

Costs of Sustainable Feeding with Animals in Helsinki Zoo

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Degree programme	
International Business	
Report/thesis title	Number of pages and attachment pages
Costs of Sustainable Feeding with Animals in Helsinki Zoo	46 + 4
<p>This thesis examines the costs of sustainable feeding with zoo animals in Helsinki Zoo.</p> <p>The objective of this study was to determine the present costs of feeding and compare them to environmentally friendly, ethical produced feeding costs.</p> <p>The aim was to provide information for zoo of the current sustainability in feeding and make recommendations for possible savings in sustainable food procurement.</p> <p>The study consists of a theory section and an empirical section that deals with the case company. The theory section discusses sustainability, sustainable development, purchasing strategies of sustainable food and costs of sustainable food.</p> <p>The empirical part focuses on document analysis, open-ended questions to retailers and to managers of Helsinki Zoo.</p> <p>The study was based on qualitative methods. First, purchased food products were calculated and itemised. Second, open-ended questions to 22 retailers and three managers were sent by email and the answers were analysed.</p> <p>All managers replied to the questions. 17 retailers replied to the questions, which resulted in their response rate of 77.2 percent.</p> <p>Sustainable food procurement is an important goal, and it is a value of the zoo. Answers to open-ended questions showed that managers of Helsinki Zoo regarded seasonal food, local food, and transport distance, as well as price and transport costs the most important points in sustainable food procurement.</p> <p>According to replies of open-ended questions, retailers were mainly already delivering sustainable food products.</p> <p>Results showed that most products were sustainable, and it is possible to save money with sustainable food procurement.</p>	
Keywords	
Cost, environmentally friendly, ethical produced, qualitative research, sustainable food procurement, sustainability	

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1 Introduction

This thesis is written as a part of bachelor's degree programme in international business. It discusses present purchasing costs of zoo animal's feeding and the purchasing costs of environmentally friendly and ethical produced feeding with zoo animals in Helsinki Zoo.

The first chapter introduces topic and commissioning company, Helsinki Zoo. It presents research objective with research question and investigative questions. Key concepts related to topic are explained. In addition, international aspect, demarcation, anticipated benefits, and the possible risks are discussed.

The second chapter explains theoretical framework related to the thesis topic. It discusses sustainability, sustainable food procurement, strategies of sustainable food procurement, and costs of sustainable food.

The third chapter is empirical part. It explains research design and how research is conducted. Data analysis is discussed. Reliability, and relevance of this research is analysed.

The fourth chapter discusses of the results of this research. It presents present purchasing costs of feeding. The principles and goals of Helsinki Zoo managers in sustainable food procurement are discussed. Ten most used retailers are introduced and their replies to open-ended questions are analysed.

The fifth chapter introduces key findings. The most purchased food products are calculated and itemised. It evaluates results and commissioning company has recommendations of the possibilities to change the feeding to sustainable form and save money at the same time. Reflection on learning is also brought out.

1.1 Background

The mission of Helsinki Zoo is to protect endangered animals and biodiversity. At present, unsustainable use of natural resources and climate change are eroding species life and ecosystems at an accelerating rate. Along with conservation work on species, Helsinki Zoo wants to be involved in mitigating climate change. (Korkeasaari Zoo 2020.)

In 2016, Helsinki Zoo introduced the Eco Compass environmental system and in 2020, zoo joined the Helsinki Climate Network. The main goals are to improve energy efficiency and to sort waste more efficiently. The carbon neutral Korkeasaari 2030 program was

completed in 2019 and zoo is making every effort to reduce the carbon footprint and promote the goals of sustainable development. These goals are also posted on Commitment 2050, which is part of the Sustainable Social Commitment maintained by the Prime Minister's Office. (Korkeasaari Zoo 2020.)

The author has worked in Helsinki Zoo as a zookeeper since 1988 and for the past three years author has worked in the central kitchen of the zoo. Author is responsible of food orders for the zoo animals. Author discussed with Helsinki Zoo's CEO and CFO of this topic and they suggested to research the present purchasing costs of food and how much these purchasing costs would change if Helsinki Zoo would start to purchase ethical produced and environmentally friendly food for the zoo animals.

1.2 Research Objective

Objective of this thesis is to study the purchasing costs in feeding with zoo animals in Helsinki Zoo. The outcomes of thesis will be information of present purchasing costs of food and purchasing costs of ethical produced, environmentally friendly food and possible savings of the costs.

The research question can be worded as "What are the purchasing costs of ethical produced and environmentally friendly feeding with zoo animals in Helsinki Zoo?"

The research question is divided into four investigative questions (IQs) as follows:

IQ 1. What are the present purchasing costs of food and where does the food come from?

IQ 2. How big part of food is already ethical produced and environmentally friendly?

IQ 3. What are the principles and goals of sustainable food procurement in Helsinki Zoo?

IQ 4. What development suggestions can be made for Helsinki Zoo based on the findings?

Table 1 below presents theoretical framework, research methods and results chapters for each investigative question.

Table 1. Overlay matrix

Investigative question	Theoretical Framework	Research Methods	Results (chapter)
IQ 1. What are the present purchasing costs of food and where does the food come from?	2.2 Sustainable Food Procurement 2.4 Purchasing Costs of Sustainable Food	Desktop research	4.1
IQ 2. How big part of food is already ethical produced and environmentally friendly?	2.2 Sustainable Food Procurement	Open-ended questions, Desktop research	4.3
IQ 3. What are the principles and goals of sustainable food procurement in Helsinki Zoo?	2.2 Sustainable Food Procurement 2.3 Strategies of Sustainable Food	Open-ended questions, Desktop research	4.2
IQ 4. What development suggestions can be made for Helsinki Zoo based on the findings?	2.2 Sustainable Food Procurement 2.3 Strategies of Sustainable Food 2.4 Purchasing Costs of Sustainable Food	Qualitative thematic analysis	5

1.3 Demarcation

The focus of this study is on purchasing costs in feeding with zoo animals in Helsinki Zoo, and it is limited to year 2019. It focuses on comparison of the present purchasing costs to purchasing costs of environmentally friendly, ethical produced food. The research involves three managers at Helsinki Zoo, and 22 retailers from whom the food was purchased.

