exchange takes place of products when an actor gives something to another actor and they give you something else

RQ I: How composition of diets of urban population is influenced by the agrobiodiversity of the rural farming population?

- (1) Which food products are consumed by the residents of Oxapampa?
- (2) Where are the food products consumed obtained by the residents of Oxapampa?
- (3) Which food products are commercialized in Oxapampa?
- (4) Where do the commercialized food products originate from?
- (5) Which food products are produced in the food system of Oxapampa?
- (6) Where do farmers sell their produced food?

RQ II: What implications can be drawn about the management of food sovereignty and agrobiodiversity in the Oxapampa food system?

4. Method

4.1. Literature Research

The literature is searched with two databases: Web of Science and Scopus. Keywords were used to gain scientific knowledge about the topic of interest. Keywords were selected to gain in-depth knowledge about the ongoing debate on food systems, foodscapes, food diversity, and agrobiodiversity (Table 2).

Abstracts of findings were read, and literature was further selected. During the selection, papers were elected which emphasize the assessment of food systems on food sovereignty and food security. Besides, there was a preference on the literature especially focused on the region of study (Peru), to assess the regional circumstances of agrobiodiversity and the food system. Literature that focuses on the following topics was not included: ethical foodscapes and ethical food behaviour, food hubs, foodscapes of public institutions or companies, alternative food systems, and urban agriculture.

The important papers were collected in a spreadsheet to get an overview of the elected papers. In the spreadsheet, the main topics, relevant definitions, and methods were noted.

Table 2 - Research of scientific literature and keywords.

Database	Keywords	Description
Web of Science; Scopus	"Food Systems*" AND Foodscape*	General literature on Food systems
Web of Science; Scopus	"Food Systems*" AND ("Food Security" OR "Food Sovereignty") AND urban	Literature about Food systems especially focused on Food Security and Food Sovereignty
Web of Science; Scopus	"Food biodiversity" AND biodiversity AND "dietary diversity"	The literature on factors increasing food biodiversity in diets especially focusing on the connection between agrobiodiversity and food biodiversity

4.2. Study Area

4.2.1. The Biosphere Reserve Oxapampa-Ashaninka-Yanesha (BIOAY)

The Man and the Biosphere Research Programme was launched at the biosphere conference in 1968. The implementation of the Biosphere Research Programme was the first time that the international decision was made, that conservation of natural resources and the use of them should not be mutually exclusive but go hand in hand together. Therefore, an interdisciplinary approach was needed, which should enable the conservation of biodiversity and cultural values and provide social and economic development. To implement interdisciplinary research the idea of the biosphere reserves arises. From 1976 on, the first 57 biosphere reserves were implemented (Köck & Grabherr, 2014).

Biosphere reserves have to conform to internationally agreed criteria, and are sites where new strategies of sustainable use are implemented and developed. Therefore, they are also sites where increased scientific research should take place, as well as education programs to reinforce the participation of the local population (Köck & Grabherr, 2014).

Biosphere reserves have evolved over the last decades. The Sevilla strategies (1995) were aiming to reinforce the idea to balance conservation of the ecosystem and facilitate human wellbeing at the same time. The Sevilla strategies contributed to the development in direction

of conservation and human wellbeing as well as the Madrid Action Plan launched in 2008 (UNESCO, 1996). The new criteria and norms of Biosphere Reserves lead to a separation between first- and second-generation of Biosphere Reserves. The second generation has to act and conform to far more difficult and demanding regulations based on new ideas and concepts. Still, slowly all BR from first-generation should also fulfill the new ideas and concepts transformed in the following year (Köck & Grabherr, 2014). The Lima Action Plan created for the following years (2015-2025) brought even new changes and will be crucial for the development of biosphere reserves in the following years. The new Action Plan is even more focused on sustainability science and based on management driven rather than a research-driven program (Reed, 2016).

Nowadays there are 701 biosphere reserves in 124 countries. They are distributed all over the world, including a wide range of different landscapes and habitats and extensions (Pool-Stanvliet & Coetzer, 2020). The current vision is to create: *“a world where people are conscious of their common future and interaction with our planet, and act collectively and responsibly to build thriving societies in harmony within the biosphere”* (UNESCO, 2017). The special focus lays on sustainable development in the area and to strengthen models encouraging sustainability. The biosphere reserve is seen as a role model through enabling the exploration and testing, innovation of sustainability strategies. Biosphere Reserves should help to fulfill the Sustainable Development Goals through the communication of experiences made (UNESCO, 2017).

Every biosphere reserve has to fulfill three functions: (1) conservation function (to preserve genetic resources, species, ecosystems, and landscapes; (2) development function (to foster sustainable economic and human development) (3) logistic support function (to support demonstration projects, environmental education and training, and research and monitoring related to local, national, and global issues of conservation and sustainable development). Besides, the biosphere reserve should include three interrelated zones in the area aiming to achieve the functions mentioned including (1) core area (securely protected sites dedicated to conserving biological diversity, undertaking-non-destructive research, and other low impact use); (2) buffer zone surrounding the core area (cooperative activities compatible with ecological practices, education, recreation, ecotourism, applied and basic research) (3) transition area (contains agricultural activities, settlements, and other uses, stakeholders work together to manage and sustainably develop the area's resources (UNESCO, 1996).

In Peru, there are 5 different biosphere reserves. The first three biosphere reserves were introduced in 1977. Huascarán situated in the Department of Ancash, the Manu located in the Department of Cusco and Madre de Dios and the Noroeste Amotapes-Manglares Biosphere Reserve situated at the border to Ecuador. In 2010 the Oxapampa-Ashaninka-Yanesha was launched as the fourth biosphere reserve. The last biosphere reserve implemented was the Gran Pajatén in 2016 (UNESCO, 2018). The biosphere reserve Oxapampa-Ashaninka-Yanesha is situated in the Department of Pasco in central Peru. The biosphere reserve is located between the Amazon Rainforest lowlands and the mountain cloud forest plus ranges from an altitude of 3000m to 4, 500 m (UNESCO, 2016).

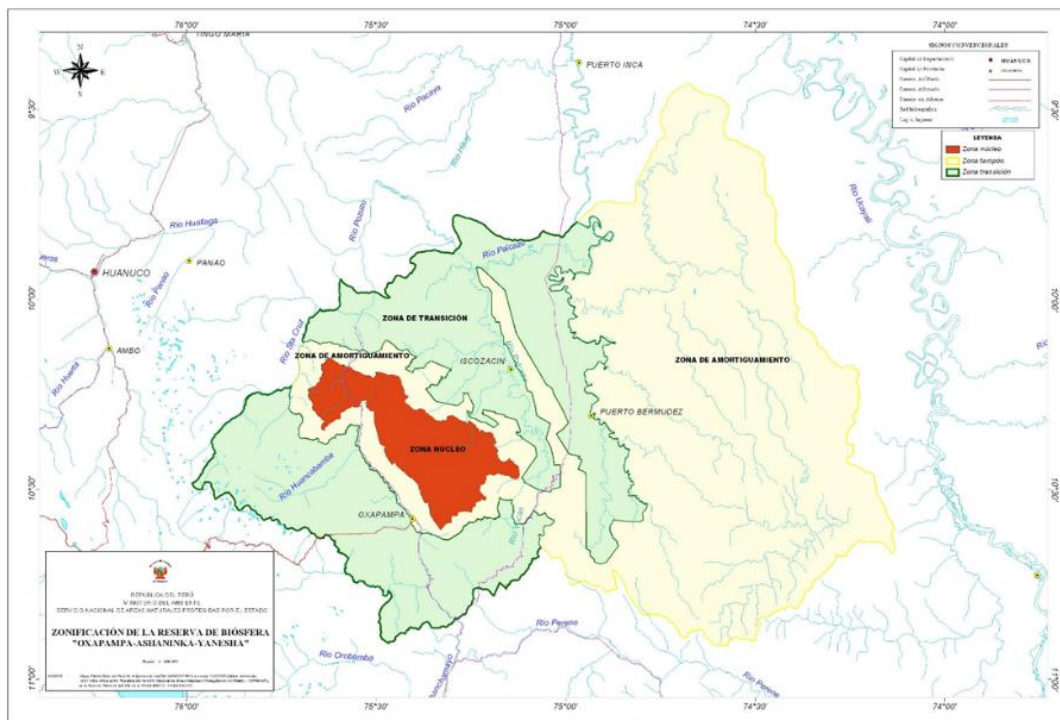


Figure 2 - Extension and zones of the biosphere reserve Oxapampa-Ashaninka-Yanesha (BIOAY) (UNESCO, 2018)

The core area (Zona Nucleo) includes the Yanachaga-Chemillien National Park which is preliminarily dedicated to conservation. The Transition Zone (Zone de Transición), including, and the buffer zone, (Zone de Amortiguamiento) are also used to fulfill human needs and use natural resources to create economic income in the region (UNESCO, 2016). San Matias-San Carlos Protected-Forest and Yanesha and El Sira Communal Reserve are also part of the core zone as well as the transition zone (SERNANP, 2014). The biosphere park is high in biodiversity as well as ethnic diversity (Yanesha, Ashaninka, Mestizo, European immigrants) (Aguilar-Delgado, 2014).

4.2.2. Oxapampa

Peru is one of the 16 most biodiverse countries in flora, fauna, ecosystem, and genetic diversity in the world. The high diversity of Peru also includes an especially high agrobiodiversity. This high diversity contributed to the development and promotion of the special Peruvian cuisine in the last decades (2014). Peru is separated into three geographic contexts: *Selva*, *Sierra*, and *Costa*. The *Costa* is a narrow strip lying parallel to the Pacific Ocean. The *Costa* is arid but has a high amount of agricultural land. The agricultural land in the *Costa* is irrigated and produces mostly cash crops due to its beneficial location next to key urban centres. The *Costa* occupies 12% of the Peruvian territory. The *Sierra* is situated between *Costa* and *Selva*. The *Selva* is characterized by mountainous geography and situated between 500 to 6767 meters above sea level and occupies 28% of the national territory. The *Selva* is dominated by rainforest and occupies 60% of the Peruvian territory (Cantor et al., 2018; Crabtree, 2002; MINAGRI, 2020).

A broad range of products is produced in Peru. The main organic products produced in Peru are coffee, cocoa, banana, quinoa, and mango. Coffee and Cocoa are mainly produced in the *Selva Alta*, which is the zone between the tropical rainforest and the Andes. Banana and mango are mainly produced in northern coastal areas. Quinoa is produced in the *Altiplano* (2011).

The municipality of Oxapampa is part of the Yungas Peruanas, also described as Selva Alta or Céja de Selva. The Yungas Peruanas are dominated by great differences of altitude, an almost permanent coverage with clouds and high humidity. The annual mean precipitation ranges from 1500 to 3000mm (rain). The Yungas Peruanas are especially rich in biodiversity and also constitute a high variety of different terrestrial ecosystems (Tovar Narváez et al., 2010). The climate of the district Oxapampa is subtropical and humid, Oxapampa is located between 600 and 1500 meters above sea level and has high rainfall and an average temperature of 22° C. Between 2,500 and 1,500 meters above sea level. Fog is frequent during the night and in the morning (MUNIOXAPAMPA, 2009b).

The district of Oxapampa is rich in biodiversity as well as cultural diversity. The populations contain the indigenous communities of Yanasha, Ashéninka, and Asháninka, the descendant of the Austro-Aleman settlers and immigrants from Sierra and Costa. Yaneshas especially dedicate themselves the cultivating coffee and are especially located, inside the study area, in the village Tsachopen. Descendants of Austro-Aleman practice more modernized agriculture and especially practice cattle and dairy farming. Immigrants especially originate from the Sierra and cannot be related to one single crop. Inside the system boundary, there are no Ashaninkas and Asheninkas (MUNIOXAPAMPA, 2009a, 2009b). The city of Oxapampa is located at an altitude of approximately 1800 meters and has 14, 000 inhabitants.

Agriculture has high importance for the economic income of the region and the population. Farmers predominately cultivate in the district of Oxapampa, coffee, granadilla and banana (Table 3). Products are especially said to be marketed locally, in Oxapampa, or in regional markets. But also in different Peruvian regions, especially in Lima, selling chili pepper, squash, and granadilla (MUNIOXAPAMPA, 2009a, 2009b). Especially in the region of Oxapampa, Chontabamba and Huancabamba granadilla is the most important crop to sustain the income of farmers. Granadilla is often cultivated coupled with coffee, chili peppers, squash, and crops for subsistence farming (Romero Simón, 2019).

Table 3 – Local production: this table shows the extension of the most frequently cultivated crops in the area of Oxapampa district, as well as the regional allocation if specified (MUNIOXAPAMPA, 2009b).

Crop	Area (in ha)	Villages
Coffee	524	Acuzazu, Pisco river, Mesapata, Churumazú and Alto Churumazú
Granadilla	325	Chacos, San Alberto, Cantarizu, Santa Cruz, Alto Acuzazu, Paraíso
Banana	285	Mesapata, Paucaratanambo
Orange	145	
Avocado	145	Cantarizu, Mesapata, Sogormo
Chili Pepper (rocoto)	95	Chacos, San Alberto, Cantarizu, Santa Cruz, Alto Acuzazu, Paraíso
Yuca	31	
Mandarin	26	
Beans	25	
Squash	8	Miraflores
Caigua	5	

Animal husbandry is also an important branch for agricultural production in the district of Oxapampa, creating income for farmers. Dairy and cattle farming play a major role. In the district, there are approximately 7676 cattle kept in the fields. Dairy products such as milk and cheese are produced and sold in the Province of Oxapampa, la Merced, and especially in Lima. Besides, farmers have 6844 chicken and 1852 pigs (MUNIOXAPAMPA, 2009b).

4.3. Sampling

Actors inside the food system of Oxapampa along the agri-food chain, from consumer to farmer, were sampled. The food system includes representatives of restaurants, markets, shops, as well as farmers and consumers (Table 4).

Table 4 – Definitions of Actors: definition of different groups of persons included into the survey inside the food system Oxapampa

Actors	Definition
Consumer	A person who buys goods or services for their own use; (Cambridge English Dictionary, 2020) in the present study food products
Restaurateur	A person who owns and manages a restaurant (Cambridge English Dictionary, 2020), in the present study also the person preparing the food
Salesperson	A person whose job is selling things in a shop or directly to customers; in the present study, salesperson includes farmers selling at local markets and vendors selling at markets or in shops (Cambridge English Dictionary, 2020)
Vendor	a person whose job is selling things in a shop or directly to customers; in the present study includes not farmers selling on the local markets (Cambridge English Dictionary, 2020)
Intermediary	The trader between the producer and the retailer, intermediaries buy their products in large quantities from factories, farmers, wholesale markets and producers, the products are distributed and transported to different parts of the country (Cambridge English Dictionary, 2020) In Oxapampa, intermediaries sell products to salespersons and also buy products in large quantities from farmers.
Wholesale market	A store or market which is selling goods in large amounts at low prices to shops and businesses, rather than selling goods in shops to customers (Cambridge English Dictionary, 2020)
Farmer	A person which uses the land for growing crops and/or keeping animals as a business (Cambridge English Dictionary, 2020); in the present study persons cultivating for self-consumption are not included
Processor	a person or company that produces a product, especially in an industrial process; in this study a food product (Cambridge English Dictionary, 2020)

Consumers were selected by non-probability sampling (Newing & Eagle, 2011). The selection criteria for consumers in this study were women living in a family household. Women were selected because they are seen as the most representative of family households. They often are responsible for food preparation and therefore highly relevant for the food sources used and purchase decisions (Ruel & Alderman, 2013). The first contact point with the local consumer was the private school, Peruano Suizo located in the south of Oxapampa. This school describes themselves as: “an integrated private educational association based on the socio-constructivist humanist model that provides our students with a solid integral and quality education from an educational proposal that declares itself in favour of the development of the arts, environmental awareness and the mastery of English and German as foreign languages (Peruano Suizo, 2020).” Parents were informed about the research program and invited to interviews by the distribution of flyers to pupils.

After first interviews with respondents, additional parents identified by snowball sampling were contacted. “Snowball sampling means to identify new interviewees by asking already interviewed people to identify other people who fit the selection criteria (Ritchie et al., 2012)”. Because of a lack of participants and first findings, which deduced that parents of this private school were wealthier and differed from other social groups, additional sites for contact were identified. One of the identified sites was the public school Reverendo Padre Bardo Bayerle

(Institución educativa N°35005). After the approval of the school, mothers were interviewed during the anniversary celebrations, which took a whole week from 21 to 27.09.2019. Besides, the institution *Vaso de Leche* was contacted and a meeting of women were arranged. This institution governed by the municipality gives food aid and shares knowledge to persons in need of food, especially focusing on pregnant women and families. Thereby they aimed to contribute to an improvement of the quality of life for participants (MEF, 2020). During this meeting of women of the *Vaso de Leche*, additional mothers were interviewed.

After interviews with consumers were conducted, results collected were used to identify markets, shops, restaurants and processors by link trace sampling. The link tracing method is a sampling strategy used in social network analysis. Based on the first interviewees the following interviewees will be identified due to the relation between the actors involved (Marsden, 2011). The relation refers, in this context to the transfer or exchange of products from one actor to another. The transfer refers to “*move someone or something from one place to another (Cambridge English Dictionary, 2020)*”. Thereby, the markets, the weekly fairs, shops, supermarket, and restaurants were identified as points of sale (Table 5). Information was collected from salespersons selling products at points of sale, of restaurateurs and on processors supplying points of sale and restaurants.

Table 5 – Definition of sites: definition of sites visited during data collection to gather information about the food system Oxapampa of actors included in the survey

Sites	Description
Market	An open area or building at which people gather to buy and sell goods or food (Cambridge English Dictionary, 2020), in the present study referring to daily markets in Oxapampa which have fixed stands, distributed according to the sales item selling
Shops	A store where food and small items for the household are sold (Cambridge English Dictionary, 2020), in Oxapampa often as part of a house and administrated by the inhabitants
Fair	A large public event where goods are bought and sold, usually from tables that have been specially arranged for the event (Cambridge English Dictionary, 2020), in the present study referring to the fair taking place twice a week where mainly food is sold
Supermarket	A large store where many different foods and other goods used in the home are sold (Cambridge English Dictionary, 2020). Supermarkets have fixed hours, several employees and are not part of a household. In the single supermarket in Oxapampa there are no fresh products, such as vegetables and fruit, and it mainly sells packaged and processed foods.
Points of sale	A place where something is sold to the public or the place where someone pays for something (Cambridge English Dictionary, 2020); in the present study markets, shops, the fair and supermarkets are defined as points of sale
Restaurants	A place where meals are prepared and served to customers (Cambridge English Dictionary, 2020)

Farmers were selected by non-probability sampling (Newing & Eagle, 2011) if their farm was situated inside the food system Oxapampa. The food system Oxapampa is restricted to an area of 7 km around the city center. This is done to limit traveling time during data collection to an affordable amount of time. Also, to make data collection feasible and to focus on farmers situated in the nearby surroundings of Oxapampa. The traveling distances were covered by motorcycle and did not take more than one hour. Villages covered in the area were Oxapampa, Chontabamba, Chacos, San Alberto, Llamaquizú, Acuzazú, and Gramazú.

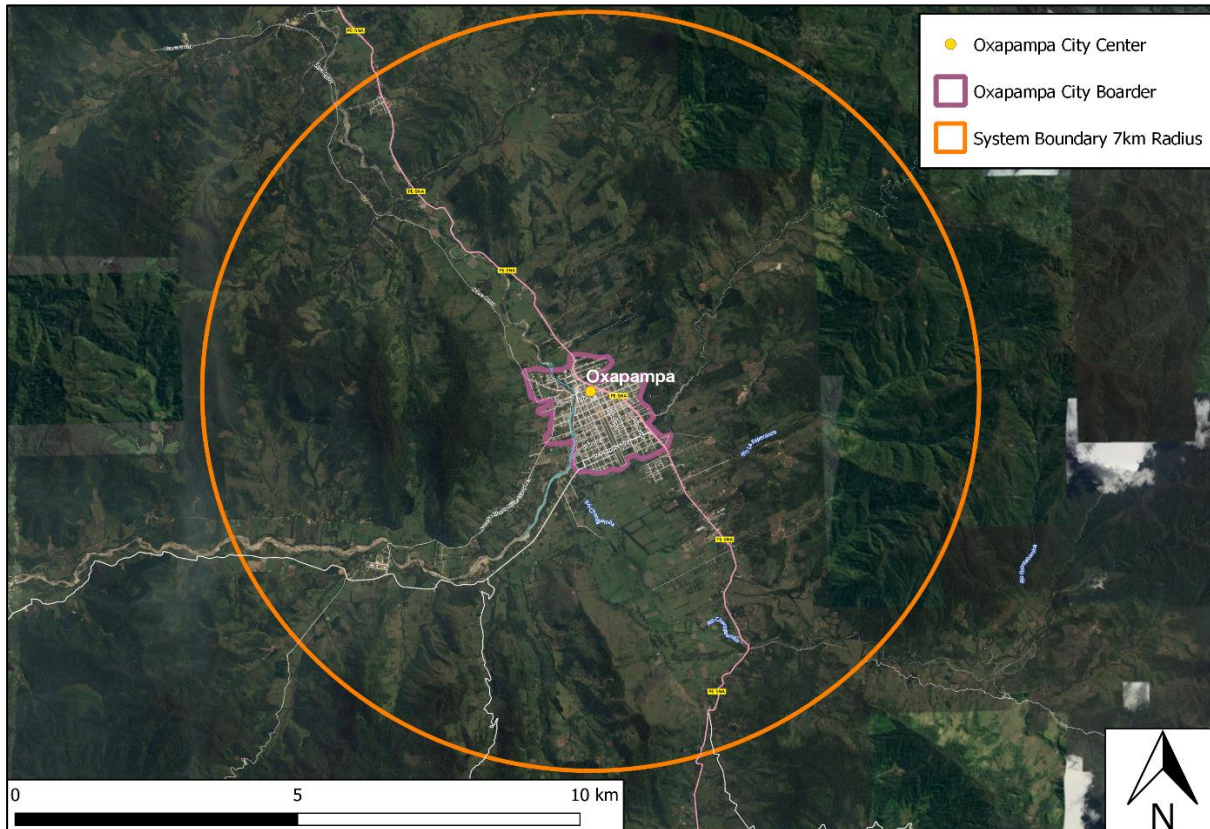


Figure 3– Food System of Oxapampa: This map shows the urban area of Oxapampa (marked in purple) and the extension of the rural area inside the food system (marked in orange). The yellow dot in the middle symbolizes the city center of Oxapampa (main square) (openstreetmap.com edited by Eva Arhar)

4.4. Data Collection

Data collection was mainly obtained by structured interviews (Newing & Eagle, 2011) with actors along the agri-food chain. The structured interviews were based on five different questionnaires, one for each interviewee category (consumer, restaurateur, salespersons, processor, farmer), which were created based on Kirchhoff, 2010 and Newing & Eagle, 2011.