1.4 International Aspect

Helsinki Zoo imports significant part of its feed from different European retailers. In 2019, zoo imported feed from Netherlands (Kiezebrink International B.V) and from Denmark (Brogaarden ApS). Supplements were imported from Germany (Nekton GMBH), and United Kingdom (International Zoo Veterinary Group).

1.5 Anticipated Benefits

Opening the present purchasing costs in feeding with zoo animals provides a background to observe the costs of sustainable food for the animals. Sustainability in feeding supports zoo's values and it could also benefit the animals in a long run.

In recent years, zoo has been working to reduce the amount of mixed waste, improve energy efficiency, increase solar power, and develop a carbon neutral program for 2030. Zoo is certified by Eco Compass. (Korkeasaari Zoo 2020.)

COVID-19 pandemic forced Helsinki Zoo to close its doors for three months in spring 2020 and in December 2020 for three weeks. This affected greatly to zoo's income. The feeding costs are the major cost in animal care section; hence it is important to carefully look at them and try to find different approaches to reduce them.

This study can increase the positive image of Helsinki Zoo, and finding out the costs of sustainable feeding could benefit other zoos as well. Author is interested in learning of this topic and would like to work as a financial controller at Helsinki Zoo in the future.

1.6 Risks and Risk Analysis

Possibility that the retailers do not have enough information of their products or they are not willing to share it can be a slight risk, but food importers and retailers must follow EU legislations to provide information of their products. European Union has regulations to ensure the verification of compliance with feed and food law, animal health and animal welfare rules. (European Commission.)

The COVID-19 pandemic was not a risk to execute this research, because open-ended questions to Helsinki Zoo managers and retailers were sent by email.

1.7 Key Concepts

Cost may be defined as the amount of resources sacrificed or given up achieving a specific objective, which may be the acquisition of goods or services. In other words, cost means the amount of expenditure (actual or national) incurred on, attributable to a thing. (Kohli 2010, 3.)

Ethical produced food includes consideration of people, which aims at workers' welfare, whether on small farms, producer co-operatives, large estates, or plantations. It includes the environment centred on environmental sustainability and animals, mainly concerned

with animal rights and welfare. Ethical production therefore considers animal welfare in addition to the three pillars of sustainable food production. (EIT Food 2020.)

Fair trade changes the way trade works through better prices, decent working conditions and a fairer deal for farmers and workers in developing countries. (Fairtrade International 2020).

Sustainable food procurement can be defined as the purchasing of food, which throughout every stage of the supply chain, minimises harm to, and promotes the flourishing of economies, societies, and ecosystems, both now and in the future. (Hanson & Holt 2014, 1637).

Sustainability is a paradigm for thinking about the future in which environmental, societal, and economic considerations are balanced in the pursuit of an improved quality of life. (UNESCO 2019).

1.8 Case Company

Helsinki Zoo was established in 1889, which makes it one of the oldest zoos in the world. Helsinki Zoo is a non-profit organisation, and it operates in an island in Helsinki region. Zoo's mission is to conserve biodiversity, and it participates in in-situ conservation work to protect the original habitats of various species. Alongside the environmental education task, the protection of species is the most important task of Helsinki Zoo. Therefore, Helsinki Zoo is actively participating in the coordinated European Conservation Program (EEP or EAZA Ex-situ Program) for 20 species. In addition to conservation work and education, Helsinki Zoo has been involved in nature conservation work around the world. Most of Helsinki Zoo's conservation work has been raising funds for different international projects and support them. Along with conservation work on species, Helsinki Zoo wants to be involved in mitigating climate change. (Korkeasaari Zoo 2020.)

In 2019, there were 155 species, 1457 individuals of animals from five different continents in Helsinki Zoo. Thirteen new species were introduced to Korkeasaari in honour of the 130-year history. Six of these species are endangered and two of these were confiscated by authorities. (Korkeasaaren vuosi 2019.)

The feeding of different animal species consists a wide variety of factors. Every species has their own feeding instructions and zookeepers must follow them. Some species demand highly specialised food, some are very simple and straight forward in their feeding habits. The food needs to be healthy and nutritiously balanced.

The climatic load on animal food is not easy to reduce because diets are strictly limited. However, by using seasonal products and closer-produced alternatives can reduce the load. (Korkeasaari Zoo 2020.)

Helsinki Zoo has approximately 500 000 visitors per year and 80 permanent employees. In 2019, turnover was EUR 4.2 million. Korkeasaari Zoo received about 48 percent of its income from entrance ticket revenues, sales of products and services, and rental income. Helsinki Zoo Foundation is a subsidiary in Helsinki City Group. In 2019, a significant part of the operations, approximately EUR 4.6 million, was covered by an operating grant paid by the City of Helsinki. (Korkeasaaren vuosi 2019.)



Figure 1. Income of Helsinki Zoo in 2019

2 Costs of Sustainable Food

This chapter discusses sustainability, sustainable food procurement, strategies of sustainable procurement and purchasing costs of sustainable food.

Literature base on sustainability in zoos is small and not always peer reviewed. The idea of sustainable food in zoos has received relatively little attention to date. (Hanson & Holt 2014, 1636-1638.) Growing interest to develop sustainability and sustainable procurement in zoos has increased the need to research this subject more.