The questionnaire was used as a method, because questionnaires allow easy quantification for statistical analysis and is well suited to collect information about populations (Newing & Eagle, 2011). Structured interviews were made based on this questionnaire to minimize the risk of misunderstandings during interrogation (Newing & Eagle, 2011). “A *structured interview* is an interview using fixed wording or other stimuli that are presented in the same way to all informants (Newing & Eagle, 2011)”.

During the operationalization process variables, on which data was collected, were defined Table 6. Then questions were formulated, which aimed to collect information about the specific variables. Possible predefined answers were given in the form of checklists. Thereby interviewer could choose applicable answers from a predefined set of answers according to answers given by participants (Newing & Eagle, 2011). This predefined checklist was created based on previous brainstorming and adapted by observations made during exploratory interviews. An open-ended question was included in the questionnaire to collect lists of food products/crops.

4.4.1. Local Consumption

At first information about the eating and purchase habits of consumers was obtained. To assess eating habits food frequency questionnaire (see Appendix, 11.1 Food questionnaire) was done with women on the household level. The household-level was referred to, as the food and beverage consumption of all household members.

This was assessed by doing interviews with women because they were mostly responsible for food purchase and food preparation. This assumption can be supported by information collected during the exploratory and the first interviews made. Food consumed inside the household and no food consumed outside the house was considered in the questionnaire. Outside consumption was analyzed based on interviews in restaurants and with salespersons.

Table 6 - Method Design: Actors along the agri-food chain were interviewed during data collection. Each step on the value chain is assessed by a certain method. The consumption habits of the consumers will lead to the merchants and interest of interest and so on until the farmers, which are supplying the consumers with their products are described.

Subject		Actors	Method	Variables
Local consumption	Local consumption	Consumers	Food questionnaire	Food biodiversity
			Structured interview	Origin of food; Preferences, and attitude for food purchase
	Local Gastronomy	Restaurateur	Lists of restaurant menus	Food biodiversity of food preparation in restaurants
			Structured interviews	Origin, Preferences, and attitudes for food preparation
Local sale	Local sale	Salesperson	List of sold food products	Food biodiversity at points of sale
			Structured interviews	Origin; Preferences and attitude for sale and food supply
Local production	Local food processing	Processor	Lists of produced food products	Diversity of food products produced
			Structured interviews	Origin; Preferences, and attitude for ingredients used
	Local agriculture	Farmers	List of cultivated crops and kept animals	Agrobiodiversity, Animal husbandry
			Structured interviews	Challenges for farming and market strategy for product sale

To collect information about eating and purchase habits a food frequency questionnaire was developed. “*The Food Frequency questionnaire aims to assess the frequency with which food items or food groups are consumed during a specified period* (Gibson, 2005)”. The Food list has to be thoughtfully established so that respondents have a list of products reflecting local circumstances and assortment. The Food list has to be adapted to cultural characteristics, habits, and values (FAO, 2018). The Food questionnaire is a method frequently used in nutrition epidemiology to assess the habitual food intake of consumers. The Food questionnaire was developed due to emerging problems with 24h food recall. The Food questionnaire has several advantages to 24h food recall but has been criticized about producing limited reliable results in nutrition studies (Cade et al., 2004). However, 24h food

recall, as well as the Food questionnaire, are still used frequently in nutrition studies. In food biodiversity studies most frequently 24h food recalls are used. The identified studies on food biodiversity and agrobiodiversity are mostly focused on the benefits of food biodiversity on the nutrition and health of respondents (Sibhatu & Qaim, 2018).

In this study, the emphasis was not put on the nutritional effect of food and the health state of respondents but on the species, diversity consumed by consumers in the food system Oxapampa to assess implications for agrobiodiversity. Therefore, a Food frequency questionnaire was preferred.

The food frequency questionnaire contained a food list and a frequency category section. This list was created based on the availability of products at points of sale in the food system Oxapampa as well as on exploratory interviews with consumers.

A list including 120 different food products was created. The list included vegetables, fruits, tubers, cereals, herbs, and spices meat and milk products. This food questionnaire was mainly focused on unprocessed or minimally processed products, which are referred to as products that are single food or had no or a very slight modification (Poti et al., 2015). This includes milk products and coffee which are highly relevant for agricultural production in the region of Oxapampa. The ordinal scale used included the following frequencies: daily; 3-4 per week, 1-2 per week, 1-3 per month, less than 1 per month, never.

Two additional sections helped to identify the origin of products and reasons for the preferences of consumers. Respondents had to choose where they usually got the product from by using the following categories: market, fair, gastronomy, farmer, processor, friend. Reasons for preferences are based on Cunha et al, (2018) a review on food choice questionnaire studies including the categories: sensory appeal, health, price, natural content, convenience, mood, weight control, ethical concern, familiarity.

During surveys by food frequency questionnaire, several problems appeared. Women participating tended to get impatient towards the end. Therefore, they tried to fill in missing food products faster and as a result untrustworthy information was gathered. Sometimes consumers selected a high frequency of various products, which did not seem credible concerning the amount of food, which must be consumed by the persons interviewed to fulfill this. In the section about reasons for consumption, just two categories (health and taste) were selected. As a consequence of the occurring problems and to increase the feasibility of the interviews with consumers a new questionnaire (see Appendix, 11.2 Consumer questionnaire) was created based on the first findings with the food frequency questionnaire, especially using credible findings.



Figure 4 - Data Collection: an interview with women in the office of Vaso de Leche

This questionnaire included a section focused on product species as well as a section on purchase habits. The first section included the listing of frequently consumed vegetables and fruits. Besides, the questionnaire contained a list of various cereals and tubers, which were identified by the food questionnaire to be most frequently consumed by consumers interviewed. Participants were asked to rank the tubers and cereals according to the frequency of consumption (every day or every other day, sometimes, rarely, never). Also, animal products, including meat and milk products, as well as coffee had to be ranked according to their frequency of consumption by interviewed women.

The second section was focused on purchase habits. Interviewees were asked to tell how much of their purchase they make at identified points of sale in percentage. Moreover, information about the purchase habits for different product types (vegetables, fruits, tubers, meat products, milk products) was collected. Consumers interviewed were also asked to state why they prefer this point of sale for food purchases. Thereby, information about preferences for this point of sale was obtained. The following preferences were identified by price, quality of products, proximity, habit, or variety. These terms were defined as followed:

- **Price:** lower price or better cost quality ratio
- **Quality:** good or beneficial characteristics or features of the products (Cambridge English Dictionary, 2020)
- **Proximity:** proximity to frequently visited places (home, work) and constant availability of products due to opening times
- **Habit:** to be used to visit certain sites, without really knowing why (Cambridge English Dictionary, 2020)
- **Variety:** especially large assortment of food products or varieties which including food products which are not available on other points of sale

This questionnaire was used for structured interviews with identified women to collect information on local consumption. Outside consumption was obtained based on interviews done with restaurateurs.

4.4.2. Local Gastronomy

To gather information also on the outside consumption of consumers, information on consumption in restaurants was collected. This data was collected in two different ways.

The first part of information was obtained by analysis of restaurant menus. Therefore, photos of the daily menu, which is in Peru sold on weekdays and contains a starter, a main dish, and beverage were made (Figure 5). This was done in 5 different weeks on one day each week, varying the weekdays. Dishes collected were sorted by frequency and listed.



Figure 5 – Menus of Restaurants: the daily menu of restaurateurs for lunch is presented on blackboards in front of the restaurants to attract consumers. This menu always includes a starter, a main dish, and a beverage.

The Second part of the information was collected by interviews. These interviews were conducted in ten restaurants inside the urban area of Oxapampa with the responsible restaurateurs. This comparable small number of interviews was done because of the low importance of restaurants for the consumption of consumers. Structured interviews (Newing & Eagle, 2011) were made with restaurateur based on a questionnaire (see Appendix, 11.3 Restaurateur questionnaire) .

At first, restaurateurs were asked about ingredients most often used for food preparation. Then they were asked about the origin of the products used, asking about the geographical allocation (Lima, Tarma, Sierra, Selva, Coast) as well as sources of products (intermediate, wholesale market, fairs, market, farmer, food processor or homegrown). In the end, they were asked about reasons for the preferences of suppliers (price, quality of products, proximity, habit, or variety). Notes and selection of categories were made according to answers by the restaurateurs by the interviewer.

4.4.3. Local Commercialization

Structured interviews with salespersons in all markets (Alameda, Abasto and Santa Rosa), several shops, and the fairs were made. The share of interviewees at different points of sale was based on the importance of the food purchase habits of consumers. A salesperson was referred to as a person selling at least one product on one of the identified points of sale.

Salespersons who are also farmers were included in the survey. Farmers in the fair are defined as all interviewees, which at least cultivate or produce one of their sold products. In contrast, vendors are reselling bought products.

Mentions of farmers selling their products were counted according to the location of their farm. Products of farms located inside the system boundary were counted as originating from Oxapampa. Products of farmers outside this system boundary were counted according to the position of the farm. Origin of Products of farmers not situated inside the system boundary, but in the surrounding area were counted as part of the category *Selva without Oxapampa*.

Farmers also sometimes sold food products additionally bought for sale from food suppliers, then the location of the farm, as well as the origin of additional products, was noted. The quantity of each product was not obtained so different amounts of products, also concerning origin were not included in results.

The structured interview (Newing & Eagle, 2011) was based on a questionnaire (see Appendix, 11.4 Salesperson questionnaire). This questionnaire contained three sections. First focusing on products offered, second on the origin of products and third on reasons for preferences of product supply. Answers on the questionnaire were given and created based on 2 explorative interviews with salespersons at points of sale. Then the questionnaire was pre-tested 3 times. During the testing phase listing of salespersons of food products which were not available at that moment were included in the interview, but salespersons stated that assortment in their booths is hardly affected by season. Therefore, this question was excluded and just the products available in their booth at that moment were listed.

In the final version of the questionnaire, in the first section, all food products offered by salespersons in their booths were listed by the interviewer. Information about the origin of each product was noted on the questionnaire if known by salespersons.

In the second section, questions were focused on the origin of the products, asking about the geographical allocation (Lima, Tarma, Sierra, Selva, Coast) as well as sources of products (intermediate, wholesale market, fairs, market, farmer, food processor or homegrown). or

obtaining product not just from one site, but from several sites. Therefore, multiple mention of sites was possible.

In the third section, salespersons were asked about reasons for preference of supply. Possible answers (price, quality of products, proximity, habit, or variety) were ticked by interviewers according to answers by respondents.

4.4.4. Local Production

Data about farmers inside the system boundary was collected by structured interviews (Newing & Eagle, 2011) based on a questionnaire (see Appendix, 11.5 Farmer questionnaire). Persons were counted as farmers if they sell at least one of the products produced at the fair or to a merchant. Farmers just focusing on subsistence farming were not included in the survey.

Farmers were asked to list all crops cultivated in their fields and in their gardens. The mentioned crops were listed in the first section of the questionnaire then they were asked how and where they marketed each of the crops mentioned and about the geographical allocation (Lima, Tarma, Sierra, Selva and Costa) as well as sources of products (intermediate, wholesale market, fairs, market, farmer, food processor or homegrown). This was noted next to each crop.

In addition, they were asked about reasons for the preferences for the mentioned crops and utilization. The same procedure was followed for animals kept on the farm. Crops and animals used for self-consumption were also listed and added to the category self-consumption.

Cultivated crops differ between seasons and therefore can cause influence on obtained data (Cunningham & A., 2001). Therefore, a seasonal calendar was included in the questionnaire to note seasonal variations. Seasons formed one axis of the matrix and crops the others to note the cultivation period of crops and their harvesting time (Cunningham & A., 2001). Farmers were asked about seasonal changes and harvesting time, harvesting time was noted but farmers did not state any seasonal nor annual variations during the interviews.

To understand the production inside the food system additional questions were focused on the practices of farmers, concerning plant treatment and animal husbandry to identify difficulties for farmers and obstacles for local production.

4.4.5. Local Food Processing

Coffee and milk producers inside the defined food system relevant for local sales and local consumption were identified. Structured interviews (Newing & Eagle, 2011) were made with food processors based on a questionnaire. A questionnaire similar to the questionnaires for salespersons and farmers was developed and used.

At first, food products produced by processors were listed by the interviewer. Additional information about the companies was collected, including information on the quantity of production and target group or region for sale. Then information about the origin of ingredients was collected asking about the geographical allocation (Lima, Tarma, Sierra, Selva, Costa) as well as sources of products (intermediate, wholesale market, fairs, market, farmer, food processor or homegrown). At the end, processors were asked how and where they sell their products, using the same categories as for the origin of products processed.

4.5. Data Storages and Data Analysis

4.5.1. Literature Review

During literature research, scientific literature was stored in Citavi. Identified literature was read and publications were noted in a spreadsheet containing main information of scientific publication, key terms, topics, and a summary. Thereby key topics were identified, and a basic

structure of the literature research was established. The literature identified was allocated according to the topics identified. During reading, relevant information was marked and summarized and stored in Citavi to be allocated according to relevance for topics and subtopics. Literature reviews summarize the findings during this procedure.

4.5.2. During Data Collection

Filled out questionnaires of Consumers, Farmers, Salesperson, Processors, and Restaurants were scanned to prevent loss of the information collected.

To create the second questionnaire for consumers data obtained by food questionnaires were used. This data obtained was typed into Microsoft Access. Each food product, as well as frequency, was noted. Each frequency was affiliated to a certain value so that data was available as an ordinal scale ranging from 0 to 5 (daily=5, 3-4 times per week=4, 1-2 times per week=3, 1-3 times per month=2, less than 1 time per month =1, never=0). Thereby the mean value of the frequency of product consumption was calculated. A value nearer to 4 meant that the product is more frequently consumed, whereas zero meant that the product was rarely consumed. This information collected was used to create a questionnaire for consumers.

During data collection, the first results of the consumer survey were needed for link-trace sampling. This meant to identify important points of sale, restaurants, and food processors to further proceed with the survey. Information collected during consumer surveys about the origin of food products consumed was to move someone or something from one place to anotherred into Microsoft excel. The arithmetic means of the share of food purchase at points of sale (in percentage) for the purchase of consumers was calculated.

Further transformation of information collected with questionnaires was done after the data collection was completed.

4.5.3. After Data Collection

Lists generated by questionnaires and free listing with salespersons, gastronomy, processors, and farmers were used to gain information about food diversity and agrobiodiversity. The data analysis was based on descriptive statistics, to describe the state of the situation inside the food system of Oxapampa. To store data digitally and to make data available for analyses with SPSS (IBM Deutschland GMBH, 2019), data was transferred into Microsoft Access (Microsoft Coporation, 2016).

Microsoft Access is a program used for database management. Tables are used, which can be interconnected with each other. This is especially relevant because collected data was available not in a 1: n relation, but a m: n relation. A m: n relation means that a salesperson can have several products in his assortment, but a product, like for example bananas, can be traced back to several salespersons. In Microsoft Access, tables are available as pivot tables. which enable based on requests to create tables just consisting of the information of interest (Herrmann, 2018). The requests, which can be used in Microsoft Access, are not possible in Microsoft Excel; therefore, Microsoft Access was preferred.

Demographic Data was transformed in pivot tables in Access and was transformed in Excel tables which were used for analysis in SPSS. Demographic data was nominal scaled (for example gender, the origin of persons, profession) and ordinal scaled (for example age, size of the farm). Nominal scaled data were calculated via descriptive statistics calculating frequencies of attributes affiliated to interviewees. For ordinal scaled data, means were calculated.

Lists of food products were transformed into Microsoft Access, to create tables which then could be exported into Microsoft Excel. Data of lists was displayed in tables in the headline all

products noted and in rows persons were noted, with related attributes of demographic data. If a product was consumed, sold, cultivated, or used for food preparation this was noted with a 1. The tables created were imported into SPSS. Multiple response sets were created in SPSS based on dichotomies. The frequency of food products/crops was calculated. For example, in the case of salespersons how often bananas were offered as a food product.

By this procedure all lists were analyzed, including the following:

- List of fruits and vegetables consumed by consumers
- List of ingredients frequently used for food preparation in restaurants
- List of products offered by salespersons and available in shops and markets
- List of crops cultivated by farmers
- List of products produced by food processors

Frequencies for example of booth position of salespersons was calculated. Also, cross tables were used to see influencing factors of demographic data collected on the list of products/crops.

Data about the origin or destination of products (geographical as well as of merchants) was also available in a m: n relations and therefore Access was used to prepare tables with data collected for analysis with SPSS. The finalized table was imported into SPSS and multiple response sets were created. Then the frequency of each origin and destination mentioned by interviewees was calculated.

Data collected during consumer survey about importance was partly ordinal scaled, including information on the frequency of consumption of tubers, cereals, coffee, and milk products. This data was analyzed by calculating arithmetic mean of frequencies ranging from 0 to 4 (0=never, 1=rarely, 2=sometimes, 4=daily, or every other day).

Data collected about the overall importance of points of sale for food purchase was stated in percentage. Therefore, the arithmetic mean of percentages was calculated to gain information about the importance of points of sale.

4.5.4. Social Network Analysis

The social network analysis was developed as a consequence of a change of paradigm from an approach focused on an individual as the center of research to an approach taking into account the ties and relations between this individual (Stegbauer, 2008). The social network analysis is subject to acceptance that actors are not just acting on their own independently from relations hierarchy and organization inside their surroundings, but are interacting and related to other actors influencing their behaviour (Cistulli et al., 2018). “*Social networks are defined as a set of nodes (or network members) that are tied by one or more types of relations* (Wasserman & Faust, 1994)”.

The nodes generally represent persons or organizations, which are connected by one or more relations to other nodes, but can refer to any units which can be connected to other units. The relations between the nodes, called ties, can represent for example collaborations, friendships, trade ties, web links, citations, resource flows, information flows, exchanges of social support, but possibilities are extensive depending on the objective of scientific studies. Ties can be directed or undirected. Directed ties go from one node to another implicating a one-way relation between nodes. Undirected nodes do not give information about the direction of the relation. Also, the value of ties can differ, a stronger connection can be represented by a thicker line or arrow between nodes (Marin & Wellman, 2011).

Social network analysis is already used in different fields looking at school classes, cybercommunities, networks inside companies, or even at animal social networks (Scott & Carrington, 2011). Social network analysis in the context of food systems is a rather new approach, which can be used to not just focus on parts of the food system but also try to understand the food system as a whole. This method can be used to identify factors to sustain

food security and food sovereignty inside the food system. By looking at the exchange/transfer of food products places and where this exchange/transfer takes place, can be identified and the origin and travelled distances of food products (Cistulli et al., 2018).

Social network analysis in this study was used to illustrate and analyze the food system of Oxapampa. Therefore, exchange or transfer of food products was made visible and known as flow. The food products are referred to as products produced for consumption which are unprocessed or minimally processed. The term flow can also be found in case studies focusing on a better understanding of the food system and looking at food flows. This term is used to describe the transfer from products from production to consumption (Blekking et al., 2017; Karg et al., 2016).

Three social networks were created (1) points of sale and consumers (2) points of sale and farmers (3) farmers, consumers, restaurateurs, and points of sale.

To create a frame for such networks, to think about system boundaries and to identify units included in the study is important to create a feasible frame for study conducted. Networks can, for example, focus on all employees in an organization (position-based) or all participants of a certain event (event-based) (Marin & Wellman, 2011). In this study, system boundary is position based (1) including all farmers situated inside the system boundary of 7 km (2) including all actors (consumers, vendors, restaurateurs, processors exchanging or transferring food from one actor (node) to another) situated inside the system boundary.

Nodes were representing actors of the food system including farmers, consumers, and points of sale where vendors were selling products (markets, shops, fairs). Ties were representing the exchange or transfer of products between the nodes.

To analyze the food system of Oxapampa an adjacency matrix was created in Microsoft Excel. In the adjacency matrix, all nodes were noted in the headline as well as the side row of the table. If there was a tie between two nodes a one was entered in a cell if there was none a zero was entered (Hanneman & Riddle, 2011). The adjacency matrix was imported into Visone (Algorithms & Data Structures Group & Domestic Politics & Public Administration Group, 2011), a program used to illustrate social networks and to analyze them.