Helsinki Zoo has committed itself to promote measures aimed at sustainability of operations and its carbon neutrality by 2030. (Sitoumus2050).

According to Hanson (2015, 483) matching organisational values with actions in food procurement is the key to institutional integrity and it will pursue corporate goals, such as biodiversity conservation, animal welfare, fair trade and/or others.



Figure 2. Conceptual image of theoretical framework

2.1 Sustainability and Sustainable Development

Sustainable development is overarching paradigm of the United Nations. In 1987, Bruntland Commission Report described the concept of sustainable development, as sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (United Nations World Commission on Environment and Development 1987.)

Sustainability is often thought of as a long-term goal, as a more sustainable world, while sustainable development refers to the many processes and pathways to achieve it. For example, sustainable agriculture and forestry, sustainable production and consumption, good government, research and technology transfer, education and training are those. (UNESCO 2019.)

A process of defining sustainability in its context and identifying its limits must then be converted into needs, aspirations, and principles. These should be put into operation by strategies and frameworks encompassing relevant instruments, procedures, and processes. (Hawkins, Rimmington & Smith 2006, 826.)

World Association of Zoos and Aquariums (WAZA 2005, 57) declares that the zoological community has greater environmental responsibilities than many other institutions. The adoption of sustainable practices will help meet its obligations. Biodiversity conservation without actions for sustainability is incomplete.

Sustainable supply chain management, and sustainable food procurement, are particularly relevant to mission-based or values-led organizations, especially those whose mission relates to sustainability, or an aspect of it. (Dillard & Pullman 2010, 744-745.)

There are many different views as to what constitutes a sustainable food system, and what falls within the scope of the term sustainability. Sustainability implies the use of resources at rates that do not exceed the capacity of the Earth to replace them. For food, a sustainable system can be seen encompassing a range of issues, such as security of the supply of food, health, safety, affordability, quality, a strong food industry in terms of jobs and growth. It includes also environmental sustainability, in terms of issues such as climate change, biodiversity, water and soil quality. (European Commission 2016.)

2.2 Sustainable Food Procurement

Sustainable procurement is procurement of goods, services, utilities and works that takes into consideration wider environmental, economic, and social costs and benefits, over and above private cost-benefit analysis. The process is cyclical because it follows the life cycle of these goods, works and services – from the initial identification of a business need, maintenance throughout their serviceable life, to how goods are reused, recycled, or disposed of, or once a service contract comes to an end. The aim of sustainable procurement is to move away from a linear system of purchase, use and disposal, towards a closed loop system whereby resources are re-circulated, and waste is eliminated or minimised. (Bristol, Clifton & West of England Zoological Society 2010.)

Stein (2018) emphasises that ethical issues are often discussed under the concept of sustainable procurement, with reference being made to environmental, economic, and social sustainability. The most important environmental considerations include protecting biodiversity, especially by introducing organic food, and reducing greenhouse gas emissions, by reducing food miles or perhaps by reducing meat consumption. The most important economic and social considerations include promoting animal welfare, supporting local food producers, promoting better employment conditions among employees in the food chain and buying fair trade products.

Hanson (2015, 487-490) discusses of the drivers and barriers to implement the sustainable food procurement in British and Irish zoos. The highest ranked driver and barrier were economic issues. The other drivers were product quality, management commitment, moral obligation, dedicated team or individual, organisational culture, partner or sponsor opportunities and external stakeholder pressure. Barriers to implement the sustainable food procurement were lack of alternative suppliers, no designated team or role, supply chain coordination complexity, lack of management commitment, no clear goals or targets, organisational culture, and lack of incentive for achievements.

2.3 Strategies of Sustainable Procurement

According to Klassen, Krause & Vachon (2009, 21-22) companies are only as sustainable as the suppliers that compose their supply chains. Suppliers are selected and retained or eliminated from a company's supply base by various managers within the firm, including purchasing managers, design engineers, buyers and teams that can include representatives from all parts of the firm. If sustainable development becomes a strategic priority for the firm, and supplier selection decisions need to be critically reassessed, adapted or per-

haps replaced. Sustainability becomes an order qualifier when placing orders with suppliers, purchasing managers will have to proactively revisit their supplier selection decisions to elevate sustainability. Supply chain managers will need to be more transparent in their activities, to provide verification of their efforts to achieve sustainability in their supply chains. Quality, cost, delivery, flexibility, and innovation are often evident in a product.

World Association of Zoos and Aquariums emphasises in WAZA Sustainability Strategy 2020-2030 (WAZA 2020, 17) that zoos and aquariums should be responsible in the ways they operate through how they procure and dispose of goods and services and how they communicate this with staff, visitors, and communities. The value chain is the full life cycle of a product or service including procurement, production, consumption, and disposal processes. Having a better understanding of zoos' and aquariums' value chains is a critical first step in understanding responsible consumption and production. A better understanding enables zoos and aquariums to share information, with and influence, suppliers, and partners, to limit risk and to ensure products used are disposed of in the most environmentally friendly way. Zoos and aquariums should identify where an intervention in the value chain can improve environmental and social impact of the system.

Hanson & Holt (2014, 1647-1648) studied factors for sustainable food procurement strategies in British and Irish zoos and they found out that local expenditure, nutritional content, and packaging reduction were some of the highest scoring indicators in practice sustainable food procurement and as priorities.

Table 2. Relevant factors for sustainable food procurement strategies in zoos (Hanson & Holt 2014)

Economic	Environmental	Social
Sustainability policy	Animal welfare	Fairtrade
Consideration of entire supply chain	Sustainable seafood	Traceability
Local expenditure	Sustainable palm oil	Culture produce
Seasonality	Sustainable farming methods	Ethical employment / human rights
Supplier engagement	GM food	Food provenance as a communication tool
Alternative suppliers	Packaging reduction	Nutritional content
Small suppliers < 10 employees	Browse / vegetation grown on-site	Food security in poorer nations

Schram (2008) discusses that sustainability is a wider concept than environmentally friendly, as human ethical concerns are an integral part of it. While transport aspects remain important considerations, rejecting any foreign or exotic imports might not always be the best way to serve interests of both local populations and habitats we want to safeguard in the rest of the world. Using fair fruits or rainforest products does not only contribute to saving habitats and species, but it creates an economic support basis for conservation measures.

2.4 Purchasing Costs of Sustainable Food

Environmentally sustainable food is usually more expensive than common food. Because of the costs and demands in implementing control and monitoring regimes, the price of environmentally sustainable products tend to be substantially greater than for comparable products that do not make environmental claims. Establishing collaboration and commitment across the entire value-chain can be expensive and difficult to sustain over the longer term. Higher prices impact on demand for these products. (Bhaskaran, Cary, Fernandez & Polonsky 2006, 679-680.)

Lehtinen (2012) points out that cost effectiveness is imperative. The economic factors include both enhancement of local economy and profitability of companies. Local producers should have effective farming methods and automated processes to beat the competition. Cost effectiveness does not necessarily run contrary to sustainability. Local food chains are not necessarily sustainable as such, but there are several facts that support the argument that local food is more sustainable than other alternatives. Short food supply chains have many advantages over long multinational chains – specifically short delivery times, small work-in-progress inventories, flexibility, good traceability, lower hygiene and quality risks, and visibility of suppliers. The transparency of shorter supply chains also makes it possible to evidence environmental and social impacts along the value stream of locally supplied food.

According to Hanson (2015), sustainable food procurement can bring cost savings when zoo has adequate financial support for implementing sustainability.

Effective planning in sustainable food needs a good overview of the organisational arrangements for the procurement activities a company wish to cover. Important factor is to find out who is involved in procurement activities and in which way. This procedure helps to save costs. (The Procura+ Manual 2007.)

3 Research Methods

This chapter introduces research design, research methods, and data collection process.

The research was executed with qualitative research methods and it was a case study. Data collection methods were document analysis and open-ended questions. Data analysis method was qualitative thematic analysis. These methods provided answers to research question and to investigative questions.

3.1 Research Design

Qualitative research is an umbrella term for a wide variety of approaches and methods for the study of natural social life. The information or data collected and analysed is primarily, but not exclusively, non-quantitative in character. It is consisting of textual materials such as interview transcripts, field notes, and documents, and or visual materials such as artefacts, photographs, video recordings, and websites, that document human experiences about others and or one's self in social action and reflexive states. (Beretvas, Leavy & Saldana 2011.)

This research had three phases. In the first phase financial documents were analysed. The second phase included open-ended questions to managers of Helsinki Zoo and the third phase considered open-ended questions to retailers and wholesalers.

The material collected for research problem is called primary material. In qualitative research, primary data (observation, interviews) are collected from people involved in the phenomenon. The choice of interviewees should be made by interviewing those who has knowledge of the phenomenon or who know something about the phenomenon according to their own experience. The selection criteria must be presented and justified. (Kananen 2015, 29.)

Various documents can be used as material for qualitative research. The work can be based on purely existing materials. The materials of historical research are always documentaries that were once produced from various phenomena. Various recordings, videos, images, and websites can be used as research material. Such materials are called secondary materials because they already exist. The material is interpreted and concluded using the chosen method of analysis. (Kananen 2015, 28.)