In social networks created centrality of each node was analyzed and made visible. Centrality is defined by the amount of connection between one node and any other node (Cistulli et al., 2018). If a consumer buys a product from three different sites, the node has a higher centrality than the node representing a consumer buying just from one site's products. A node that has more ties with other nodes, means that the node can choose from multiple alternatives to gain the resources needed. Therefore the centrality of a node was measured (Cistulli et al., 2018). The node centrality was measured by the calculation of degrees. The degree measures the number of ties, which connect one node with adjacent nodes. A high degree means connections to a high number of other nodes. It can be differentiated between indegrees and outdegrees. Indegree includes the number of ties directed to the node and outdegree includes the number of ties directed to other nodes (Cistulli et al., 2018; Wasserman & Faust, 1994). For the different social networks, indegree and outdegree were calculated. Outdegree for the social network including points of sale and consumers, to measure the number of consumers obtaining food from points of sale. Indegree for points of sale and farmers to measure the supply by farmers to points of sale. Degree for the third social network, including ties directed to the node and other nodes. The degree of a node was illustrated by the size of each node. A higher centrality lead to a bigger circle. The centrality represents the importance of the points of sale for the food supply of consumers.

Density was also calculated. Density gives information about the share of the realized ties to the proportion of possible ties between actors (Cistulli et al., 2018).

Ties between nodes are directed, representing the direction of the transfer from one node to another. If there is an exchange of products the exchange is illustrated by two arrows.

4.6. Returning of Results and Considerations of Ethical Questions

In schools and the institution *Vaso de Leche* approval by the administration was given before women were informed and questioned about the research project. Survey participants were asked for their consent before starting the questioning.

All participants taking part in the surveys were asked if they wanted to get back the results of this study. If respondents were interested an e-mail address was noted. A summary of the study and results were sent back in Spanish to interested participants. Besides, a text presenting the study conducted and discussing main results, will be published in a book developed as part of the research project, Lessons Learned for the Management Policy of the Biosphere Reserve “Oxapampa-Asháninka-Yanesha”. This book will be handed to the biosphere reserve management and will be available for the local population.

Collected data was anonymized so that collected information cannot be traced back to single persons. Also, the exact position of farms was not included to reduce traceability.

4.7. The Food System Oxapampa

Local consumption in Oxapampa is taking place at home as well as in restaurants. Food products are obtained from various points of sale situated inside the urban area of Oxapampa. For the local economy especially agricultural production, crop production as well as cattle farming, and processors of locally produced agricultural products are important for the economic income of the region (SERNANP, 2014). Processors are mainly dairies and coffee roasters.

4.7.1. Restaurants in Oxapampa

Restaurants are distributed all over the rural and urban areas of Oxapampa. Especially in the city center there are various restaurants. Several of them are focused on tourists coming predominately from other regions of Peru or from the local population. Restaurants focused on tourists offer meals typical of the region and are higher in price. Local restaurants are lower in price. They offer a daily menu at lunchtime and some of them also for dinner. The menu includes a starter, a main dish, and a beverage. The menu is especially cheap compared to dishes from the menu and ranges from 8 to 20 soles (8 to 20 soles correspond to 2.14€ to 5.36 € - the prices in euro were calculated according to the exchange rate of Soles and Euro by the Banco Central de Reserva del Perú; 1 sole equates 0.2681€, at the 31st October 2019). Some tourist restaurants also offer menus, but not all of them. Also, the menus of tourist restaurants are more expensive (20 soles; correspond to 4.76€).

4.7.2. Points of Sale in Oxapampa

Oxapampa has a wide variety of points of sale. Three daily markets, Mercado Santa Rosa, Mercado Alameda, and Mercado Abasto. They are located in the center of Oxapampa and supply consumers with fruits, vegetables, tubers, meat, and fish. Booths of the markets are administrated by the municipality of Oxapampa and rented by the local population. Each market has a certain number of booths, which are organized into product groups sold. People renting the market booths are allowed to sell only certain product groups, like fruits, vegetables, chicken, meat, or fish. For example, in Mercado Santa Rosa there are 99 booths and 36 (6 fruits, 13 vegetables, 5 chicken, 9 meat, 3 fish) reserved for food sale. The market booths can be rented by paying 96 soles per month (96 soles correspond to 25.74 €). The food supply for the markets is not organized uniformly, therefore the support of products depend on each salesperson. Still, food supply is predominately sustained by intermediaries bringing products mostly from Lima to the markets. Some salespersons also travel to buy products from intermediaries for lower prices.



Figure 6 – A market booth: a salesperson selling predominately fruits in a market booth situated in the Mercado Alameda.

The weekly fair takes place twice a week, on Tuesdays and Saturdays. The weekly fair is called *feria* which can be translated as fair. The fair has no other specific name. Salespersons come from different regions and sell a wide variety. Saturdays are a special day and farmers come from different regions of the Biosphere Park and even from outside the park to sell their own produced products. Farmers and salespersons have their booths spatially separated inside the fair so that farmers and salespersons are easy to distinguish them. The fair of Oxapampa is preferred for its low prices as well as for the good quality of the products and the access and exchange with local farmers. The municipality also charges organizes and administrates the fair and charges 1.50 soles (1.50 soles correspond to 0.40€) for sale of products. For the farmers, the fair is an opportunity to sell products produced in small quantities that cannot be sold by intermediaries.



Figure 7 – At the Fair: farmers and vendors are selling their products at the fair

The shops distributed throughout Oxapampa, offer a quick possibility to access the products. Shops offer a mixed assortment of fresh fruits, vegetables, and tubers, with packaged processed foods such as cookies and canned and locally produced milk. The majority of salespersons in shops also get their supply sustained by intermediaries, but also a high share

buys a product from the fair to resell them. There is a single store, which can be seen as a supermarket, that has a diverse assortment, several employees and sells mainly packaged food.

4.8. Sample Description of the Surveys

During the survey, 167 persons were interviewed (Table 8). Thirty-two consumers, 10 restaurateurs, and 60 salespersons were questioned situated inside the urban area. Seven processors and 58 farmers were interviewed inside the system boundary mostly located in the surroundings of Oxapampa. The sample size of each group of people equates 100%. The sample size is additional shown for an easier understanding (Figure 8).

Table 7 - Sample size of Actors: the total number of interviewees of each group participating in survey. The sample size equates 100%.

Group of People	Sample Size (n)	n=100%
Consumer	32	32=100%
Restaurateur	10	10=100%
Salesperson	60	60=100%
Farmer	58	58=100%
Food processor	7	4=100%
Total number of interviewees	167	156=100%

Composition of Sample (n=167)

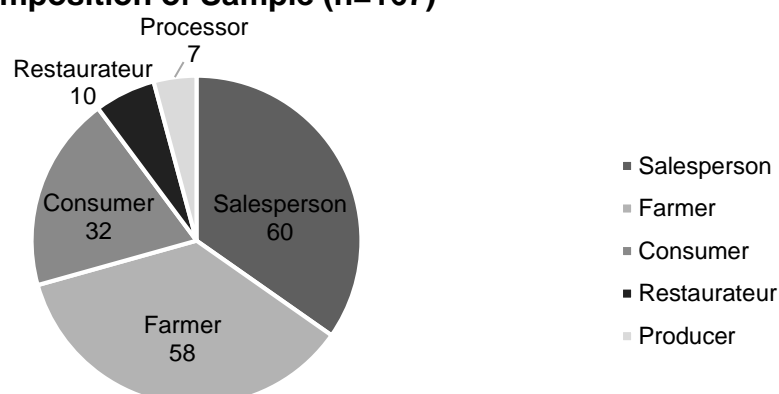


Figure 8 – Composition of Sample: The composition of all participants at surveys and interviews during data collection in Oxapampa and surrounding (n=167, 100%=n among all persons interviewed)

4.8.1. Sample Description of the Consumer Survey

The total sample of consumers interviewed by the questionnaire was composed of 32 female persons. The youngest person interviewed was 22 years old and the oldest 75, the arithmetic mean age was 41. The majority of respondents were born in Oxapampa (53%), others came from Lima (16%) or different cities situated in the Sierra or Selva. 21.9% of respondents had a university degree and 34.4 % reported having completed primary school as well as a secondary school. Interviewees had diverse professions, still, 31.3% of women interviewed described themselves as Housewives.

Table 8 - Sample Description of Consumer survey: sociodemographic data including age, education, and profession of consumers interviewed

Age (n=32)	Descriptives	
Minimum	22	
Maximum	75	
Arithmetic Mean	41	
Origin	Number of participants (n=32)	Number of participants in percentage (n=32=100%)
City Oxapampa	17	53%
Province of Oxapampa, without city	2	6%
Sierra	8	25%
Costa	5	16%
Education	Number of participants (n=32)	Number of participants in percentage (n=32=100%)
Primary School	11	34.4%
Secondary School	11	34.4%
Vocational Training	3	9.4%
University Degree	7	21.9%
Profession	Number of participants (n=32)	Number of participants in percentage (n=32=100%)
Housewife	10	31.3%
Vendor	6	18.8%
Cook	3	9.4%
Professor	3	9.4%
Farmer	2	6.3%
Restaurateur	2	6.3%
Others	1	18.6%

Survey data related to Households and Food preparation

In the households of consumers interviewed, live between 2 and 8 persons and on average life 4.06 persons. They go out to eat between 0 to 5 times per week in restaurants or booths on the street and the arithmetic mean was 1.01 times per week. Women interviewed described themselves mostly (94%) percentage as a mum or as a grandmother (6%). Besides 93.8% of women stated to be mainly responsible for food purchase and food preparation in the household. Just 2 women (6.3%) did not describe themselves as mainly responsible.

Table 9 - Sample Description of Consumer survey: survey data related to household and food preparation

Number of house members (n=32)	Descriptives	
Minimum	2	
Maximum	8	
Arithmetic mean	4.06	
Number of eating out per week (n=32)	Descriptives	
Minimum	0	
Maximum	5	
Arithmetic mean	1.01	
Position in Family	Number of Participants (n=32)	Number of participants in percentage (n=32=100%)
Mother	30	94%
grandmother	2	6%
Responsibility for food preparation	Number of Participants (n=32)	Number of participants in percentage (n=32=100%)
main responsible	30	93.8%
not responsible	2	6.3%

4.8.2. Sample Description of the Restaurateur Survey

The importance of eating outside for consumers was limited, therefore only a small number of 10 restaurateurs were interviewed inside the urban area. The restaurateurs interviewed were between 21 and 56 years old. They were mostly female (70%) and had completed vocational

training (40%) or finished primary (30%) or secondary school (30%). Restaurateur mostly came from Oxapampa (70%). Twenty percent came from Lima and 10% from Huanuco.

Table 10 - Sample Description of Restaurateur Survey: sociodemographic data of restaurateur including age, sex, education, and origin

Age (n=10)	Descriptives	
Minimum	21	
Maximum	56	
Arithmetic mean	34.3	
Sex	Number of Participants (n=10)	Number of participants in percentage (n=10=100%)
Female	7	70%
Male	3	30%
Education	Number of Participants (n=10)	Number of participants in percentage (n=10=100%)
Primary school	3	30%
Secondary school	3	30%
Vocational training	4	40%
Origen	Number of Participants (n=10)	Number of participants in percentage (n=10=100%)
Oxapampa	7	70%
Lima	2	20%
Huanuco	1	10%

4.8.3. Sample Description of the Salespersons Survey

Sixty salespersons were interviewed between the age of 18 and 79 years, the arithmetic mean of age was 41.86 years. A higher share of 71.7% of respondents were female and 28.3% were male. 58.3% of interviewees reported to be Vendors and 40% as Farmers, just one person described themselves as a housewife. Most interviewees originate from Oxapampa 76.7%, others originate from the Sierra and other towns situated in the rainforest. Most of the respondents have completed secondary school 40% and primary school 33.3%, just 11.7% completed university, 6.7% did some vocational training and 8.3% stated that they had no formal education.

Table 11 - Sample Description of Salesperson Survey: sociodemographic data including age, sex, profession, origin, and education of participants

Age (n=60)	Descriptives	
Minimum	18	
Maximum	79	
Arithmetic mean	41.86	
Sex	Number of Participants (n=60)	Number of participants in percentage (n=60=100%)
Female	43	71.7%
Male	17	28.3%
Profession	Number of Participants (n=60)	Number of participants in percentage (n=60=100%)
Vendor	35	58.3%
Farmer	24	40.0%
Others	1	1.7%
Education	Number of Participants (n=60)	Number of participants in percentage (n=60=100%)
No education	5	8.3%
Primary School	20	33.3%
Secondary School	24	40.0%
Vocational Training	4	6.7%
University	7	11.7%

Origin of Participants	Number of Participants (n=60)	Number of participants in percentage (n=60=100%)
City of Oxapampa	46	76.7%
Province of Oxapampa, without city	3	5.1%
Selva	5	8.6%
Sierra	3	5.1%
Costa	1	1.7%
Unknown	2	3.4%

This diagram shows the location of booths of salespersons, who were interviewed. This was done based on the importance of markets, shops, and the fair for consumers. Therefore 54% of salespersons in the fair were interviewed, which is also the most important site for consumers for the purchase of food products. Second most important site for consumers for their purchase were markets therefore 28% of interviews were done in one of the three markets in Oxapampa. Eighteen percent of salespersons interviewed were persons owning their shop.

Position of Booths of Interviewed Salespersons (n=60)

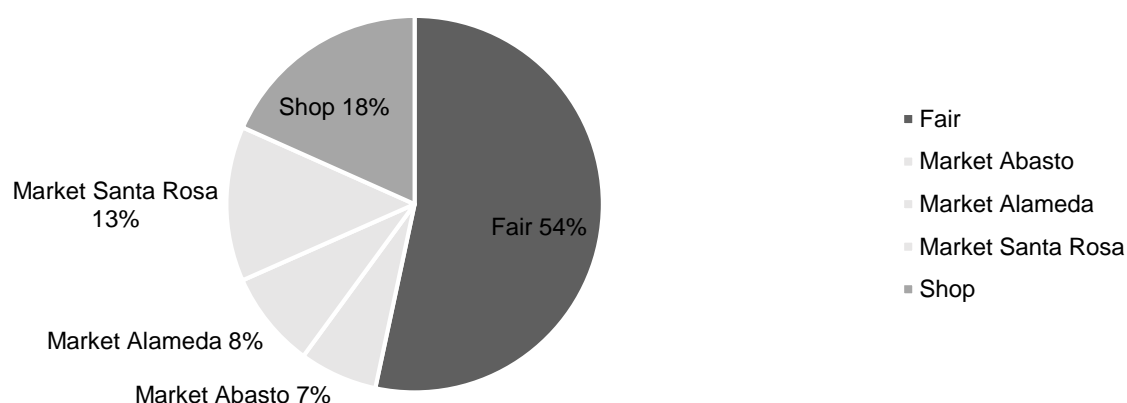


Figure 9 – Position of Booths of Interviewed Salespersons: salespersons were interviewed in different markets, shops and the fair. The decision for the share of interview partners was based on the results of the purchase habits of consumers (n=58; n=58=100% among all salespersons interviewed).

4.8.4. Sample Description of the Farmer Survey

Farmers interviewed were between 18 and 76 years old. The arithmetic mean was 46,24 years. Shares between female farmers (48%) and male (52%) farmer were nearly evenly balanced. Most of the farmers completed their secondary school (41%) or primary school (22%). Fifty percent of farmers were from Oxapampa and 45% of the province of Oxapampa, without the city Oxapampa. Just 5% of famers originate from other parts of Peru.

Table 12 - Sample description of Farmer Survey: sociodemographic data of farmers including age, sex, education, and origin

Age (n=58)	Descriptives	
Minimum	18	
Maximum	76	
Arithmetic Mean	46.24	
Sex	Number of Participants (n=58)	Number of participants in percentage (n=58=100%)
Female	28	48%
Male	30	52%

Education	Number of Participants (n=58)	Number of participants in percentage (n=58=100%)
No education	9	16%
Primary School	13	22%
Secondary School	24	41%
Vocational Training	4	7%
University	8	14%
Origin of Farmers	Number of Participants (n=58)	Number of participants in percentage (n=58=100%)
City of Oxapampa	27	50%
Province of Oxapampa, without city	25	45%
Sierra	2	3.6%
Costa	1	1.4%

The size of the farms is between 0.02 ha and 90 ha, the arithmetic mean is 10.59 ha of the production units inside the system boundary. Figure 10 shows that 61% of farmers have farming units smaller than 3 ha and 10% above 30 ha.

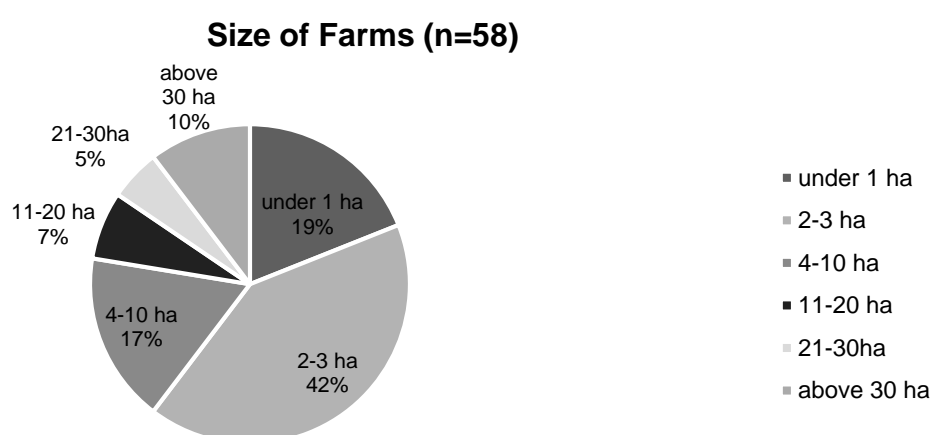


Figure 10 – Size of Farms: distribution of the size of production units in the farms inside the system boundary of Oxapampa (n=58, N=58=100% among all farmers interviewed)

The farms were located inside the system boundary of 7km and distributed throughout the study area. They were situated in different villages (see Figure 11).

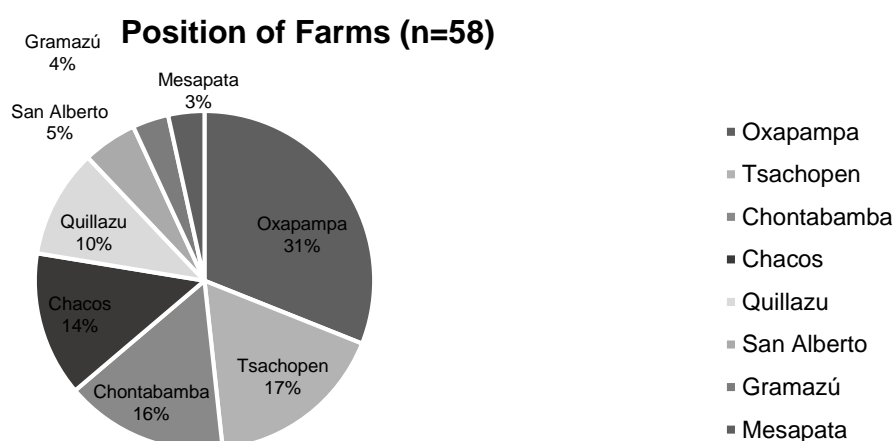


Figure 11 – Position of Farms: location of farmers farms interviewed (n=58; n=58=100% =n among all farmers interviewed)

Several farmers (76.8%) stated to also keep animals. of farmers Forty-nine percent have chickens, 28% cows, 16% guinea pigs, 12% pigs and 9% ducks.

4.8.5. Sample Description of Food Processor Survey

Six food processors located inside, and in the surrounding area around Oxapampa, were interviewed concerning information about four dairies, two coffee roasters and one food processor roasting coffee and also making marmalades, banana chips, pituca chips, and much more were collected.

5. Results

5.1. Local Consumption

5.1.1. Origin of Food Products consumed

The following seven origins used for food acquisition of consumers were identified during the interviews: Fair, market, local products, stores, farmers, food processors (n=32 consumers = 100%, multiple answers possible) (Figure 12). Ninety-seven percent of 32 consumers interviewed visit the fair. They buy on average 53% of all products consumed in the fair. Interviewees explained that the fair is especially visited because of its low price (mentioned by 91% of interviewees, multiple answers possible), and good quality of products (mentioned by 50% of interviewees, multiple answers possible). Markets are visited by 75% of consumers interviewed, and shops are visited by 72%. However, markets and shops have a lower share of total purchases. Shops are visited especially because of their proximity to readily obtained products nearby. Just 25% of interviewees mentioned buying products from farmers or growing their own food for self-consumption. Supermarkets as well as food processors are visited by a small number of persons. In general, the most frequent motive for the preference of points of sale is the price, mentioned by 97% of interviewed consumers (multiple answers possible).

Differences between the purchasing behaviour of consumers for different product groups were found (n=32 consumers = 100%, multiple answers possible). Ninety-one percent of consumers mentioned buying vegetables and fruit mostly from the fair, moreover tubers are said to be bought by about 69% of consumers interviewed at the fair. Fifty-three percent of consumers interviewed are said to buy milk products and cereal at the shops. Meat is mostly bought by 62.5% of consumers interviewed, in one of the markets. The arithmetic means of eating outside their own household was 0.99 times per week.