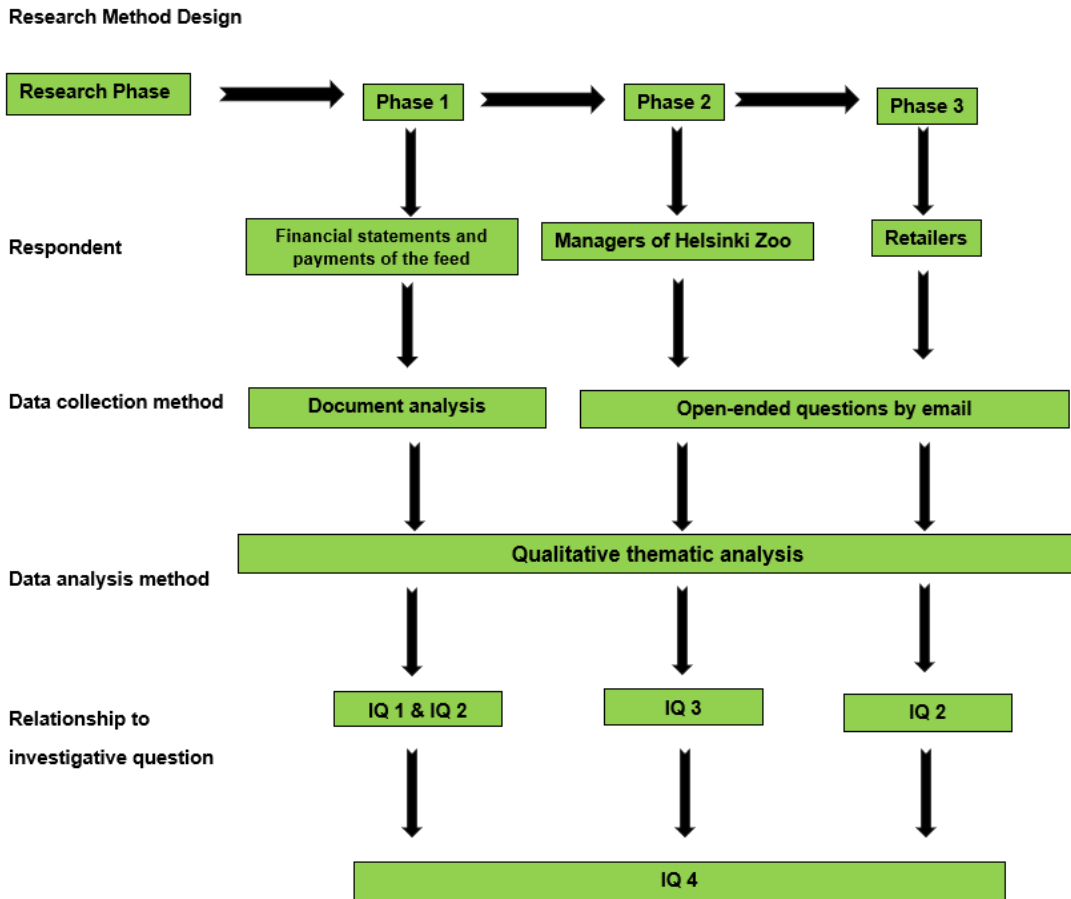


Figure 3. Research methods

3.2 Data Collection

The first phase in data collection method was document analysis method. Document analysis is a systematic procedure for reviewing or evaluating document, both printed and electronic, which are computer-based and Internet-transmitted material. (Bowen 2009, 27.)

The documents were found from accounting program (Proccountor), and Helsinki Zoo's payments of feed.

Document analysis answered to investigative question 1.: What are the present purchasing costs of food and where does the food come from? and to investigative question 2. How big part of food is already ethical produced and environmentally friendly?

The second phase was to send the open-ended questions by email to three managers in Helsinki Zoo. These three managers were CEO, CFO, and manager of animal section. COVID-19 pandemic prevented the possibility to perform face-to-face interviews, and

there were schedule problems to perform Teams interviews. Therefore, open-ended questions were sent by email. This was also a request from managers. Helsinki Zoo is part of Helsinki City Group and Helsinki City has strict rules how to deal COVID-19 pandemic in workplaces.

Questions to managers answered to investigative question 3.: What are the principles and goals of sustainable food procurement in Helsinki Zoo?

All questions that do not include a set of response options are known as open-ended questions. Open-ended questions require respondents to formulate a response in their own words and to express it verbally or in writing. Respondents are not steered in a particular direction by predefined response categories. The use of open-ended questions is recommended if it is not yet possible to clearly delimit the subject of inquiry, or if one expects new topics to emerge. (Züll 2016, 3-4.)

The third phase considered questions to retailers. COVID-19 pandemic affected to the possibility to perform face-to-face interviews; therefore, open-ended questions were sent by email. Questions to retailers answered to investigative question 2.: How big part of food is already ethical produced and environmentally friendly?

Many, if not most, qualitative research studies rely on interviews with participants. The data collection method is an effective way of soliciting and documenting, in their own words, an individual's or group's perspectives, feelings, opinions, values, attitudes, and beliefs about their personal experiences and social world, in addition to information about their lives. (Beretvas, Leavy & Saldana 2011.)

The data covered information of present purchasing costs of food, origin of food, goals of sustainable food procurement, what was the current amount of environmentally friendly feed, ethical produced food, and what would be the costs of sustainable food. When all data was analysed, it was possible to give development suggestions to Helsinki Zoo.

RQ: What are the purchasing costs of ethical produced and environmentally friendly feeding with zoo animals in Helsinki Zoo?

IQ 1. What are the present purchasing costs of food and where does the food come from?

IQ 2. How big part of food is already ethical produced and environmentally friendly?

IQ 3. What are the principles and goals of sustainable food procurement in Helsinki Zoo?

IQ 4. What development suggestions can be made for Helsinki Zoo based on the findings?

3.3 Data Analysis

Document analysis was done with accounting program (Procountor), and Helsinki Zoo's payments of feed. Answers to open-ended questions of three managers were analysed and compared. Response rate was 100 percent. Open-ended questions were sent to 22 retailers and 17 of them replied. Response rate was 77.2 percent. Answers were studied and analysed.

3.4 Reliability and Relevance

It is important to study sustainability of animal feeding in zoos and there is lack of research in this subject. Costs of feeding can be reliably stated from payments of feed. This study has relevance for Helsinki Zoo and possibly to other zoos as well.

Qualitative methodologies accept that the investigator is part of what is being studied and will influence it, and that this does not devalue a study but, in fact, enhances it. Simply deciding what questions to ask or not ask, and who you ask them to (and not) reflect certain decisions that should be consciously made and documented. (Grossoehme 2014.)

Open-ended questions to three managers of Helsinki Zoo were sent by email. (Attachment 2.) These managers (CEO, CFO, and manager of animal care section) are the decision makers in drawing up a budget for animal food and they build the guidelines for sustainable development.

The reliability of qualitative study differs from the evaluation of quantitative research. In a qualitative study, reliability means that the research results correspond to underlying phenomenon are truthful. The assessment of truthfulness is based on sufficiently accurate documentation that external evaluators can check coding, grouping and interpretation. This is called member checking. Based on material and documentation others should come to the same conclusion. (Kananen 2015, 352.)

Open-ended questions to retailers were sent by email. (Attachment 3.) 17 out of 22 retailers replied. According to their replies, it was possible to make conclusions of the sustainability of their products.

4 Results

This chapter discusses of results in this research. Current feeding costs along with managers' goals and principles of sustainable food procurement are presented. Introduction of ten most used retailers and analysis of their products are included. This chapter presents answers to IQ1, IQ2, and IQ3.

4.1 Present Feeding Costs

In 2019, feeding costs in Helsinki Zoo were EUR 251 313 (Attachment 1.)