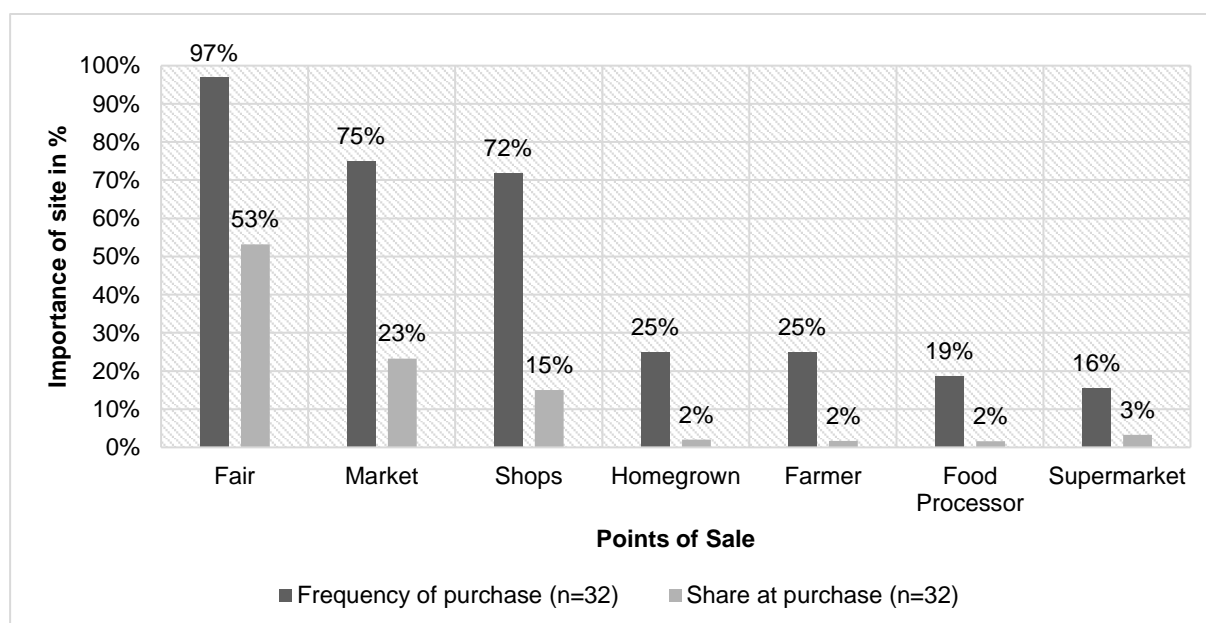


Figure 12 – Origin of Food Products consumed: the most important sites for consumers for purchasing food are shown (n=32, n=100% among consumers interviewed). Dark grey bars show the frequency of visits to each site and do not refer to the number of products purchased (n=32, n=100% among consumers interviewed). Light grey bars show the arithmetic mean percentage of the share of all food purchased by respondents (n=32, n=32=100% among all interview partners, multiple answers possible)

5.1.2. Food Products consumed

The vegetables most frequently mentioned by consumers to be consumed ($n=32$ consumers = 100%, multiple answers possible) (Figure 13) were carrots (91%), lettuce (78%), tomatoes (78%) onions (72%), celery (69%), beans (53%), cucumbers (47%) and squash (47%). The most frequently mentioned fruits by consumers ($n=32$ consumers = 100%, multiple answers possible) (Figure 13) were bananas (78%), oranges (66%), papayas (66%), apples (63%), grapes (63%) and mandarins (59%). Scientific names of plants mentioned are stated in Appendix, 11.6 Scientific Names of Plants mentioned.

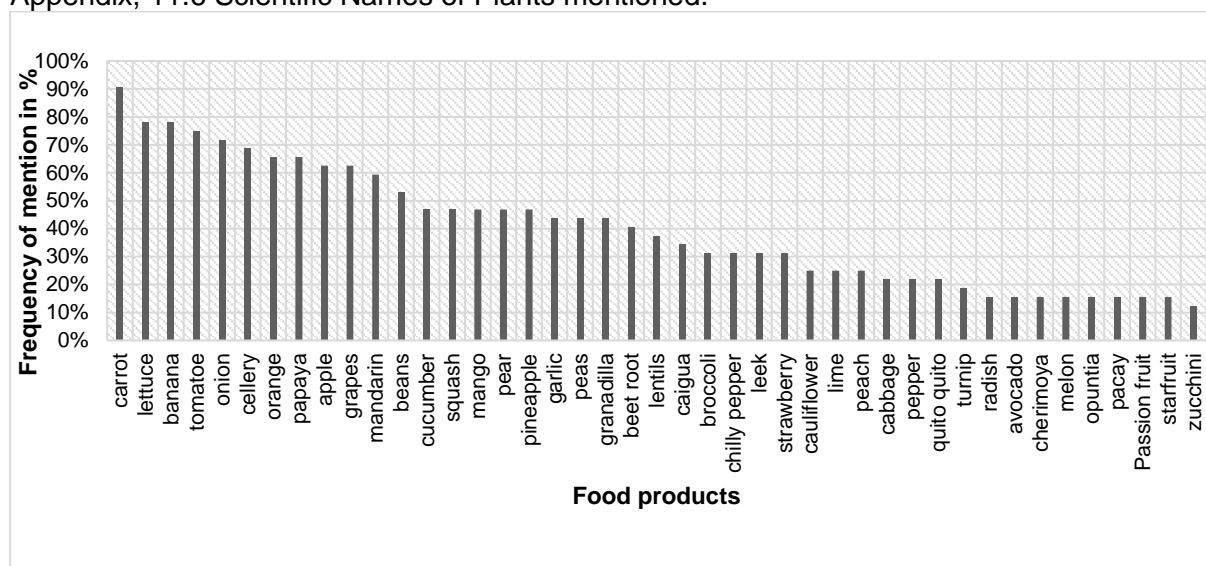


Figure 13 – Vegetables and Fruits consumed: the most frequently mentioned fruits and vegetables by respondents ($n=32$, $n=32=100\%$ among all interview partners, multiple answers possible). All fruits and vegetables included into the Figure were mentioned by more than 10 percent of interviewees.

More than 50% of consumers ($n=32$ consumers = 100%) consume rice, milk products, chicken, coffee, and potatoes daily or every other day, therefore the products rice, milk, chicken, coffee and potatoes are valued as the most relevant products for local consumption (Figure 14).

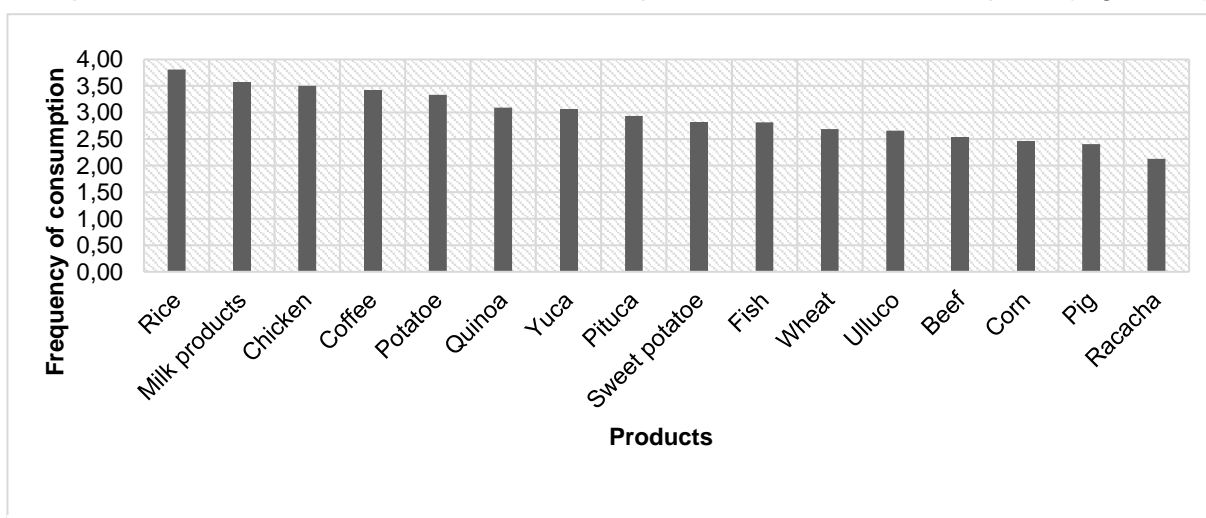


Figure 14 - Cereals, Tubers and Animal Products consumed: cereals, tubers, and animal products are frequently consumed by the consumers interviewed ($n=32$). The frequency of consumption is ranked as followed: 4=every day or every other day, 3=sometimes, 2=rarely, 1=never.

Quinoa, yuca, pituca, sweet potatoes, and fish are sometimes consumed by the majority of consumers. Consumers are not necessarily consuming coffee daily originating from the surroundings of Oxapampa. Consumers also consume highly processed instant coffee.

5.1.3. Social Network Analysis of Local Consumption

The social network about local consumption illustrates the purchase of consumers from different sites for food purchases (Figure 16). The social network has a density of 6.9%. The outdegree value of the fair is 33%, 26% by the market, 24% by the shops, 8% by Food processors, 5% by supermarkets, and 4% by intermediaries.

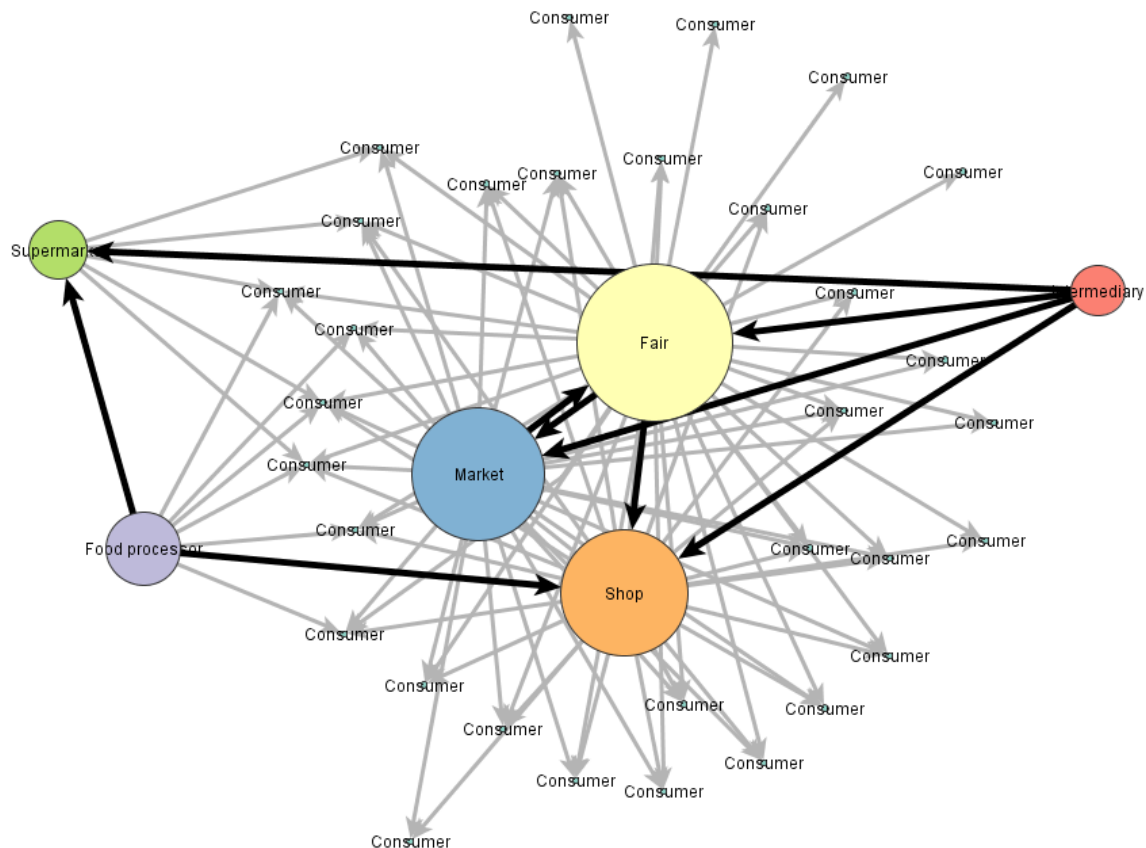


Figure 15 – Social Network Analysis of local Consumption: each consumer-node represents one of the 32 interviewed consumers. The social network contains 38 actors (32 consumers plus 6 points of sale) and 99 ties connecting the actors included. The size of the nodes represents the centrality. The transfer of products between points of sale is shown with thicker directed ties. The ties illustrate a higher amount of transfer from products from one point of sale to another compared to transfer from points of sale to consumers.

Consumers are obtaining food products from the following categories fair, market, shop, food processor, supermarket. Consumers are purchasing products from three (15 consumers), two (eight consumers), or four (three consumers) points of sale. Two consumers obtain products from each of the five points of sale. Four of 32 consumers just depend on one point of sale for food purchases, and those four consumers just depend on the fair. Intermediaries supply fairs, markets, shops and the supermarket with products. In markets and fairs an exchange of products is happening, which is represented by two arrows. Salespersons selling at the market also sell their products at the fair, and salespersons selling at the market buy products from a salesperson at the fair. Shops get a supply of food products from the fair and food processors.

5.2. Local Gastronomy

Ten local restaurateurs interviewed inside the urban area (n=10 restaurateurs = 100%, multiple answers possible), state that products used for cooking originate partly from one of the markets

(100%), the fair (60%), or directly from food processors (10%). Markets are mostly preferred because of their proximity (40%) to the restaurant and quality (40%) of products. Price plays a subordinate but still an important role (30%) for the decision making about purchase of food products of restaurateurs.

The list of dishes offered by restaurants for the menu contains 91 different dishes. 55 of the offered dishes were offered just one time by one restaurant. Most often, the dishes offered were Trucha Frita (10), Arroz a la Cubana (8), Arroz Chaufa (5), Parilla de Res (5), Pollo con Mani (5), Tortilla de Verdura (5), Pescado Frito (4), Seco de Gallina (4) and Tallarin Verde (4).

Ingredients used for the preparation of dishes by restaurateurs are mainly congruent with ingredients mentioned by restaurateurs for food preparation. The most frequent ingredients mentioned ($n=10$ restaurateurs = 100%, multiple answers possible) are rice (100%), chicken (90%), potatoes (80%), beef (70%), garlic (70%), onion (70%), tomatoes (60%) and pork (60%) (Figure 17).

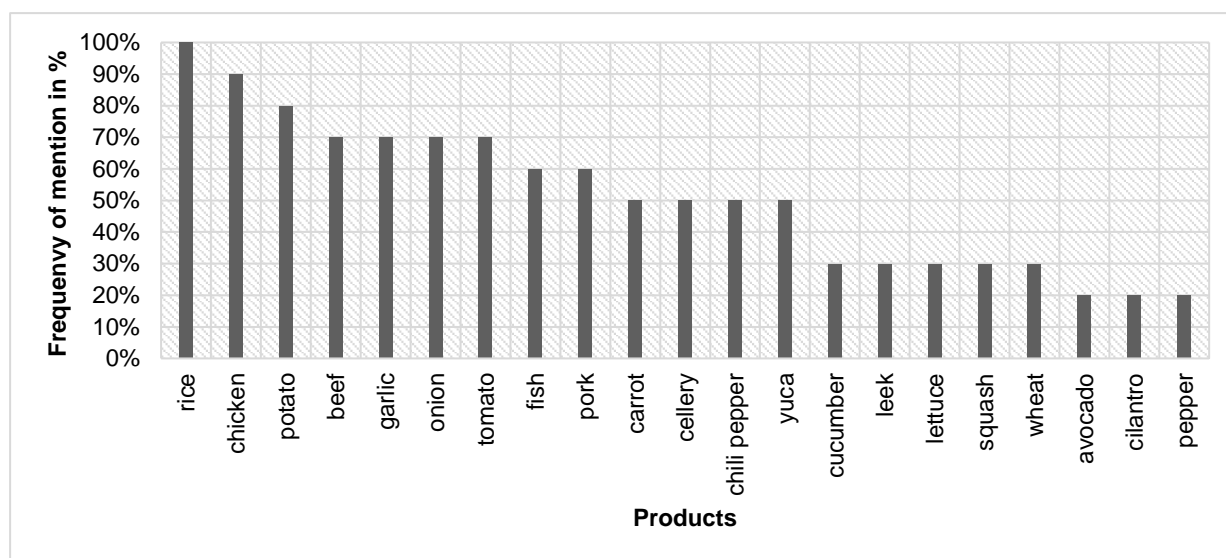


Figure 16 – Local Gastronomy: main ingredients used by more than one restaurateur for food preparation ($n=10$, $n=10=100\%=n$ among all interview partners, multiple answers possible)

5.3. Local Commercialization

5.3.1. Origin of Food Product sold

Sixty percent of salespersons mentioned ($n=60$ salespersons = 100%, multiple answers possible), selling products coming from the surroundings of Oxapampa and 57% of salespersons from Lima (Figure 18). Another city mentioned frequently was Tarma. 28% of the salespersons sell products from Tarma. Twenty percent of salesperson sale products coming from the Selva. In the region Selva salespersons selling products from the surroundings of Oxapampa were not included, although Oxapampa is situated in the Selva, due to its high share and importance. Seven percent from the Sierra, not including the city of Tarma. Three percent from the Costa, not including the city of Lima. The same applies to the city Tarma and Lima as to the city of Oxapampa, because of their high share in the origin of food products, they are called extra.

Eighty-three percent of farmers interviewed sold self-produced products, which were produced inside the system boundary ($n=24$ farmers = 100%, multiple answers possible). Farmers also sell products coming from Tarma (17%), Lima (17%), Selva (17%), Sierra (4%), and Costa (6%). In contrast, vendors especially obtain their products from Lima (83%) and Tarma (36%), but also Oxapampa (44%). The category Costa includes all regions inside the Costa, except

for Lima. Sierra also includes areas inside the Sierra, but not Tarma. Likewise, the Selva does not include Oxapampa.

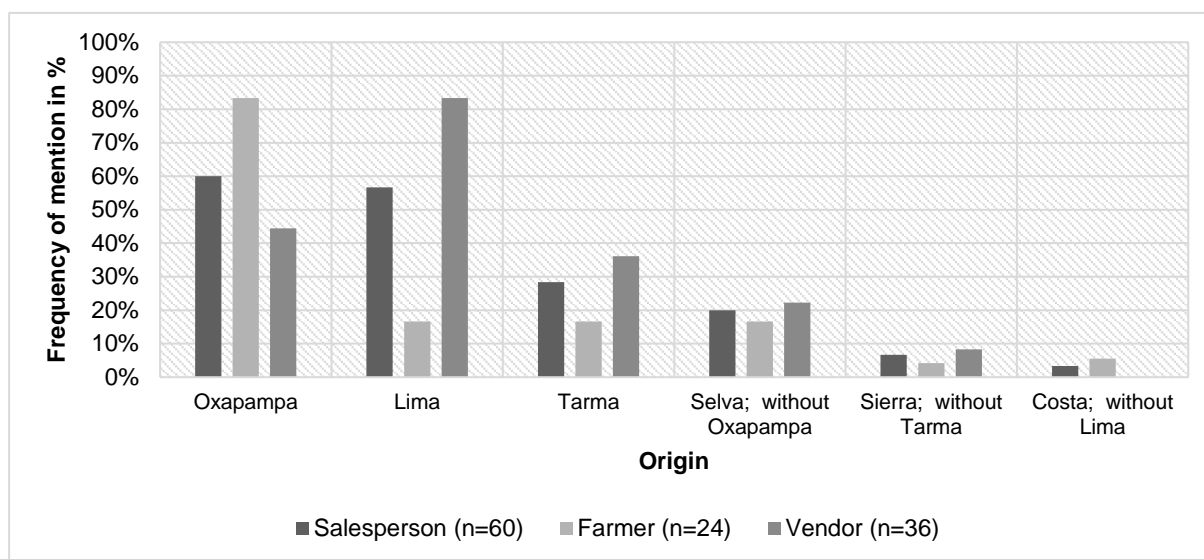


Figure 17 - Origin of Food Products sold: blue bars represent the salesperson and therefore the origin of products from all persons interviewed at the fair, the markets, and shops ($n=60$, $n=60=100\%=n$ among all salespersons interviewed, multiple answers possible). Light grey bars show the farmers ($n=24$, $n=24=100\%=n$ among all farmers interviewed; multiple answers possible) and dark grey ones the vendors ($n=36$, $n=36=100\%=n$ among all vendors interviewed, multiple answers possible).

5.3.2. Supply of Food Products

Vendors especially purchase their products from (Figure 18) the intermediary (75% of vendors) and wholesale markets (42% of vendors) ($n=36$ vendors = 100%, multiple answers possible). Farmers sell their products but also additionally purchase products from the intermediary (21% of farmers) and wholesale markets (4% of farmers) ($n=24$ farmers = 100%, multiple answers possible). The purchase of products by vendors from the fair especially refers to shop owners buying 54% of their food products at the Fair and resell them. 15% of vendors also buy products directly from farmers and resell them. Especially vendors selling animal products in shops or in the market buy products directly from the farmers. Shop vendors predominately sell animal products or coffee directly purchased from local food processors. Seven percent of salespersons sell products from food processors ($n=60$ salespersons = 100%, multiple answers possible).

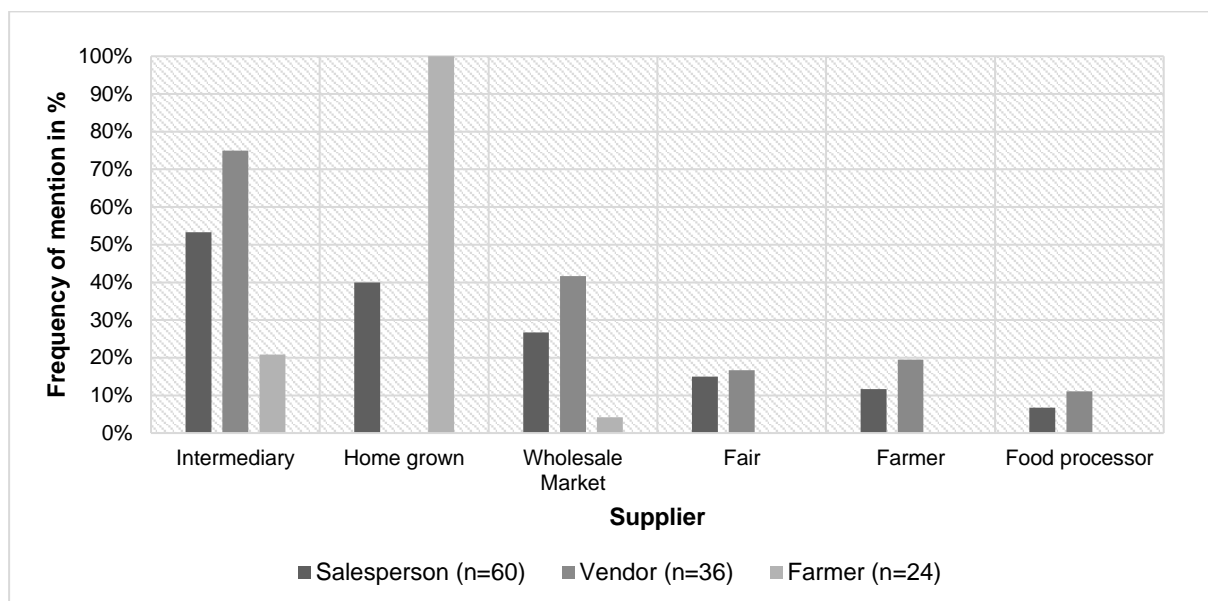


Figure 18 – Supply of Food Products: salespersons resell products bought from intermediaries, wholesale markets, the local fair, farmers, or food processors. Salespersons also produce their food to sell the products at the local fair (n=60, n=60=100%=n among all interviewed salespersons, multiple answers possible).

5.3.3. Food Products Sold

The most frequent food products sold in Oxapampa on the markets by salespersons (n=60 salespersons = 100%, multiple answers possible) are bananas (37%), tomatoes (32%), carrots 30%, potatoes (30%), apples (28%), corn (28%), parsley (28%), chilli peppers (27%), lettuce (25%), and onions (25%) (Figure 19). Products also produced in the surroundings of Oxapampa that are sold frequently in markets, shops or the fair are bananas, squash, caigua, and oranges. Salespersons offer between 1 and 33 different food products and offer on average 10.43 products at choice contributing to the diversity of the food availability for consumers.

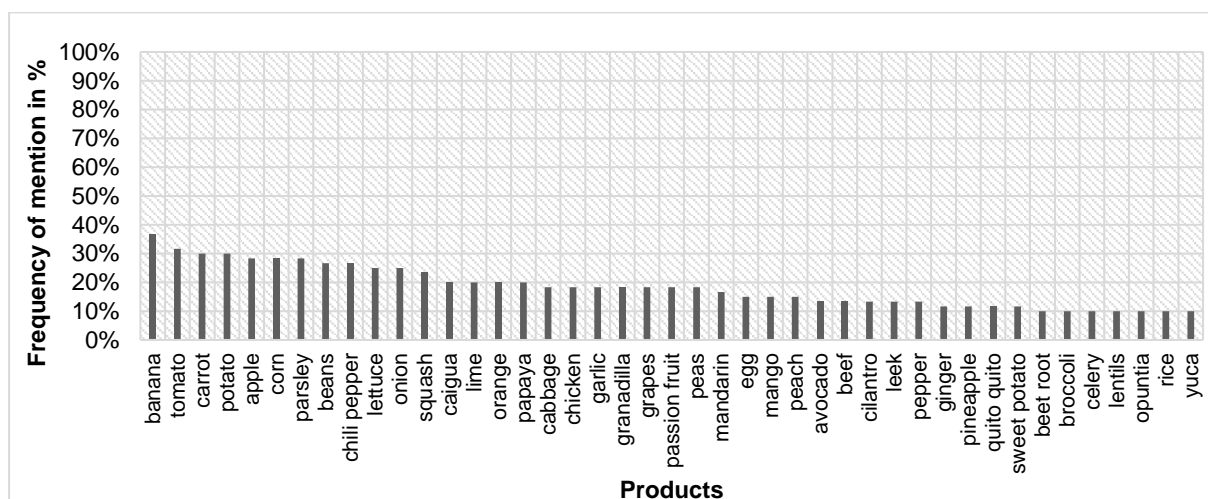


Figure 19 – Food Products Sold: products most often included in the assortment offered by salespersons (n=60; n=60=100%=n among all salespersons interviewed, multiple answers possible).

5.4. Local Production

5.4.1. Commercialization of Food Products

58 Farmers were interviewed, 18 farmers at the fair, and 40 farmers on their farms (Figure 20) (n=58 farmers = 100%, multiple answers possible). The majority of farmers (67%) mentioned selling a part of their products at the Fair of Oxapampa. The high number of farmers selling at the fair is clear for farmers questioned at the fair, but still, 60% of farmers asked in the countryside also stated that they sold products at the fair. Just a small number of farmers sold their products to cooperatives (7%), directly to shops (5%), did direct marketing (5%), by selling products directly from their farm to consumers, or exported the products to the international market (2%).

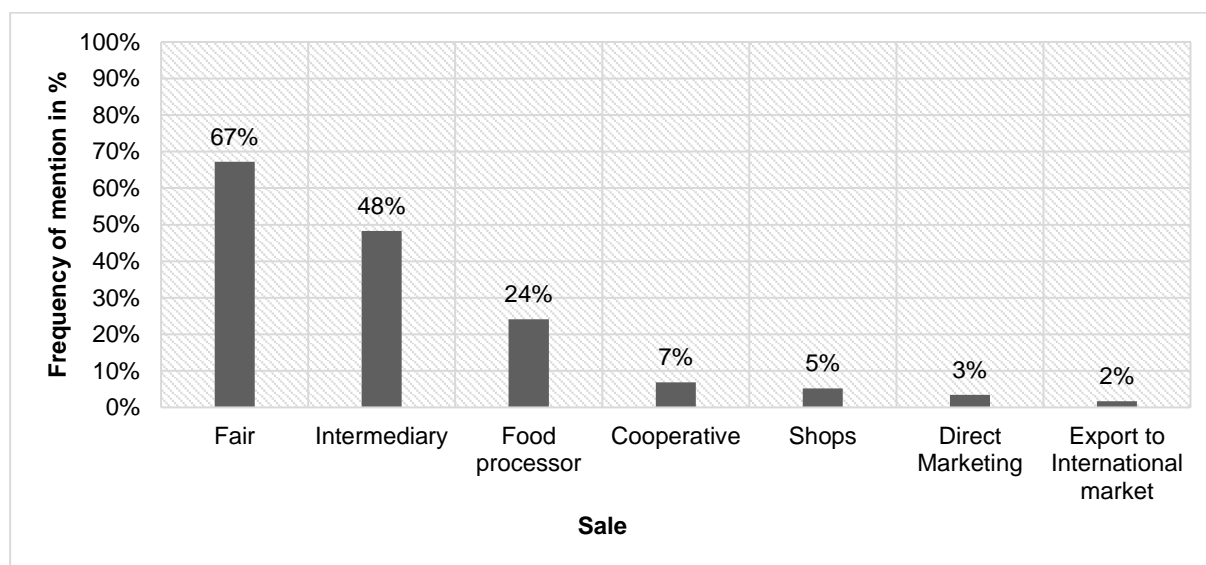


Figure 20 – Commercialization of Food Products: farmers use seven different ways to sell their products. The fair as a market accessible for farmers plays a key role in food sales. Intermediaries are especially used if food has to be sold in big quantities. Food processors are especially relevant for farmers for the sale of animal products (n=58; n=58=100%=n among all farmers interviewed, multiple answers possible).

During interviews, granadilla, squash, caigua, avocados, and chili peppers, were predominately mentioned related to selling by an intermediary. Coffee was mentioned related to being sold in various ways to intermediaries, cooperatives selling coffee to food processors, and also to be exported. Milk and meat were mostly mentioned to be sold to food processors. All other crops included in the chart above were especially mentioned related to selling at the fair. Cross tables between marketing strategies and products produced showed similar results.

Farmers sell their products from 1 to 4 different ways. The arithmetic mean says that farmers usually use 1.78 different ways to market their products. Of all farmers 21% sell their products just at the fair and do not use an additional strategy to sell their products (n=58 farmers = 100%, multiple answers possible). Of all farmers 52% sell their products primarily to intermediaries, 21% to food processors, and 7% to cooperatives.

5.4.2. Food Products produced

Farmers mentioned that they cultivate or produce between 1-13 products. On average farmers have mentioned 5,12 different food products, with a high standard deviation of 3.31. Food products most often mentioned by farmers to be produced on their field (n=58 farmers = 100%, multiple answers possible) were coffee (53%), bananas (34%), granadilla (34%), corn (26%),

squash (26%), milk (22%), avocados (21%), caigua (19%), beef (17%) and pituca (17%) (Figure 21).

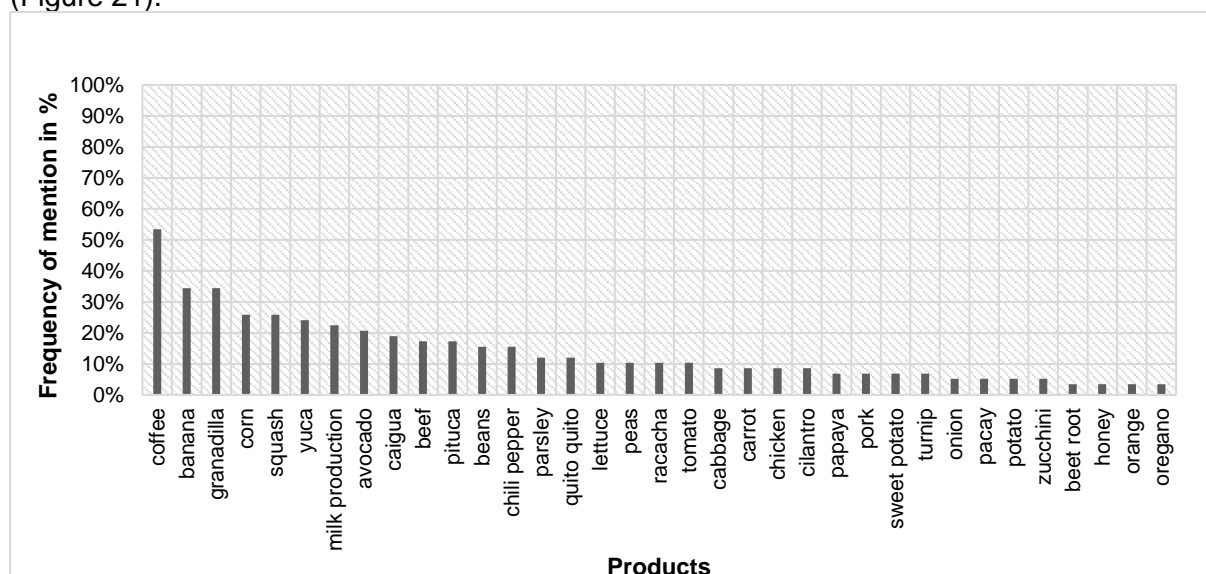


Figure 21 – Food Products produced: all food products produced by more than one farmer (n=58; n=58=100% among all farmers interviewed, multiple answers possible)

5.4.3. Social Network Analysis of Food Production

The social network has a density of 2.3% of all possible ties (Figure 22). Especially the fair (connected to 40.59% of farmers) and intermediaries (connected to 29.70% of farmers) have high centrality and are supplied by a high number of different farmers. Points of sale are tied by the transfer of products between them.

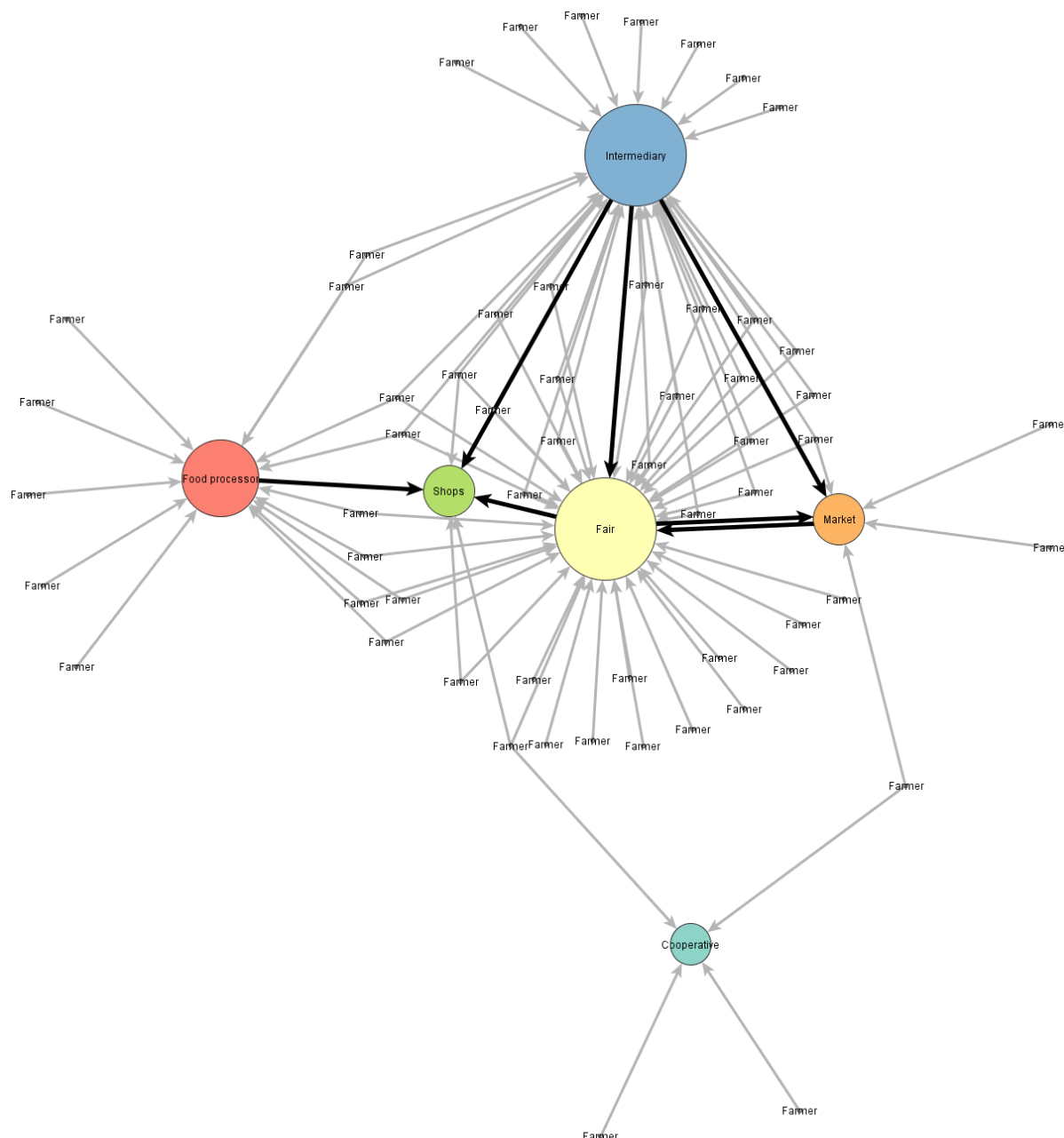


Figure 22 – Social Network Analysis of Food Production: each node in grey represents one of the 58 interviewed farmers. The social network contains 64 actors (58 farmers plus 6 points of sale) and 102 ties between the actors involved. The size of the nodes represents the centrality. Thicker ties represent an increased transfer of products between points of sale. Farmers sell their products at, or to, a maximum of three different points of sale. The majority sells the products just in one (27 out of 58) or two (26 out of 58) different ways. Production of products by farmers supplies local points of sale, including fairs, shops, markets, and local food processors. A high number of farmers sell their products to intermediaries. The node intermediary is connected to all local points of sale, excluding food processors. Markets are supplied by a small number of farmers directly. The same applies to shops. Coffee farmers are connected to cooperatives by the sale of coffee to cooperatives.

5.5. Local Food Processing

Dairies process locally produced milk from farmers into cheese, yogurt, and milk. They produce between 500 to 3000 litre of milk per day, depending on the size of the company. The biggest companies ordered in size are Floralp, Mosel, Angelita, and Sabrossi. They have different approaches to food supply; whereas Floralp depends on just five quite large dairy farms, Mosel depends on 20, Sabrossi depends on 10, and Angelita depends on 13 smaller dairy farmers depend. Mosel and Angelita also have their own cattle but are also dependent on additional supply. Floralp is focused on producing a luxury article of line with higher prices for tourists and the national market, especially Lima. All other processors sell mostly in the surroundings of Oxapampa, including various cities inside the biosphere park, but they also supply more distant cities, such as Huancaayo (Sierra), Tarma (Sierra), Satipo (Selva), and Tingo Maria (Selva).

Coffee roasters interviewed were Café Colono and Café Grano. Café Colono purchases coffee from about 100 different local small-scale coffee farmers, roasts the coffee, and sells the coffee mostly on the national market. They also sell coffee in Oxapampa itself and the rainforest area. Farmers are not bonded to the coffee company but can bring whatever quantity they have to the coffee roaster and will be paid according to the quality and quantity of the coffee. They are not producing their coffee. The coffee company Cafe Grano, in contrast, sells its coffee in small quantities nationally, while selling the majority internationally, besides cultivating a high share of the coffee itself. Besides, this coffee is certified organic. Oxalecker is focused on tourists coming to the area, selling special products such as coffee, pituca chips, and banana chips. Products are predominately produced on their farm.

5.6. The Local Food System Oxapampa

5.6.1. Transfer of Food products

A high amount of vegetables and fruits produced in the area such as granadilla, squash, avocados, and caigua, have small importance for local sale and consumption by consumers (Table 13). Chicken has high importance for consumption although chicken is not produced for sale inside the area. Chickens are kept by farmers but used for self-consumption. Therefore, local chickens are hardly available on the market. Beef and pork are predominately produced and sold on the markets from local farmers. However, a smaller quantity is consumed by local consumers.

Table 13 – Transfer of Food products: the twenty most mentioned vegetables and fruits are represented, which are consumed, used in restaurants, sold and produced by farmers. They are transferred along the value chain from one actor to another.

	Local Consumption	Local Gastronomy	Local Sale	Local Production
1	carrots	garlic	bananas	bananas
2	lettuce	onion	tomatoes	granadilla
3	bananas	tomatoes	carrots	squash
4	tomatoes	carrots	apples	avocados
5	onions	celery	corn	caigua
6	celery	chili peppers	beans	beans
7	oranges	cucumbers	chili peppers	chili peppers
8	papaya	leeks	lettuce	quito quito
9	apples	lettuce	onions	lettuce
10	grapes	squash	squash	peas
11	mandarins	avocados	caigua	tomatoes
12	beans	turnips	limes	cabbage
13	cucumbers	beetroot	oranges	carrots
14	squash	broccoli	papaya	papaya
15	mangos	cabbage	cabbage	turnips
16	pears	caigua	garlic	onions
17	pineapples	cauliflower	granadillas	pacay
18	garlic	cocona	grapes	zucchini
19	peas	beans	passion fruit	beet root
20	granadillas	ginger	peas	orange

Several farmers are also dedicated to dairy farming. The milk produced by farmers from Oxapampa is further processed by local food processors in dairies. The locally produced milk products also have high importance for the consumption of local consumers.

Although rice and quinoa are not produced in the area, they play a major role in consumption. In contrast to this, tubers, such as potatoes, pituca, yuca, ulluco, and racacha, have high importance and are produced locally. Coffee has high importance for consumers and is produced locally. The cooperation between farmers and dairy allows farmers to sell at a stable price and secure their economic income.

5.6.2. Social Network Analysis of the Food system Oxapampa

The social network has a density of 1.8% of all possible ties (Figure 23). The degree of points of sale is fairly 19.14%, market 9.33%, intermediary 8.8%, Shops 7.17%, food processor 5.26%, supermarket 1.44% and cooperative 0.95%.

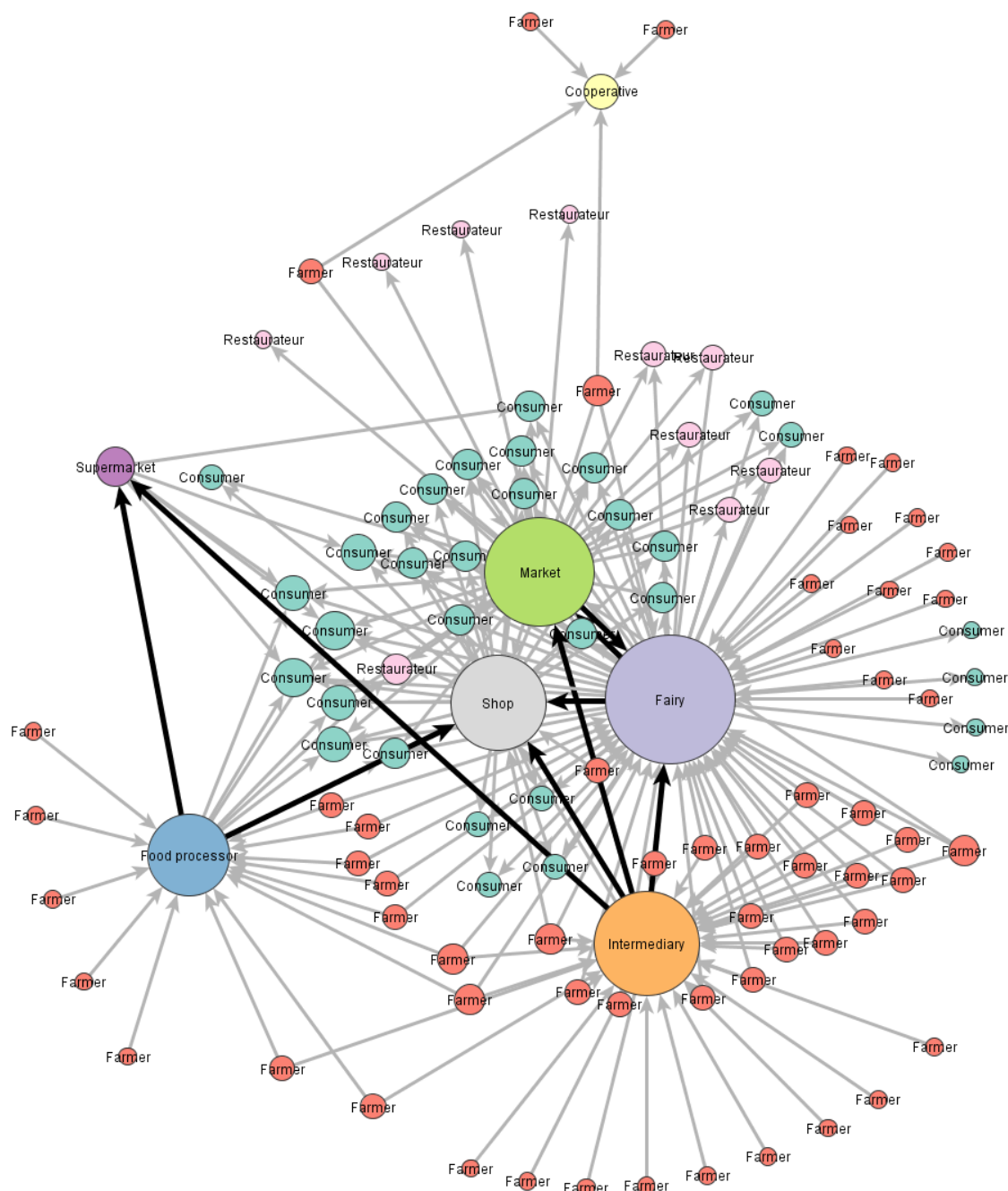


Figure 23 – Social network of the local food system of Oxapampa: each node represents one of the actors interviewed during data collection. The social network contains 109 actors (58 farmers, 10 restaurateurs, 32 consumers, and 7 points of sale) and 208 ties connecting the actors involved. The size of circles represents the centrality of a node. Thicker ties represent an increased exchange of products between points of sale.