It is not a significant amount of zoo's entirely expenses, but it is the greatest cost in animal care section. Food for zoo animals can be expensive because it is highly specialised and there are not so many retailers who can deliver or produce specific feed. Species-specific feeding is a very important part in animal welfare. Feeding with zoo animals has also a big role in the image of the zoo. Public has always been very interested in feeding, quality of food, and origin of food. The information of present purchasing costs and origin of food can be found from accounting program (Proccountor), and from receipts of food payments.

4.2 Principles and Goals of the Managers in Helsinki Zoo

Open-ended questions were sent to CEO, CFO, and manager of animal care section by email. (Attachment 2.) They all answered to the questions.

4.2.1 CEO

CEO pointed out that the goal is to be as sustainable as possible without compromising wellbeing of animals. The goal is to use zoo's money wisely, but above that, zoo wants to feed the animals well and be sustainable. Sustainability can also cost, but best practices are those which save both money and environment. Sustainability will be more and more in the agenda of many companies. Hopefully, in the future we will be able to choose the suppliers, who already have taken care of these issues. Goal must be carbon neutral and sustainable use of renewable resources. Zoo's goal is to save wildlife, but this must be done fair way. We cannot violate human rights when pursuing other goals. Sometimes human rights issues are hard to clarify in procurements, but this does not mean that we should not try to do so.

4.2.2 CFO

According to CFO we should live as we teach. Our own activities must be ecologically sustainable. We work for the protection of species and strive to contribute to raising and increasing the environmental awareness of our customers. We should use resources responsibly and long-term. We are looking for new ways to operate efficiently and use resources prudently. Activities must have general acceptance because of public funding and guidance. Sustainable sourcing of animal food must be part of action planning. It is relevant to know where the food comes from and how it is produced. As a semi-public organisation a special attention must always be paid to the use of funds. The share of food in the foundation's costs is not particularly large compared to, for example, staff or real estate costs. Economically tight times always put pressure on values and dimensions. It is important to consider other dimensions in procurement as well. These can have direct environmental impacts, reputational values, and societal impacts, for example locality and employment. Human rights issues are intrinsically linked to global food production. The economies of developing countries should be able to be supported in a way that considers environmental and human rights issues. Western zoos must also take human rights issues into account in their food procurement and costs. This should also be assessed in the food procurement criteria.

4.2.3 Manager of the Animal Section

Manager of the animal section discussed that the goals are same as our strategical goal and values. We want to protect and conserve endangered animals and biodiversity of nature. Our values are animal welfare and justice, as well as ecological and economical options. We have a budget for animal feed and one of the values is economical operation. The price of feed is not the only thing to consider. One option is to figure out different kind of product if the price is not affordable. In the future, animal feed is more sustainable and use of loss feeding products will be more common than today. Transport methods and distances are also something that should be valued when making decision. If we care about animal welfare issues, we should care for human rights too. Sometimes it is very difficult to find out total food production chains, but different kind of certificates could be useful. Domestic and local products are more transparent in their process chains.

4.2.4 Summary of Managers Answers

All managers considered sustainable food procurement as an important goal and it is an important value of the zoo. Price of food was not the most important issue in sustainable

food procurement, but it should be considered as one food procurement criteria. According to managers seasonal food, local food, and transport distance, as well as price and transport costs were the most important points in sustainable food procurement.

Table 3. Order of precedence in food procurement

Order	CEO	CFO	Manager of animal section
Domesticity	6	7	2
Price	4	5	3
Transportation distance	3	4	5
Transport costs	5	3	6
Organic	7	6	7
Local food	2	2	4
Seasonal food	1	1	1

4.3 Retailers and Wholesalers

Helsinki Zoo purchased food from 22 retailers and wholesalers in 2019. Ten of the most used retailers and wholesalers covered EUR 231 313 of the food expenses, which is 92.3 percent of the total feeding costs. (Attachment 1.) Open-ended questions to the retailers were sent by email. (Attachment 3.) 17 of 22 retailers replied. Response rate was 77.2 percent.