A high exchange and transfer of products are happening between points of sale. Intermediaries supply nearly all points of sale directly. The fair supplies markets and shops and also is highly important for the supply of consumers and restaurateurs. Food processors are mostly supplying shops and the supermarket with produced products.

Farmers are connected to the fair or food processors directly, but also can indirectly support local points of sale by detouring around the intermediaries. Just four farmers sell products to a cooperative.

The ten restaurateurs involved into the survey all obtain products from the market, and six of the ten restaurateurs, also from the fair.

6. Discussion

6.1. Agrobiodiversity and Food Biodiversity in the Food System Oxapampa

Results show that farmers producing in the surroundings of Oxapampa sell crops produced in large quantities to intermediaries and then intermediaries export the products bought out of the system. The farmers interviewed cannot sell small quantities of crops to intermediaries. Therefore, the farmers interviewed usually use crops produced in small quantities for self-consumption or sell them at the fair. Consumers of the food system Oxapampa, thus have predominately access to food products produced in small quantities and offered at points of sale in Oxapampa. Therefore, food products produced in the study area in small quantities have a higher impact on the composition of diets of consumers interviewed. Products that are sold on the national market have no direct effect on the food biodiversity of consumers interviewed. Food products farmers produce and sell to intermediaries can only have an effect on composition of diets if products return to points of sale of Oxapampa by intermediaries, after they are exported out of the food system of Oxapampa.

Also other studies show (Gitagia et al., 2019; Koppmair et al., 2017) that access for farmers to points of sale do not necessarily lead to an increase of diversity in the field or at the points of sale. A focus on cash crops by farmers can increase the income of farmers and can give them the freedom to use their income freely (Gitagia et al., 2019; Koppmair et al., 2017). The tendency of farmers to focus on cash crops is related to an easier sale of products produced (Vasile & Duncan, 2017). Farmers can sell all crops at once to intermediaries or crops are even recollected by intermediaries directly from the farmers farm (Vasile & Duncan, 2017). In the food system of Oxapampa, farmers tend to sell products produced in large quantities to intermediaries. Literature (Vasile & Duncan, 2017) indicates that sale of farmers to intermediaries is linked to less additional effort for farmers than a local sale by farmers at points of sale.

Farmers selling local produced products at points of sale are related to focus on diversification and sale of products that are not frequently produced and sold locally at points of sale (Ntandou-Bouzito & Bellon, 2016). The comparison of food products, sold, consumed, and produced in the study area shows that especially vegetables, which are partly consumed by consumers interviewed, are also produced by farmers. The farmers who sell at fair, predominately offer products that are in demand by consumers and restaurants. But farmers situated in the food system Oxapampa and focusing on diversification seem to be a rather smaller number of farmers, which produce a small quantity of food products in Oxapampa and its surrounding. Products produced by farmers focusing on the sale of products at the fair, predominately do not appear in the list of the most produced crops in the area. Other studies (Ntandou-Bouzito & Bellon, 2016) show as well, that the strategy of farmers to sell produced products locally at points of sale and to utilize the potential of market access to create income by diversifying the variety of crops in their fields and thereby meeting consumer demands, is common.

The high number of products frequently consumed, but not produced by farmers in the food system Oxapampa can be linked back to climatic conditions in the study area as well. Climate conditions can affect agricultural production and cause arising limitations for agricultural production (Vaarst et al., 2018). But climate conditions in the study area would also suit crops, which are not currently produced by farmers. The reasons for a highly limited number of crops produced and the reliance on food products coming from outside of the local food system, is not totally clear. For example, a high amount of chicken is demanded inside the food system, and a high number of farmers are raising chickens. The chickens kept by farmers are not sold locally at points of sale and are therefore not accessible for consumers. Chickens offered on the points of sale are imported mostly from Lima. The consumption of chickens in the study

area exceeds the number of chickens kept by the farmers. The low amount of locally sold chickens, can be related to a low price for sale of chickens at the points of sale of Oxapampa due to a strong competition on the national market.

Products that are frequently consumed and not produced by farmers in the surroundings of Oxapampa are an opportunity for farmers to diversify agrobiodiversity, without a loss of income. However, others studies (Vasile & Duncan, 2017; Wegerif & Wiskerke, 2017; Zhou et al., 2012) show that farmers are more profit-driven and often do not have the capacity to invest in elaborate sale strategies. Therefore, they do not invest in alternative food networks or marketing strategies (Wegerif & Wiskerke, 2017). There is a high potential for diversification of products produced by farmers by focusing on locally demanded crops or even the use of unutilized crops to developed new products or create new sale opportunities (Jacobsen et al., 2015). The shift in focus by farmers also holds the opportunity to develop new products, which can be sold on the national or global markets with higher prices and can generate additional income for famers (Jacobsen et al., 2015).

Studies show (Battersby, 2011; Gitagia et al., 2019) that location and type of markets accessible for farmers and consumers in the study areas are defined to have a strong influence on the state of food biodiversity. Especially, a high accessibility for consumers, has a beneficial effect on diversity of diets of consumers (Battersby, 2011). Oxapampa has several points of sale, where farmers have the possibility to interact with vendors or directly with consumers. Especially in the fair farmers can get in contact with consumers. The products sold at the fair sustain access to food diversity and therefore are highly important for diversification of diets of consumers. A high number of products offered at the points of sale in Oxapampa has to be sourced from outside the food system from more distant areas.

The following examples of crops produced or frequently consumed in Oxapampa, including granadilla, bananas, rice, tubers and coffee, support the assumption that a high cultivation does not necessarily lead to a high consumption of products. A high local consumption of specific crops by consumers, also does not necessarily leads to an alteration of variety of crops cultivated.

Data collected by the municipality on agricultural products shows that granadilla is mostly cultivated by farmers in large extensions in the surroundings of Oxapampa (MUNIOXAPAMPA, 2009b). In the present study farmers sell granadilla mostly to intermediaries. Bananas, which were also frequently cultivated by farmers, were associated by interviewed farmers with self-consumption and sale of small quantities at points of sale by farmers. The area defined by the municipality as the main production area of bananas is not part of the defined food system of Oxapampa (MUNIOXAPAMPA, 2009b). This supports the assumption that especially large-scale farmers focus on specific crops, like granadilla, in certain areas and sell them to intermediaries. While crops like banana which are additional cultivated in small areas are sold in point of sale in Oxapampa, whereas in other areas they generate a major income and are therefore economically more important for farmers.

Rice is not produced in the food system of Oxapampa, although, rice is daily consumed by the consumers interviewed. Rice has to be imported from more distant areas, especially the Northern Coast, other parts of the Selva Alta or foreign countries (MINAGRI, 2019).

Different types of tubers are cultivated frequently by farmers for self-consumption and are predominately sold by farmers at the fair. The quantity of tubers produced and sold on the fair by farmers is insufficient to meet the consumer demand (MUNIOXAPAMPA, 2009b). Vendors are selling potatoes on the fair to satisfy the needs of consumers. Thus, the food system of Oxapampa is dependent on tubers being shipped in from outside sources.

Coffee is frequently consumed by the local consumers. However, a high amount of coffee is exported out of the food system Oxapampa. Besides, consumers are not necessarily consuming coffee originating from the surroundings of Oxapampa. Consumers also consume highly processed instant coffee from other origin. Coffee roasters are focused on the national

market and exportation. However, the local market could be an opportunity for farmers to sell directly to local consumers.

Results show that the composition of food products consumed is rather independent of food products produced in the food system Oxapampa and has to be linked to other factors. The pattern, of independency between food products produced and consumed, can be supported by another study, which point out the importance of education and access to markets for a high food biodiversity (Sibhatu & Qaim, 2018).

6.2. Implications for Food Sovereignty in the Food System Oxapampa

Agricultural production in the study area is organized in mosaics, small areas are focused on single crops or a highly limited number of crops. The fragmentation of agricultural land can be linked to an easier sale to intermediaries, which are specified on the purchase of a specific crop species. The fragmentation has negative effects on the agrobiodiversity, including across fields and on the landscape level. Low overall agrobiodiversity on the landscape level as well as the farm level harms food sovereignty (Chappell et al., 2013). Agrobiodiversity is an essential element that can sustain food sovereignty in the food system (Chappell et al., 2013). Due to limitation of agrobiodiversity in the field of farmers of the surroundings of Oxapampa, the supply of points of sale in Oxapampa with products from more distant areas is necessary for the population of Oxapampa to sustain diverse diets. However, further implications on the state of food sovereignty were made. The discussion on food sovereignty is structured in production, commercialization and consumption.

6.2.1. Consumption in the Food System of Oxapampa

In a food sovereign system, availability and accessibility of food should be given and maintained for people (Wittman, 2011). In the food system of Oxapampa, high diversity of food products sold at points of sale is securing the access for consumers to food products. Therefore, it is assumed that food security inside the system is present. However, the presence of a sovereign food system, in which a consumers should decide over their own food system, and may get involved in decision making processes (Akram-Lodhi, 2015), is questionable.

Food products in the food system Oxapampa seem to generally not be preferred over other food products, which come from more distant areas. According to other studies, origin of products has a minor effect on purchase decision and consumers' willingness to buy products (Karg et al., 2016). The low preference of food produced in the surroundings in Oxapampa could be also due to missing transparency at the points of sale of Oxapampa. No labelling is used, and salespersons also often do not have information about the origin of products they sell, which makes it difficult to identify the origin and quality of food products. Also other studies point out that no labelling was used in assessed food systems (Zhou et al., 2012). Findings also show that products are exchanged between the fair, markets and shops, therefore it is a challenge for consumers to trace products back to their origin. More transparency for consumers about origin, and farming practices used, is defined as a key issue to increase the willingness of consumers to pay more for a diverse range of crops produced by local farmers (Kahane et al., 2013).

Education is defined as a key factor for increase of diversity in diets of consumers (Koppmair et al., 2017). Educational programs can contribute to an increase of valuation and knowledge about locally produced food, and beneficial effects of high food biodiversity (Gitagia et al., 2019; KC et al., 2018). By increasing the valuation of locally produced food by consumers of the food system Oxapampa, a demand for farmers markets offering locally produced products could be created. Studies (Vallejo-Rojas et al., 2016) show that, the increase of appreciation of locally produced food can increase and stabilize income for farmers, by shortening value chains and reducing the dependence on volatile national or international markets. Besides, the

focus on locally produced products can contribute to regional development by keeping regional capital inside the region and giving new opportunities to farmers (Blay-Palmer et al., 2018; Sonnino et al., 2019). Thereby, agrobiodiversity could be increased by farmers in the food system Oxapampa, without a loss of income, and could contribute to biodiversity conservation in the biosphere reserve Oxapampa-Ashaninka-Yanesha.

6.2.2. Commercialization in the Food system of Oxapampa

Results show that commercialization of products is highly complex, and products are difficult to be traced back to their origin by consumers, if they are not directly bought from farmers at the fair. The exact origin of products supplied by intermediaries is mostly unknown. Lima and Tarma, which are most frequently mentioned as the place of origin of products sold in Oxapampa, are not necessarily places of production, but important trading points for the distribution of products to the region Pasco. Lima as the capital, and Tarma for its advantageous trading position situated between the Coast, Sierra and Selva, are used for redistribution of products (Gobierno Regional de Junín, 2015). The connection between rural and urban land in Oxapampa, is specially created by the sale of farmers at the fair directly to consumers. Studies argue (Vieira et al., 2018) that the dependency on products from more distant areas can have negative implications for the resilience of the food system. To ensure the supply of the local population in Oxapampa with a high variety of food products and maintain resilience of the food system, long-distance transports are needed.

Food sovereign systems should be based on a localized food system (Akram-Lodhi, 2015). However, in the literature is argued that this does not mean that the supply from more distant areas should stop. To increase resilience inside a food system a special focus should be put on the development of a local production which can supply the food system with basic needs in case of a crisis (Sonnino, 2013), but still is also supplied by the global market (Vieira et al., 2018). Results show that a high number of crops which are consumed on a daily basis are not produced inside the food system Oxapampa. Thus, if the access to products from more distant areas is not maintained, the production inside the food system of Oxapampa cannot secure the nutritional needs of its consumers.

The fair in Oxapampa connects farmers and consumers and contributes to the availability and accessibility of a wide range of food products to the population of Oxapampa. All residents use the fair as one of their main sources for food. Therefore food seems to be accessible independently from social disparity in Oxapampa, which is defined to be crucial to sustain food sovereignty in a food system (Wittman, 2011). The fair and all markets are implemented and administrated by the municipality from the top-down. Therefore, the municipality can be defined as the centre of the decision-making for distribution of food products in Oxapampa. However, studies (Akram-Lodhi, 2015) argue that a food sovereign system should be based on decision making by food consumers and providers.

6.2.3. Production in the Food System of Oxapampa

Agricultural land in the surroundings of Oxapampa, as mentioned before, is used for the production of a narrow range of cash crops. Studies (Mulvany, 2014) show that a low amount of agrobiodiversity has negative implications on the food sovereignty of a food system. A diverse multifunctional system is crucial for the development of a food sovereign farming system (Chappell et al., 2013). A low agrobiodiversity harms ecosystem services provided, as well as the health of the farming system (Chappell et al., 2013).

Pest management is challenged by the local circumstances of Oxapampa, due to the limited agrobiodiversity in the field. A higher agrobiodiversity in the field can contribute to a decreased need for the application of pesticides which can harm local biodiversity (Perfecto & Vandermeer, 2008). A study taking place in the district of Oxapampa, shows that cultivation of granadilla was particularly connected to the high use of chemical synthetic fertilizers and

pesticides (Romero Simón, 2019). In contrast agroforestry systems, such as coffee systems, are generally described in the literature as less intensive used agroecosystems, which are higher in agrobiodiversity compared to plantations (Beenhouwer et al., 2013). Therefore, it can be assumed that different agroecosystems, crops and management in the surroundings of Oxapampa has an influence on the field of farmers.

A reduced use of synthetic chemical fertilizer can improve the maintenance of biodiversity in agriculturally used land (Kahane et al., 2013; Perfecto & Vandermeer, 2008). To decrease the need to use synthetic chemical fertilizers and pesticides which harm biodiversity in the biosphere reserve park Oxapampa-Ashaninka-Yanesha, an increase of agrobiodiversity on the landscape level could contribute.

Findings of the study point more into the direction, that conservation of diversity by biosphere reserve management is, instead, happening separated from agriculturally used land, focusing on protected areas. In a sovereign system conservation should not happen separately, but integrated into the use of agricultural production (Wittman, 2011).

6.3. Methodological Limitations and Potential Biases

6.3.1. Sample Design

The realization of interviews was complicate by a low willingness of consumers to participate. This resulted in a rather low sample size of the consumer survey. Besides, especially women contacted in the school Peruano Suzio, were partly not originally from Oxapampa and differed in purchase habits to other women interviewed at Vaso de leche or the public school Reverendo Padre Bardo Bayerle. The difference in results about food products consumed and purchase habits can be related to a different association with social group and origin. To reduce the impact of social status, women of supposed different social status were interviewed.

The system boundary defined as a geographical frame for the study, was including a rather small area. The size of the system boundary was chosen, to make the study feasible for the given resources and time frame. At the market, farmers were interviewed about the products they sell at the fair and grow on their farm. Some farms of farmers interviewed were not situated inside the system boundary. These farmers were not included into the farmers survey as farmers cultivating and selling products inside the food system of Oxapampa, but as vendors. The importance for the food supply on the fair also from farmers from more distant areas, gives evidence, that farmers from slightly more distant areas also contribute to the supply of the food system of Oxapampa by sale on the fair. The farmers from more distant areas contribute to food biodiversity and provide additional products. Therefore, the definition and size of system boundary impacts and limits validity of the results obtained.

6.3.2. Method

Especially the food questionnaire used during consumers survey was not as effective as expected and therefore, an alternative questionnaire was developed. The change of the food questionnaire to a self-established questionnaire was related to several problems. The approaches applied to collect data with the self-established questionnaire made it difficult to compare fruits, vegetables, and tubers and cereals during data analysis. For Free Listing consumers had to remember the vegetables and fruits. For other product groups ranking was used, which did not require consumers to remember, instead, only to classify the products already listed. Therefore, a higher frequency of products already listed for ranking is assumed. To increase the validity of results for further studies a 24h food recall is suggested, which can also contribute to higher comparability of results with other studies focusing on dietary diversity.

Farmers were interviewed at their farms, as well as in the fair, while selling their products.

The interviews of farmers at the market and fair may have led to an increased representation of local sales by farmers in the farmers survey. However, farmers interviewed at the market stated that they also sell to intermediaries. Farmers interviewed at their farms mentioned that they sell their products on the fair as well as to intermediaries. This observation indicates that farmers interviewed at their farm as well as on the market sell to intermediaries and local markets, regardless of where the interview took place. Therefore, a minor impact on results by interviews of farmers also at the fair, can be assumed.

During interviews with farmers and consumers at points of sale about commercialization and production information about quantities of each food product sold or produced were not included into the survey. Therefore, no unambiguous statement can be made about the dependence of the food system of Oxapampa on more distant areas.

During interviews with farmers about products cultivated, it was observed that farmers often place emphasis on crops generating a large part of income, missing crops used for self-consumption or sale at the fair. To reduce the misleading effect on results, they were explicitly asked about crops produced which are not particularly used for sale. Still, it can be assumed, that the increased mentioning of cash crops leads to an alteration of results, increasing the mentioning of crops generating major income.

During farmers survey information about agrobiodiversity was obtained by interviews, no field inventories were applicated. To increase the validity of results about agrobiodiversity, transect walks would be suggested including an inventory of agrobiodiversity in the field. It can be assumed that the procedure chosen had impact on findings obtained, reducing representation of species less valued by farmers and not used for consumption.

7. Conclusion

Inside the food system of Oxapampa, there is a high potential to increase agrobiodiversity and thereby contribute to the conservation of biodiversity inside the agroecosystems. An increase of agrobiodiversity can reduce the need for the application of chemical synthetic fertilizers and pesticides and thereby also conserve biodiversity inside the fields. To encourage farmers to increase agrobiodiversity incentives are needed. Therefore, conditions should be established which enable farmers to sell a more diverse range of products to local consumers, without a severe additional investment of resources and loss of income. Educational programs should contribute to an improvement of farming practices that sustain agrobiodiversity. To secure the sale of diverse products by farmers' clients, which value locally produced fresh products and are aware of health benefits by a more diverse diet are needed. Transparency of production has to be sustained to enable consumers and salespersons to evaluate the quality of products available. Strategies to foster an increase of agrobiodiversity should be drafted to use the present potential to improve biodiversity conservation inside the Biosphere reserve Oxapampa- Ashaninka- Yanesha. This research contributed to a better understanding of the food system of Oxapampa and its processes affecting agrobiodiversity and food biodiversity.

In this study, the categories of commercialization, production, and food security and consumption of food sovereignty were analyzed based on a socio-ecological approach. To give further implications on food sovereignty in the food system of Oxapampa the categories of resources, gender, and agrarian policies should also be evaluated. A low amount of studies could be identified which focus on the evaluation of food sovereignty in a food system. To better understand the attributes of a food sovereign system further research is needed. This should enable to translate food sovereignty into reality, to get information on applicability and to identify leverage points, which contribute to establishment of more food sovereign food system.

8. References

- Aguilar-Delgado, P. (2014). *Análisis E Identificación De Otras Modalidades De Conservación "In Situ" En El Ámbito De La Reserva De Biosfera De Oxapampa- Complejo Yanachaga, Como Estrategia De Adaptación Al Cambio Climático: Reserva de Biosfera Oxapampa Ashaninka Yanesha*. GIZ.
- Akram-Lodhi, A. H. (Ed.) (2013). *How to Build Food Sovereignty*.
- Akram-Lodhi, A. H. (2015). Accelerating towards food sovereignty. *Third World Quarterly*, 36(3), 563–583.
- Algorithms & Data Structures Group, & Domestic Politics & Public Administration Group. (2011). *Visone* (Version 2.6.3.) [Computer software]. University of Konstanz. <http://visone.ethz.ch/html/about.html>
- Allen, T., & Prosperi, P. (2016). Modeling Sustainable Food Systems. *Environmental Management*, 57(5), 956–975.
- Allen, T., Prosperi, P., Cogill, B., & Flichman, G. (2014). Agricultural biodiversity, social-ecological systems and sustainable diets. *The Proceedings of the Nutrition Society*, 73(4), 498–508.
- Battersby, J. (2011). Urban food insecurity in Cape Town, South Africa: An alternative approach to food access. *Development Southern Africa*, 28(4), 545–561.
- Beenhouwer, M. de, Aerts, R., & Honnay, O. (2013). A global meta-analysis of the biodiversity and ecosystem service benefits of coffee and cacao agroforestry. *Agriculture, Ecosystems & Environment*, 175, 1–7.
- Bioversity International (Ed.). (2017). *Mainstreaming Agrobiodiversity in Sustainable food systems: Scientific Foundations for an Agrobiodiversity Index*. Bioversity International.
- Blay-Palmer, A., Santini, G., Dubbeling, M., Renting, H., Taguchi, M., & Giordano, T. (2018). Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability*, 10(5), 1680.
- Blay-Palmer, A., Sonnino, R [Roberta], & Custot, J. (2016). A food politics of the possible? Growing sustainable food systems through networks of knowledge. *Agriculture and Human Values*, 33(1), 27–43.
- Blekking, J., Tuholske, C., & Evans, T. (2017). Adaptive Governance and Market Heterogeneity: An Institutional Analysis of an Urban Food System in Sub-Saharan Africa. *Sustainability*, 9(12), 2191.
- Cade, J. E., Burley, V. J., Warm, D. L., Thompson, R. L., & Margetts, B. M. (2004). Food-frequency questionnaires: A review of their design, validation and utilisation. *Nutrition Research Reviews*, 17(1), 5–22.
- Calori, A., Dansero, E., Pettenati, G., & Toldo, A. (2017). Urban food planning in Italian cities: a comparative analysis of the cases of Milan and Turin. *Agroecology and Sustainable Food Systems*, 41(8), 1026–1046.
- Cambridge English Dictionary. (2020). <https://dictionary.cambridge.org/dictionary/english>
- Cantor, A. R., Chan, I., & Baines, K. (2018). From the Chacra to the Tienda : Dietary delocalization in the Peruvian Andes. *Food and Foodways*, 26(3), 198–222.
- Chappell, M. J., Wittman, H., Bacon, C. M., Ferguson, B. G., Barrios, L. G., Barrios, R. G., Jaffee, D., Lima, J., Méndez, V. E., Morales, H., Soto-Pinto, L., Vandermeer, J., & Perfecto, I. (2013). Food sovereignty: An alternative paradigm for poverty reduction and biodiversity conservation in Latin America. *F1000Research*, 2(235), 1-17.
- Cistulli, V., Prota, L., & Cucco, I. (2018). *Social network analysis for territorial assessment and mapping of Food Security and Nutrition Systems (FSNS): A methodological approach*. FAO.

- Crabtree, J. (2002). The impact of neo-liberal economics on peruvian peasant agriculture in the 1990s. *Journal of Peasant Studies*, 29(3-4), 131–161.
- Cunha, L. M., Cabral, D., Moura, A. P., & Almeida, M. D. V. de (2018). Application of the Food Choice Questionnaire across cultures: Systematic review of cross-cultural and single country studies. *Food Quality and Preference*, 64, 21–36.
- Cunningham, & A. (2001). *Applied Ethnobotany: People, Wild Plant Use and Conservation*. Earthscan Publication.
- Dubbeling, M., Santini, G., Renting, H., Taguchi, M., Lançon, L., Zuluaga, J., Paoli, L. de, Rodriguez, A., & Andino, V. (2017). Assessing and Planning Sustainable City Region Food Systems: Insights from Two Latin American Cities. *Sustainability*, 9(8), 1455.
- Ericksen, P. (2008). Conceptualizing food system for global environmental change research. *Global Environmental Change*(18), 234–245.
- FAO. (2018). *Dietary Assessment: A resource guide to method selection and application in low resource settings*.
- Fernandez, M., & Méndez, V. E. (2019). Subsistence under the canopy: Agrobiodiversity's contributions to food and nutrition security amongst coffee communities in Chiapas, Mexico. *Agroecology and Sustainable Food Systems*, 43(5), 579–601.
- Forster, T., Santini, G., Edwards, D., & Katie, Flanagan, Taguchi, Makiko (2015). Strengthening Urban Rural Linkages through City Region Food System. *Regional Development Dialogue*(35), 1–19.
- García-Sempere, A., Hidalgo, M., Morales, H., Ferguson, B. G., Nazar-Beutelspacher, A., & Rosset, P. (2018). Urban transition toward food sovereignty. *Globalizations*, 15(3), 390–406.
- García-Sempere, A., Morales, H., Hidalgo, M., Ferguson, B. G., Rosset, P., & Nazar-Beutelspacher, A. (2019). Food Sovereignty in the city? A methodological proposal for evaluating food sovereignty in urban settings. *Agroecology and Sustainable Food Systems*, 64(2), 1–29.
- Gibson, R. (2005). *Principles of Nutritional Assessment* (2. edition). Oxford University Press.
- Gitagia, M. W., Ramkat, R. C., Mituki, D. M., Termote, C., Covic, N., & Cheserek, M. J. (2019). Determinants of dietary diversity among women of reproductive age in two different agro-ecological zones of Rongai Sub-County, Nakuru, Kenya. *Food & Nutrition Research*, 63(1553), 1–12.
- Gobierno Regional de Junín. (2015). *Memoria descriptiva del estudio económico del departamento de Junín*.
- Hallie, E., John, P. C., Christopher, W., Farryl Bertmann, Angela Xiong, & Jared Stoltzfus (2017). Identifying attributes of food system sustainability: emerging themes and consensus. *Agriculture Human Values*(34), 757–773.
- Hanneman, R., & Riddle, M. (2011). A Brief Introduction to Analyzing Social Network Data. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis*. SAGE.
- Herrmann, F. (2018). *Datenorganisation und Datenbanken*. Springer Fachmedien Wiesbaden. <https://doi.org/10.1007/978-3-658-21331-2>
- IBM Deutschland GMBH. (2019). *SPSS* (Version 26) [Computer software]. <https://www.ibm.com>
- International Institute of Social studies (Ed.). (2014). *Food Sovereignty: A Critical Dialogue*.
- Jacobsen, S.-E., Sørensen, M., Pedersen, S. M., & Weiner, J. (2013). Feeding the world: genetically modified crops versus agricultural biodiversity. *Agronomy for Sustainable Development*, 33(4), 651–662.
- Jones, A. D., Creed-Kanashiro, H., Zimmerer, K. S., Haan, S. de, Carrasco, M., Meza, K., Cruz-Garcia, G. S., Tello, M., Plasencia Amaya, F., Marin, R. M., & Ganoza, L. (2018).

- Farm-Level Agricultural Biodiversity in the Peruvian Andes Is Associated with Greater Odds of Women Achieving a Minimally Diverse and Micronutrient Adequate Diet. *The Journal of Nutrition*, 148(10), 1625–1637.
- Kahane, R., Hodgkin, T., Jaenicke, H., Hoogendoorn, C., Hermann, M., Keatinge, J. D. H., d'Arros Hughes, J., Padulosi, S., & Looney, N. (2013). Agrobiodiversity for food security, health and income. *Agronomy for Sustainable Development*, 33(4), 671–693.
- Karg, H., Drechsel, P., Akoto-Danso, E., Glaser, R., Nyarko, G., & Buerkert, A. (2016). Foodsheds and City Region Food Systems in Two West African Cities. *Sustainability*, 8(12), 1175.
- KC, K. B., Legwegoh, A. F., Therien, A., Fraser, E. D.G., & Antwi-Agyei, P. (2018). Food Price, Food Security and Dietary Diversity: A Comparative Study of Urban Cameroon and Ghana. *Journal of International Development*, 30(1), 42–60.
- Kirchhoff, S. (2010). *Der Fragebogen: Datenbasis, Konstruktion und Auswertung* (5. Aufl.). VS-Verl. <http://dx.doi.org/10.1007/978-3-531-92050-4> <https://doi.org/10.1007/978-3-531-92050-4>
- Köck, G., & Grabherr, G. (2014). 40 years of the UNESCO Man and the Biosphere Programm in Austria: a success story of ecologic basic research evolving into a flagship of transdisciplinarity. *Management and Policy Issue*(6 (1)), 57–62.
- Koppmair, S., Kassie, M., & Qaim, M. (2017). Farm production, market access and dietary diversity in Malawi. *Public Health Nutrition*, 20(2), 325–335.
- Lerner, A., & Eaking, H. (2011). An obsolete dichotomy? Rethinking the rural-urban interface in terms of food security and production in the global south. *The Geographical Journal*, 177(4), 311–320.
- Luckett, B. G., DeClerck, F. A. J., Fanzo, J., Mundorf, A. R., & Rose, D. (2015). Application of the Nutrition Functional Diversity indicator to assess food system contributions to dietary diversity and sustainable diets of Malawian households. *Public Health Nutrition*, 18(13), 2479–2487.
- Marin, A., & Wellman, B. (2011). Social Network Analysis: An Introduction. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis*. SAGE.
- Marsden, P. (2011). Survey Methods for Network Data. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis* (pp. 370–388). SAGE.
- Microsoft Coporation. (2016). *Microsoft Access* (Version Office 16) [Computer software]. <https://www.microsoft.com/de-at/>
- Ministerio de Agricultura y Riego(MINAGRI). (2019). *Observatorio de Commodities: Arroz*.
- Ministerio de Agricultura y Riego(MINAGRI). (2020). *Perfil ambiental del Perú: Ubicación y área*. <http://minagri.gob.pe/portal/datero/60-sector-agrario/introduccion/343-perfil-ambiental-del-peru>
- Ministerio de Cultura(MINCUL). (2011). *Peru: Atlas de Infraestructure y patrimonio cultural de las américas*. http://www.infoartes.pe/wp-content/uploads/2011/12/atlas_pe.pdf
- Ministerio de Economía y Finanzas(MEF). (2020, March 22). *Política Económica y Social: Programa de Vaso de Leche*. <https://www.mef.gob.pe/es/politica-economica-y-social-sp-2822/243-transferencias-de-programas/393-programa-de-vaso-de-leche>
- Ministerio del Ambiente(MINAM). (2014). *Estrategia Nacional de Diversidad Biologica: Al 2012 y su plan de Accion 2014-2018*.
- Moragues-Faus, A., & Carroll, B. (2018). Reshaping urban political ecologies: an analysis of policy trajectories to deliver food security. *Food Security*, 10(6), 1337–1351.
- Morgan, K., & Sonnino, R [R.] (2010). The urban foodscape: world cities and the new food equation. *Cambridge Journal of Regions, Economy and Society*, 3(2), 209–224.

- Mulvany, P. (2014). Agricultural Biodiversity, Ecological Food Provision Food Sovereignty: vital interdependencies. In International Institute of Social studies (Ed.), *Food Sovereignty: A Critical Dialogue*.
- Municipalidad Provincial de Oxapampa(MUNIOXAPAMPA). (2009a). *Plan Desarrollo Concertado de la Provincia de Oxapampa 2009 -2021*.
- Municipalidad Provincial de Oxapampa(MUNIOXAPAMPA). (2009b). *Plan Desarrollo Concertado del Distrito de Oxapampa 2009 -2021*. Oxapampa.
- Newing, H., & Eagle, C. M. (2011). *Conducting research in conservation: Social science methods and practice*. Routledge.
- Ntandou-Bouzito, G. D., & Bellon, M. (2016). On-farm diversity and market participation are positively associated with dietary diversity of rural mothers in southern Benin, West Africa. *PloS One*, 11(9), 1–20.
- Ntwenya, J. E., Kinabo, J., Msuya, J., Mamiro, P., Mamiro, D., Njoghomi, E., Liwei, P., & Huang, M. (2017). Rich Food Biodiversity Amid Low Consumption of Food Items in Kilosa District, Tanzania. *Food and Nutrition Bulletin*, 38(4), 501–511.
- Nyeleni (2007). Forum for Food Food Sovereignty: Forum for Food Food Sovereignty.
- Ortega-Cerdá, M., & Rivera-Ferre, M. G. (2010). Indicadores internacionales de Soberanía Alimentaria.: Nueva herramientas para una nueva agricultura. *Revista Iberoamericana De Economía Ecológica*(14), 53–77.
- Partalidou, M. (2015). Food Miles and Future Scenario for Local Food Systems: An Exploratory Study in Greece. *Outlook on Agriculture*, 44(2), 151–157.
- Pautasso, M., Aistara, G., Barnaud, A., Caillon, S., Clouvel, P., Coomes, O. T., Delêtre, M., Demeulenaere, E., Santis, P. de, Döring, T., Eloy, L., Emperaire, L., Garine, E., Goldringer, I., Jarvis, D., Joly, H. I., Leclerc, C., Louafi, S., Martin, P., . . . Tramontini, S. (2013). Seed exchange networks for agrobiodiversity conservation. A review. *Agronomy for Sustainable Development*, 33(1), 151–175.
- Pereira, H., Navarro, L., & Martins, I. (2012). Global Biodiversity Change: The Bad, the Good, and the Unknown. *Annual Review of Environment and Resources*, 37(1), 25–50.
- Perfecto, I., & Vandermeer, J. (2008). Biodiversity conservation in tropical agroecosystems: A new conservation paradigm. *Annals of the New York Academy of Sciences*(1134), 173–200.
- Peruano Suizo. (2020). *Información sobre Peruano Suizo*. <http://www.peruanosuizo.org/>
- Pool-Stanvliet, R., & Coetzer, K. (2020). The scientific value of UNESCO biosphere reserves. *South African Journal of Science*, 116(1/2).
- Poti, J. M., Mendez, M. A., Ng, S. W., & Popkin, B. M. (2015). Is the degree of food processing and convenience linked with the nutritional quality of foods purchased by US households? *The American Journal of Clinical Nutrition*, 101(6), 1251–1262.
- Powell, B., Thilsted, S. H., Ickowitz, A., Termote, C., Sunderland, T., & Herforth, A. (2015). Improving diets with wild and cultivated biodiversity from across the landscape. *Food Security*, 7(3), 535–554.
- Reed, M. G. (2016). Conservation (In)Action: Renewing the Relevance of UNESCO Biosphere Reserves. *Conservation Letters*, 9(6), 448–456.
- Ritchie, J., Lewis, J., & Elam, G. (2012). 4 Designing and Selecting Samples. In J. Ritchie & J. Lewis (Eds.), *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. SAGE Publications.
- Roe, M., Sarlöv Herlin, I., & Speak, S. (2016). Identity, food and landscape character in the urban context. *Landscape Research*, 41(7), 757–772.

- Romero Simón, E. M. (2019). *Sostenibilidad de la agricultura familiar: el caso del cultivo de granadilla (Passiflora ligularis Juss) en la provincia de Oxapampa, Pasco, Peru* [Dissertation]. Universidad Nacional Agraria La Molina, Lima.
- Ruel, M. T., & Alderman, H. (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*, 382(9891), 536–551.
- Ruiz-Almeida, A., & Rivera-Ferre, M. G. (2019). Internationally-based indicators to measure Agri-food systems sustainability using food sovereignty as a conceptual framework. *Food Security*, 11(6), 1321–1337.
- Scott, J., & Carrington, P. J. (Eds.). (2011). *The SAGE handbook of social network analysis*. SAGE.
- Servicio Nacional de Areas Naturales Protegidas por el Estado(SERNANP). (2014). *Plan de accion de la reserva de biosfera oxapampa ashaninka Yanesha 2015-2021*. <http://www.munioxapampa.com/doc/doc1.pdf>
- Sibhatu, K. T., & Qaim, M. (2018). Review: Meta-analysis of the association between production diversity, diets, and nutrition in smallholder farm households. *Food Policy*, 77, 1–18.
- Sonnino, R [Roberta] (2013). Local foodscapes: place and power in the agri-food system. *Acta Agriculturae Scandinavica, Section B - Soil & Plant Science*, 63(sup1), 2–7.
- Sonnino, R [Roberta] (2016). The new geography of food security: exploring the potential of urban food strategies. *The Geographical Journal*, 182(2), 190–200.
- Sonnino, R [Roberta], Tegoni, C. L.S., & Cunto, A. de (2019). The challenge of systemic food change: Insights from cities. *Cities*, 85, 110–116.
- Stegbauer, C. (2008). *Netzwerkanalyse und Netzwerktheorie: Ein neues Paradigma in den Sozialwissenschaften*. VS Verl. für Sozialwiss.
- Tovar Narváez, A., Tovar Ingar, C., Saito Díaz, J., Soto Hurtado, A., Regal Gastelumendi, F., Zoila, Cruz Burga, C., Véliz, R., Vásquez Ruesta, P., & Rivera Campos, G. (2010). Yungas Peruanas- Bosques montanos de la vertiente oriental de los Andes del Peru:: Una perspectiva ecorregional de conservación. *UNALM - Universidad Nacional Agraria La Molina*.
- United Nations Educational, Scientific and Cultural Organisation(UNESCO). (1996). *Biosphere reserves: the Seville Strategy and the statutory framework of the world network*.
- United Nations Educational, Scientific and Cultural Organisation(UNESCO). (2016). *Oxapampa-Ashaninka-Yanesha*. <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/latin-america-and-the-caribbean/peru/oxapampa-ashaninka-yanesha/>
- United Nations Educational, Scientific and Cultural Organisation(UNESCO) (2017). A New roadmap for the Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves; 2017: MAB Strategy (2015-2025); Lima Action Plan (2016-2025), Lima Declaration.
- United Nations Educational, Scientific and Cultural Organisation(UNESCO). (2018). *Latin America and the Caribbean*. UNESCO. <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/latin-america-and-the-caribbean/>
- Vaarst, M., Escudero, A. G., Chappell, M. J., Brinkley, C., Nijbroek, R., Arraes, N. A.M., Andreasen, L., Gattinger, A., Almeida, G. F. de, Bossio, D., & Halberg, N. (2018). Exploring the concept of agroecological food systems in a city-region context. *Agroecology and Sustainable Food Systems*, 42(6), 686–711.

- Vallejo-Rojas, V., Ravera, F., & Rivera-Ferre, M. G. (2016). Developing an integrated framework to assess agri-food systems and its application in the Ecuadorian Andes. *Regional Environmental Change*, 16(8), 2171–2185.
- Vasile, M., & Duncan, J. (2017). 'We want to be part of the broader project' Family Farmers and Local Food Governance in Porto Alegre, Brazil. *Built Environment*, 12(43(3)), 390–401.
- Vieira, L. C., Serrao-Neumann, S., Howes, M., & Mackey, B. (2018). Unpacking components of sustainable and resilient urban food systems. *Journal of Cleaner Production*, 200, 318–330.
- Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods and Applications*. Cambridge University Press.
- Wegerif, M. C. A., & Wiskerke, J. S. C. (2017). Exploring the Staple Foodscape of Dar es Salaam. *Sustainability*, 9(6), 1081.
- Wittman, H. (2011). Food Sovereignty: A New Rights Framework for Food and Nature? *Environment and Society: Advances in Research*, 2(1), 87–105.
- Wittman, H., Desmarais, A., & Wiebe, N. (2010). The Origins and Potential of Food Sovereignty. In H. Wittman, A. Desmarais, & N. Wiebe (Eds.), *Food Sovereignty - Reconnecting Food, Nature and Community*. Food First.
- Zhou, D., Matsuda, H., Hara, Y., & Takeuchi, K. (2012). Potential and observed food flows in a Chinese city: a case study of Tianjin. *Agriculture and Human Values*, 29(4), 481–492.
- Zimmerer, K. S., Haan, S. de, Jones, A. D., Creed-Kanashiro, H., Tello, M., Carrasco, M., Meza, K., Plasencia Amaya, F., Cruz-Garcia, G. S., Tubbeh, R., & Jiménez Olivencia, Y. (2019). The biodiversity of food and agriculture (Agrobiodiversity) in the anthropocene: Research advances and conceptual framework. *Anthropocene*, 25(100192), 2213–3054.