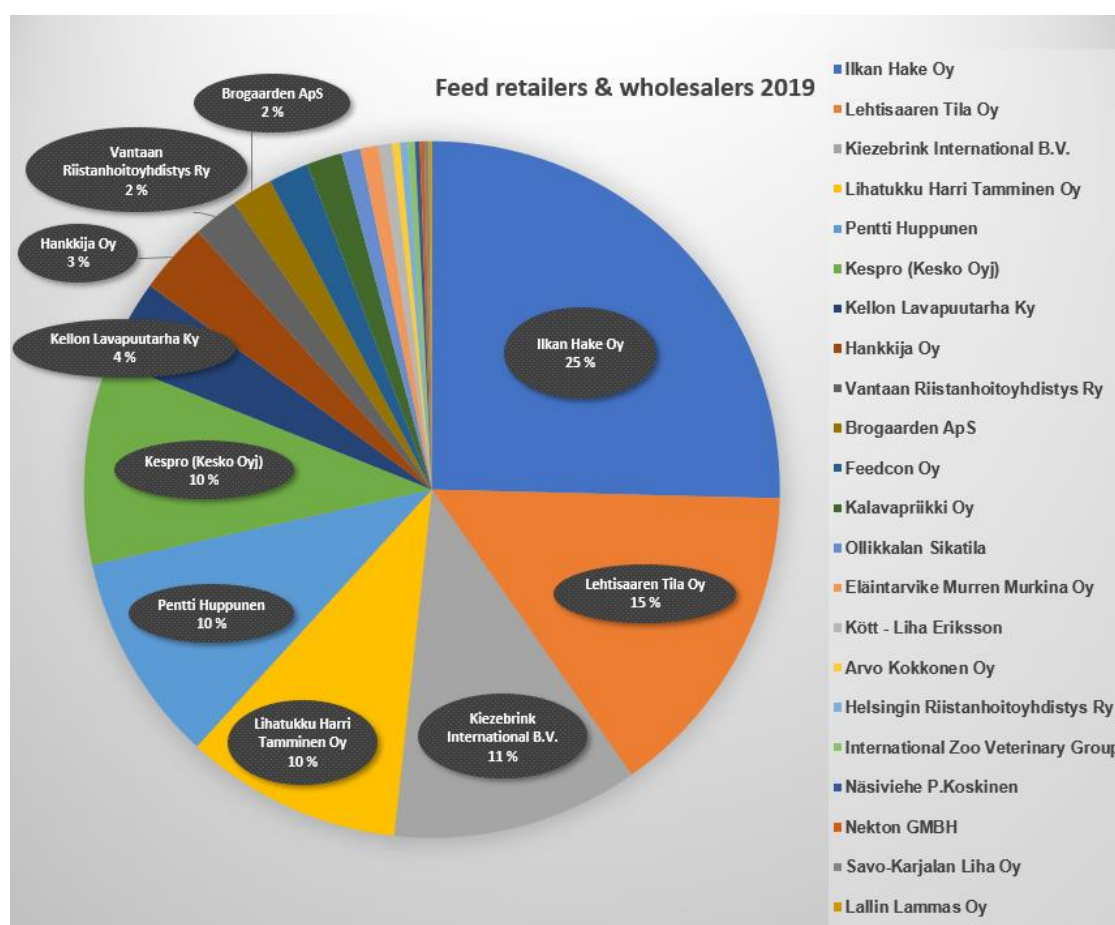


Figure 4. Helsinki Zoo's feed retailers and wholesalers in 2019

4.4 The Most Used Retailers and Wholesalers in 2019

This chapter introduces ten retailers, and their replies to open-ended questions. (Attachment 3.) These retailers had the biggest share of food procurement in 2019. Eight retailers out of ten are Finnish. Nine out of ten retailers replied which provides response rate of 90 percent. Lehtisaaren Tila Oy did not reply to open-ended questions.

4.4.1 Ilkan Hake Oy

Ilkan Hake Oy is in Orimattila and it provides eating branches (browse) for ruminants. Ilkan Hake is focused on procurement of energy wood. Company cuts energy wood from young forests, clears roadsides and fields, collects wood residues from logging openings. Ilkan Hake Oy is PEFC certified for forestry work. Branches were delivered 2 – 5 times per month, in total 70 times during 2019. Branches were gathered from different parts of southern Finland, approximately hundred kilometres from Helsinki Zoo. Used branches are collected in return load back to Orimattila, where after drying they are utilized as wood chips for the heating plant. Company considers their product to be a sustainable product. Cost of these branches with delivery was the greatest cost, EUR 63 838 of total feeding costs in 2019.



Figure 5. Branches for ruminants (Ilkan Hake Oy)

4.4.2 Lehtisaaren Tila Oy

Lehtisaaren Tila is a farm in Ilmajoki and it delivers three different types of dry hay for zoo animals. Hay is collected from different farms and hay is not organic. (Lakeuden Laatuheinä 2020.) Hay was delivered nine times in 2019. Delivery distance is long. Costs of hays and delivery was EUR 37 354.

4.4.3 Kiezebrink International B.V

Dutch retailer, Kiezebrink International B.V, is producer and wholesaler of wide variety of animal foods. Kiezebrink International provides a European operating one-stop-shop facility for zoos offering them a wide variety of high-quality products and brands. Zoos can source most of their animal diets from one supplier. This makes the management of animal nutrition efficient and keeps it simple. Kiezebrink International offers a wide range of both frozen and dry food products. Orders are delivered regularly with refrigerated transport or can be delivered by commercial transport companies. (Kiezebrink 2020.) Helsinki Zoo purchased from Kiezebrink International whole prey, compound feeds, nuts, and seeds. Most of the compound feeds do not include palm oil or GMO soya. The order to Kiezebrink International was placed 4 times in 2019 and delivery was shipped from Netherlands. Costs of food products and delivery was EUR 28 817.

4.4.4 Lihatukku Harri Tamminen Oy

Lihatukku Harri Tamminen Oy was founded in 1994 and it is a family business. The head office is in Vantaa, and their products can be found in grocery stores all over Finland. Good meat quality starts with right kind of animals. Breeding issues and species-type rearing are taken seriously. Species-type rearing means that animals can grow in conditions where their natural needs and well-being are considered, for example in terms of movement, food, and animal interaction. Company's organic product range is the largest in Finland. Lihatukku Harri Tamminen Oy is a pioneer in meat traceability. Company has FSSC 22000 quality certificate, a food product safety certification program that contributes to reliability of operations. (Lihatukku Harri Tamminen Oy 2020.) They manufacture a wide range of products from organic beef, organic pork, and organic lamb. The organic products are mainly consumer-packaged fresh meat products, but selections also include organic cut meat products and industrial assortments. It is possible to inquire availability and pricing for organic quality cuts and assortments. Company delivers weekly beef and pork from their logistics centre, which is in Vantaa. The cost of meat was EUR 25 300.

4.4.5 Pentti Huppunen

Pentti Huppunen is a sawmill and an agricultural entrepreneur from Nurmijärvi. He farms grass, which he delivers for ruminants every second day in the summer months. Grass was delivered 49 times in 2019. He also delivers whole wheat seeds and oat seeds to the zoo. (Ripatti 2016, pp. 22-24.). Grass and seeds are not organic, but they are produced using traditional domestic cultivation methods. The delivery distance is 45 kilometres. Cost of products and delivery was EUR 24 450.