9. Figures

- Figure 1 - Food Sovereignty: Categories and attributes (in grey) for the analysis of a food system on the international level. (Ortega-Cerdá & Rivera-Ferre, 2010; Ruiz-Almeida & Rivera-Ferre, 2019).11
- Figure 2 - Extension and zones of the biosphere reserve Oxapampa-Ashaninka-Yanesha (BIOAY) (UNESCO, 2018).....22
- Figure 3 – Food System of Oxapampa: This map shows the urban area of Oxapampa (marked in purple) and the extension of the rural area inside the food system (marked in orange). The yellow dot in the middle symbolizes the city center of Oxapampa (main square) (openstreetmap.com edited by Eva Arhar)26
- Figure 4 - Data Collection: an interview with women in the office of Vaso de Leche28
- Figure 5 – Menus of Restaurants: the daily menu of restaurateurs for lunch is presented on blackboards in front of the restaurants to attract consumers. This menu always includes a starter, a main dish, and a beverage.....30
- Figure 6 – A market booth: a salesperson selling predominately fruits in a market booth situated in the Mercado Alameda.36
- Figure 7 – At the Fair: farmers and vendors are selling their products at the fair36
- Figure 8 – Composition of Sample: The composition of all participants at surveys and interviews during data collection in Oxapampa and surrounding (n=167, 100%=n among all persons interviewed)37
- Figure 9 – Position of Booths of Interviewed Salespersons: salespersons were interviewed in different markets, shops and the fair. The decision for the share of interview

partners was based on the results of the purchase habits of consumers (n=58; n=58=100% among all salespersons interviewed).	40
Figure 10 – Size of Farms: distribution of the size of production units in the farms inside the system boundary of Oxapampa (n=58, N=58=100% among all farmers interviewed)	41
Figure 11 – Position of Farms: location of farmers farms interviewed (n=58; n=58=100% =n among all farmers interviewed)	41
Figure 12 – Origin of Food Products consumed: the most important sites for consumers for purchasing food are shown (n=32, n=100% among consumers interviewed). Dark grey bars show the frequency of visits to each site and do not refer to the number of products purchased (n=32, n=100% among consumers interviewed). Light grey bars show the arithmetic mean percentage of the share of all food purchased by respondents (n=32, n=32=100% among all interview partners, multiple answers possible).....	43
Figure 13 – Vegetables and Fruits consumed: the most frequently mentioned fruits and vegetables by respondents (n=32, n=32=100% among all interview partners , multiple answers possible). All fruits and vegetables included into the Figure were mentioned by more than 10 percent of interviewees.	44
Figure 14 - Cereals, Tubers and Animal Products consumed: cereals, tubers, and animal products are frequently consumed by the consumers interviewed (n=32). The frequency of consumption is ranked as followed: 4=every day or every other day, 3=sometimes, 2=rarely, 1=never.....	44
Figure 16 – Social Network Analysis of local Consumption: each consumer-node represents one of the 32 interviewed consumers. The social network contains 38 actors (32 consumers plus 6 points of sale) and 99 ties connecting the actors included. The size of the nodes represents the centrality. The transfer of products between points of sale is shown with thicker directed ties. The ties illustrate a higher amount of transfer from products from one point of sale to another compared to transfer from points of sale to consumers.....	45
Figure 17 – Local Gastronomy: main ingredients used by more than one restaurateur for food preparation (n=10, n=10=100%=n among all interview partners, multiple answers possible)	46
Figure 18 - Origin of Food Products sold: blue bars represent the salesperson and therefore the origin of products from all persons interviewed at the fair, the markets, and shops (n=60, n=60=100%=n among all salespersons interviewed, multiple answers possible). Light grey bars show the farmers (n=24, n=24=100%=n among all farmers interviewed; multiple answers possible) and dark grey ones the vendors (n=36, n=36=100%=n among all vendors interviewed, multiple answers possible).	47
Figure 19 – Supply of Food Products: salespersons resell products bought from intermediaries, wholesale markets, the local fair, farmers, or food processors. Salespersons also produce their food to sell the products at the local fair (n=60, n=60=100%=n among all interviewed salespersons, multiple answers possible).	48
Figure 20 – Food Products Sold: products most often included in the assortment offered by salespersons (n=60; n=60=100%=n among all salespersons interviewed, multiple answers possible).....	48
Figure 21 – Commercialization of Food Products: farmers use seven different ways to sell their products. The fair as a market accessible for farmers plays a key role in food sales. Intermediaries are especially used if food has to be sold in big quantities.	

Food processors are especially relevant for farmers for the sale of animal products (n=58; n=58=100%=n among all farmers interviewed, multiple answers possible).....49

Figure 22 – Food Products produced: all food products produced by more than one farmer (n=58; n=58=100% among all farmers interviewed, multiple answers possible)50

Figure 23 – Social Network Analysis of Food Production: each node in grey represents one of the 58 interviewed farmers. The social network contains 64 actors (58 farmers plus 6 points of sale) and 102 ties between the actors involved. The size of the nodes represents the centrality. Thicker ties represent an increased transfer of products between points of sale.51

Figure 24 – Social network of the local food system of Oxapampa: each node represents one of the actors interviewed during data collection. The social network contains 109 actors (58 farmers, 10 restaurateurs, 32 consumers, and 7 points of sale) and 208 ties connecting the actors involved. The size of circles represents the centrality of a node. Thicker ties represent an increased exchange of products between points of sale.54

10. Tables

Table 1 - Analyses of food systems: this table gives an overview of identified studies focusing on food system analysis. Studies are made all over the globe and strongly focused on the connection between rural and urban areas.16

Table 2 - Research of scientific literature and keywords.20

Table 3 – Local production: this table shows the extension of the most frequently cultivated crops in the area of Oxapampa district, as well as the regional allocation if specified (MUNIOXAPAMPA, 2009b).23

Table 4 – Definitions of Actors: definition of different groups of persons included into the survey inside the food system Oxapampa24

Table 5 – Definition of sites: definition of sites visited during data collection to gather information about the food system Oxapampa of actors included in the survey25

Table 6 - Method Design: Actors along the agri-food chain were interviewed during data collection. Each step on the value chain is assessed by a certain method. The consumption habits of the consumers will lead to the merchants and interest of interest and so on until the farmers, which are supplying the consumers with their products are described.27

Table 7 - Sample size of Actors: the total number of interviewees of each group participating in survey. The sample size equates 100%.37

Table 8 - Sample Description of Consumer survey: sociodemographic data including age, education, and profession of consumers interviewed.....38

Table 9 - Sample Description of Consumer survey: survey data related to household and food preparation38

Table 10 - Sample Description of Restaurateur Survey: sociodemographic data of restaurateur including age, sex, education, and origin39

Table 11 - Sample Description of Salesperson Survey: sociodemographic data including age, sex, profession, origin, and education of participants.....39

Table 12 - Sample description of Farmer Survey: sociodemographic data of farmers including age, sex, education, and origin	40
Table 13 – Transfer of Food products: the twenty most mentioned vegetables and fruits are represented, which are consumed, used in restaurants, sold and produced by farmers. They are transferred along the value chain from one actor to another.	53

11. Appendix

11.1. Food questionnaire

Cuestionario de alimentación

Geolocalización: _____

Edad: _____

Origen: _____

Genero: _____

Profesión: _____

Educación: _____

Miembros de familia: _____

Gastos del hogar _____ (por día)

Responsabilidad parar las compras: _____

Comidas/día - _____

Comer afuera - _____/semana

- **Atracción sensorial:** huele, sabe y se ve bien
- **Salud:** saludable
- **Ingredientes naturales:** sin conservantes y ingredientes sintéticos
- **Conveniente:** simple para adquirir y para cocinar
- **Humor:** me hace sentir bien, me ayuda manejar el estrés, me relaja,
- **Familiaridad:** lo como normalmente, tengo la costumbre
- **Control de peso:** bajo en calorías
- **Cuestión ética:** conciencia ambiental, proviene de la región
- **Precio:** los costos para adquirir el producto

Numero del cuestionario: _____

Donde obtienes la mayoría de tus productos:

_____ % mercado

_____ % ferias

_____ % supermercado

_____ % tiendas

_____ % procesador

_____ % amigos

_____ % producción propia

Verduras	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
aceitunas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ajo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
alcachofa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
apio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
berenjena	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
beterraga	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
brócoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cebolla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
coliflor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
esparrago	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pepino	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pimentón	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tomate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
zanahoria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
acelga	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Verduras	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
caigua	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
calabaza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lechuga	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maíz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maíz morado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
napo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
rabanito	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
zapallito italiano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
zapallo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lentejas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
rabanito	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ají	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Frutas	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
albaricoque	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
arándano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cacao	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
chirimoya	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ciruela	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dátil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
durazno	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
fresa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
granadilla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lucma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
manzana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maracuyá	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
plátano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
aguaymanto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Frutas	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
cocona	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
frambuesa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
higo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
carambola	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
kiwi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lima	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
limón	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mandarina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
melón	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
papaya	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pepino	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
quito quito	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tuña	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
uva	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
guaná-bana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pacay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

palta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
naranja	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cereales	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
arroz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cebada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
chía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
girasol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
linaza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maíz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
quinua	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
trigo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
kiwicha	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
kañiwa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maka	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

bebidas	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
cacao	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
gaseosas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
café	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Endulcantes	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
azúcar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
miel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
chancaca	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Productos de animales	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
leche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
yogurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mantequilla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
queso	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
crema de leche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

queso fresco	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
crema de queso	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
huevo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pollo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pescado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
carne de res	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
carne de cerdo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
carne de cuy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tuberculos	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveniencia	humor	Control de peso	Cuestión ética	Familiaridad	precio
papa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
camote	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
olluco	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
oca	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maka	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
yuca	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pituca	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hierbas especies	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveniencia	humor	Control de peso	Cuestión ética	Familiaridad	precio
albacá	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
clavo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
canela	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cardamomo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
comino	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cúrcuma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
moscada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hierbas especies	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveniencia	humor	Control de peso	Cuestión ética	Familiaridad	precio
mostaza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
culantro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
orégano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
perejil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pimienta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
romero	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
manzanilla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
hierba luisa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

melisa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
coca	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
menta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
muña	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
nueces	diario	3-4 por sema	1-2 por sema	1-3 por mes	Menos 1 por mes	Atracción sensorial	salud	Contenido nutricional	Conveni encia	humor	Control de peso	Cuestión ética	Familiari dad	precio
maní	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
nogal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
avellana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pecana	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
nueces de Brasil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cashew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
almendras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.2. Consumer questionnaire

Cuestionarios consumidores

numero: _____

Ubicación: _____

Miembros de familia _____

Edad: _____

Responsabilidad de compras _____

Origen: _____

Comer afuera _____/semana

Genero: _____

Profesión: _____

1. **VERDURAS:** ¿Cuáles son las 9 verduras que comes y compras con más frecuencia?

1.	4.	7.
2.	5.	8.
3.	6.	9.

2. **FRUTAS:** ¿Cuáles son las 9 frutas que comes y compras con más frecuencia?

1.	4.	7.
2.	5.	8.
3.	6.	9.

3. **CEREALES y TUBERCULOS:** ¿Cuáles son los cereales, tubérculos y legumbres que comes y compras con más frecuencia de esta lista?

3=diario o inter diario, 2= a veces, 1=casi nunca, 0=nunca

Pituca	Camote	Arroz	Legumbres
Yuca	Maíz	Quinoa	Cebada
Papa	Olluco	Trigo	Racacha

¿Hay algo que no es parte de esa lista?

4. **CARNE:** ¿Cuáles son las carnes que consumes con más frecuencia de esta lista?

3=diario o inter diario, 2= a veces, 1=casi nunca, 0=nunca

Pollo	Pescado	Cerdo
Res	Gallina	Cuy

¿Hay algo que no es parte de esa lista?

5. CAFE: ¿Cuántas veces a la semana tomas café?

3=diario o inter diario

2 =a veces

1= casi nunca

0=nunca

¿Qué marca de café compras?

6. PRODUCTOS LACTEOS ¿Cuántas veces a la semana comes productos lácteos?

3=diario o inter diario

2 =a veces

1= casi nunca

0=nunca

¿Qué marca de los productos lácteos compras?

7. COSTUMBRE ¿Dónde compras la mayoría de tus productos?

(X=siempre y más cantidad; x=menos seguido y cantidad; 0=nunca)

	Verduras	Frutas	Carnes	Cereales y Tubérculos	Café	Productos Lácteos
Tienda						
Feria						
Mercado						
Campesino						
Producción propia						

Porque motivos vas a la....

	Tienda	Feria	Mercado	Campesino	Producción Propia	Restaurante
Precio						
Calidad						
Cercanía						
Ocasiones especiales						
Costumbre						

11.3. Restaurateur questionnaire

Cuestionario para Gastronomía:

Numero de Cuestionare: _____

Geolocalización: _____ Nivel de estudios _____

Edad _____ Formal/informal _____

Genero _____ Categoría de restaurante _____

Profesión _____ Margen de precios de los platos _____

Lista de platos

¿Qué son los 10 ingredientes principales para tu cocina?

¿Dónde adquieres tus productos?

Productos principales	Origen

¿De qué productores o proveedores provienen tus productos?

- | | | |
|------------------------------------|---|--|
| <input type="checkbox"/> Campesino | <input type="checkbox"/> Intermediario | <input type="checkbox"/> Producción propia |
| <input type="checkbox"/> Productor | <input type="checkbox"/> Vendedor mayorista | <input type="checkbox"/> Mercado local |

¿De Dónde provienen tus productos?

- | | | |
|-----------------------------------|--------------------------------|---------------------------------|
| <input type="checkbox"/> Oxapampa | <input type="checkbox"/> Lima | <input type="checkbox"/> Selva |
| <input type="checkbox"/> Tarma | <input type="checkbox"/> Selva | <input type="checkbox"/> Sierra |

¿Por qué prefieres este proveedor?

- | | | |
|-----------------------------------|------------------------------------|-----------------------------------|
| <input type="checkbox"/> Precio | <input type="checkbox"/> Costumbre | <input type="checkbox"/> Calidad |
| <input type="checkbox"/> Cercanía | <input type="checkbox"/> Amistad | <input type="checkbox"/> Variedad |

¿Qué factores influyen en la elección de los platos del menú y la carta?

- | | | |
|---|--|--|
| <input type="checkbox"/> Costumbre | <input type="checkbox"/> Salud | <input type="checkbox"/> Disponibilidad de productos |
| <input type="checkbox"/> Tradición | <input type="checkbox"/> Precio | <input type="checkbox"/> Demanda de consumidores |
| <input type="checkbox"/> Facilidad de preparación | <input type="checkbox"/> Satisfacción del consumidor | |

¿Qué dificultades tienes para adquirir tus productos para preparar los platos?

- | | |
|---|---|
| <input type="checkbox"/> Acceso a lugar de compra | <input type="checkbox"/> Precios altos |
| <input type="checkbox"/> Acceso a variedad productos | <input type="checkbox"/> Falta de capital |
| <input type="checkbox"/> Acceso de productos de calidad | |

11.4. Salespersons questionnaire

Cuestionario para vendedores

Numero de Cuestionario: _____

Geocalización: _____ Posición del negocio _____

Edad: _____ Categorías de alimentos _____

Género: _____ Diferencias estacionales de trabajo _____

Profesión: _____ Frecuencia de venta _____

Nivel de estudios _____ Formal/informal _____

Lista de alimentos

Ingredientes	Origen

¿Qué productos ofreces en las diferentes temporadas?

enero	febrero	marzo	abril	mayo	junio
julio	agosto	septiembre	octubre	noviembre	diciembre

*¿De dónde compras tus productos?

- ☐ Campesino
 ☐ Intermediario
 ☐ Producción propia
☐ Productor de alimentos
 ☐ Vendedor mayorista

*¿De qué lugar provienen tus ingredientes?

- ☐ Oxapampa
 ☐ Lima
 ☐ Sierra
☐ Tarma
 ☐ Selva
 ☐ Costa

*¿Por qué prefieres esta estrategia para vender tus productos?

- ☐ Precio
 ☐ Costumbre
 ☐ Calidad
☐ Cercanía
 ☐ Amistad
 ☐ Variedad

¿Qué dificultades tienes para vender tus productos?

- ☐ Calidad de los productos
 ☐ Poca demanda
 ☐ Otras responsabilidades
☐ Fluctuaciones de precios
 ☐ Competencia
 ☐ _____
☐ Poca variedad de productos
 ☐ Sin puesto de venta fijo

***¿Que dificultades tienes para adquirir tus productos?**

- | | | |
|--|---|--|
| <input type="checkbox"/> Acceso a lugar de compra | <input type="checkbox"/> Competencia | <input type="checkbox"/> Falta de capital |
| <input type="checkbox"/> Acceso a variedad productos | <input type="checkbox"/> Fluctuaciones de precios | <input type="checkbox"/> Falta de mercados |
| <input type="checkbox"/> Acceso a productos de calidad | <input type="checkbox"/> Precios altos | |

11.5. Farmers questionnaire**Cuestionario para agricultores**

Numero de Cuestionario: _____

Geolocalización _____ Nivel de estudios _____

Edad _____ Tipo de finca _____

Genero _____ Tamaño de chacra _____

Profesión _____ Número de trabajadores _____

1.) ¿Los productos encontrados durante la visita de la finca?**2.) ¿Qué productos produces en las diferentes temporadas?****3.) ¿Qué cultivos cultivaron en el año pasado?**

enero	febrero	marzo	abril	mayo	junio
julio	agosto	septiembre	octubre	noviembre	diciembre

4.) ¿Qué especies de animales crias?

- | | | |
|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> Pollos | <input type="checkbox"/> Patos | <input type="checkbox"/> Cerdos |
| <input type="checkbox"/> Vacas | <input type="checkbox"/> Ovejas | <input type="checkbox"/> Cuy |

5.) ¿Cuáles son los usos de tus productos?

- | | | |
|---------------------------------------|---------------------------------------|-----------------------------------|
| <input type="checkbox"/> Subsistencia | <input type="checkbox"/> Artesanía | <input type="checkbox"/> Leña |
| <input type="checkbox"/> Venta | <input type="checkbox"/> Construcción | <input type="checkbox"/> Medicina |

6.) ¿Cómo comercializas tus productos alimentarios?

- | | | |
|--|--|---------------------------------------|
| <input type="checkbox"/> Exportación | <input type="checkbox"/> Consumidor | <input type="checkbox"/> Subsistencia |
| <input type="checkbox"/> Mercado local | <input type="checkbox"/> Intermediario | <input type="checkbox"/> Productor |

7.) ¿Cuáles son las dificultades para la venta de tus productos?

- | | | |
|---|---|--|
| <input type="checkbox"/> Calidad de los productos | <input type="checkbox"/> Poca demanda | <input type="checkbox"/> Otras responsabilidades |
| <input type="checkbox"/> Fluctuaciones de precios | <input type="checkbox"/> Competencia | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Falta de intermediario | <input type="checkbox"/> Sin puesto de venta fijo | |

8.) ¿Tus productos son orgánicos?

- | | |
|-----------------------------------|---------------------------------------|
| <input type="checkbox"/> Orgánico | <input type="checkbox"/> Convencional |
|-----------------------------------|---------------------------------------|

9.) ¿Qué fertilizantes usas para fertilizar tus plantas?

- | | | |
|---|-------------------------------------|---|
| <input type="checkbox"/> Fertilizantes sintéticos | <input type="checkbox"/> Compost | <input type="checkbox"/> Fertilización verde |
| <input type="checkbox"/> Excremento de animales | <input type="checkbox"/> Leguminosa | <input type="checkbox"/> Rotación de cultivos |

10.) ¿Como proteges las plantas de enfermedades y plagas?

- | | |
|---|--|
| <input type="checkbox"/> Herbicidas, insecticidas | <input type="checkbox"/> Agroforestal |
| <input type="checkbox"/> Rotación de cultivos | <input type="checkbox"/> Fertilización (compost) |

¿Pertenece a alguna organización? ¿A qué organización perteneces?**11.6. Scientific Names of Plants mentioned**

Plant	Scientific Name
amaranth	<i>Amaranthus caudatus</i>
apple	<i>Malus*</i>
apricot	<i>Prunus armeniaca</i>
artichoke	<i>Cynara cardunculus</i>
asparagus	<i>Asparagus officinalis</i>
avocado	<i>Persea americana</i>
banana	<i>Musa*</i>
barley	<i>Hordeum vulgare</i>
beetroot	<i>Beta vulgaris</i>
blueberry	<i>Vaccinium myrtillus</i>
broccoli	<i>Brassica oleracea var. Italica</i>
caigua	<i>Cyclanthera pedata</i>
carrot	<i>Daucus carota</i>
cauliflory	<i>Brassica oleracea var. botrytis</i>
celery	<i>Apium graveolens</i>
chard	<i>Beta vulgaris subsp. Vulgaris</i>
cherimoya	<i>Annona cherimola</i>
chia	<i>Salvia hispanica</i>
cocoa	<i>Theobroma cacao</i>
cocona	<i>Solanum sessiliflorum</i>
coffee	<i>Coffea*</i>
corn	<i>Zea mays</i>
cucumber	<i>Cucumis sativus</i>
eggplant	<i>Solanum melongena</i>
garlic	<i>Allium sativum</i>
granadilla	<i>Passiflora ligularis</i>

grape	<i>Vitis vinifera</i>
guanabana	<i>Annona muricata</i>
kañiwa	<i>Chenopodium pallidicaule</i> Aellen
lentils	<i>Lens culinaris</i>
lime	<i>Citrus*</i>
linseed	<i>Linum usitatissimum</i>
lucuma	<i>Pouteria lucuma</i>
maca	<i>Lepidium meyenii</i>
mandarin	<i>Citrus reticulata</i>
mango	<i>Mangifera indica</i>
melon	<i>Citrullus lanatus</i>
oca	<i>Oxalis tuberosa</i>
olives	<i>Olea europaea</i>
olluco	<i>Ullucus tuberosus</i>
onion	<i>Allium cepa</i>
orange	<i>Citrus sinensis</i>
pacay	<i>Inga feuillei</i>
papaya	<i>Carica papaya</i>
passionfruit	<i>Passiflora edulis</i>
peach	<i>Prunus persica</i>
pear	<i>Pyrus communis*</i>
pepino	<i>Solanum muricatum</i>
pepper	<i>Capsicum*</i>
physalis	<i>Physalis alkekengi</i>
pina	<i>Ananas comosus</i>
pituca	<i>Colocasia esculenta</i>
potato	<i>Solanum tuberosum</i>
pumpkin	<i>Cucurbita maxima</i>
quinoa	<i>Chenopodium quinoa</i> .
quito quito	<i>Solanum quitoense</i>
radish	<i>Raphanus rusticana</i>
rice	<i>Oryza sativa</i>
salat	<i>Lactuca sativa</i>
starfruit	<i>Averrhoa carambola</i>
strawberry	<i>Fragaria x ananassa</i>
sunflower	<i>Helianthus annuus</i>
sweet potato	<i>Ipomoea batatas</i>
tomato	<i>Solanum lycopersicum</i>
tuña	<i>Opuntia ficus-indica</i>
turnip	<i>Brassica rapa subsp.</i>
wheat	<i>Triticum aestivum</i>
yuca	<i>Manihot esculenta</i>

*Data collection was based on interviews, no exact information on species was collected. Several types of plant species are consumed and cultivated in Peru; therefore, no clear identification of species is possible.