4.4.6 Kespro

Kespro is a wholesaler owned by Kesko Corporation, which has the widest range of wholesalers in the food service sector in Finland. Customers include restaurants, hotels, cafés, transport stations, public administration institutions, the K-Group's stores and retail customers. (Kespro.) In 2019, Kesko initiated extensive work to identify the products in each division that are sustainable from a climate perspective. Sustainable products are defined as those which have a significantly smaller climate impact than comparable products or which are important for adapting to climate change. (Kesko 2019.)

Kespro sales approximately 55 000 products and it has approximately 25 000 different customer relationships. For this reason, Kespro do not monitor that a certain percentage of the products are domestic or under a certain responsibility label. However, when making product choices, customers can make wishes they want above (domesticity, a certain brand of responsibility, and so on.) depending on what is important to each customer. Due to the wide range of products and customer needs, products are purchased from several different countries depending on the product. Fruits and vegetables are purchased from countries in which they are produced and grown naturally, as well as the season determine which country they come from.

The fruits and vegetables were ordered and delivered once a week. Costs of fruits and vegetables were EUR 23 947.

4.4.7 Kellon Lavapuutarha Ky

Kellon Lavapuutarha Ky locates in municipality of Oulu. Company was established in 1975. Company manufactures and sales horticultural production equipment, cultivates horticultural products, and purchases lichen. (Kauppalehti 2020.) Lichen is collected from forests in Kello area in northern Finland, and delivery distance is approximately 610 kilometres. Company delivers lichen for forest reindeers once a year. Lichen is sustainable feed; it grows naturally in the nature and it is collected sustainably from carefully selected areas. Delivery distance to the zoo is long. Cost of lichen with delivery was EUR 9 790.

4.4.8 Hankkija Oy

Hankkija Oy is a nationwide store and service chain for agriculture-related products, machinery, hardware, and gardening. Hankkija Oy produces and trades compound feeds. Hankkija Oy has four compound feed mills in Finland. The market share is approximately 50 percent of total feed markets. (Hankkija Oy.) Company takes seriously its responsibility for the environment, and feed mills constantly invest in sustainable choices, for example in energy solutions and material flows. 80 percent of Hankkija's feeds are produced with domestic renewable fuels, and factories have already reduced CO2 emissions by 5 000 tonnes. Feeds are also utilized with food industry's by-products which are unfit for human consumption, and surplus fractions from in-house production replace feed mill for thermal energy. The amount of waste is minimised, and it is sorted accurately. Packaging materials are also developed to be more environmentally friendly. Hankkija Oy also have some organic products. Hankkija Oy delivered seven times five different compound feeds in 2019. Cost of feeds with delivery was EUR 8 344.

4.4.9 Vantaan Riistanhoitoyhdistys Ry

Vantaan Riistanhoitoyhdistys Ry (Vantaa Game Management Association) delivers road kills, mainly elks and deer, for big cats and bears. The operation is based on agreements between police and game management association, as well as Game Management Act. After a game animal accident, the alarm system is triggered by a request for assistance from police. Hunters, dog handlers and hunting clubs are involved to the operations on a voluntary basis. (Suomen Riistakeskus 2020.) These road kills are natural food for big predators, and they were delivered 85 times from Vantaa area. Delivery distances were not very long, between 20 – 50 kilometres. Zoo paid only delivery costs and they were EUR 5 300. This food can be considered as sustainable food.

4.4.10 Brogaarden ApS

Brogaarden ApS is an old Danish company that has developed since the 19th century from the sale of grain to a modern trading and development company. In recent years, company has intensified its investment in research and development with a view to increasingly developing scientifically based products in its own name. Brogaarden's department for zoological foods has been established to offer Danish and foreign zoos a product range with associated feeding advice at the highest quality level. (Brogaarden 2020.) Origin of products was in Switzerland and in United Kingdom. Now there are no completely sustainable products available, but they continue to talk with the suppliers about the opportunities to produce more sustainable feed. Company delivered compound feeds to Helsinki Zoo five times in 2019. Cost of feeds with delivery was EUR 4 830.

4.4.11 Conclusion

Sustainability has already a big part of zoo's food procurement. Most of these retailers have included environmental and ethical issues to be part of their operating models. Ilkan Hake Oy, Kellon Lavapuutarha Ky, and Vantaan Riistanhoitoyhdistys Ry delivered the most sustainable food products to the zoo.



Figure 6. Amur tiger eats a roadkill (Korkeasaari 2020)

5 Discussion

This chapter presents key findings of research. Recommendations, evaluation of research and conclusion are included. Reflection on learning is discussed.

5.1 Key Findings

22 retailers delivered food to the Helsinki Zoo in 2019 (Attachment 1.) Most of them already produced and delivered sustainable products to the zoo. Research objective was to discover what are the purchasing costs of ethical produced and environmentally friendly feeding with zoo animals in Helsinki Zoo. The most purchased food products were analysed and calculated. That provided information of current costs and this was used to calculate sustainable feeding costs. Open-ended questions to retailers provided useful information how sustainable the most purchased products were. Managers of Helsinki Zoo benchmarked the principles and goals of sustainable food procurement. Their answers provided knowledge to indicate recommendations to the zoo. Key findings considered the most purchased products, which were branches, grass, meat, whole prey, fish, fruits, vegetables, and compound feeds. In this chapter these products were analysed, and recommendations of costs of sustainable feeding were given to the zoo. (Attachment 4.)

5.1.1 Branches

The highest cost in 2019 were eating branches with EUR 63 838. It was 25 percent of the total costs of feeding. Branches were delivered 70 times in 2019 and company, Ilkan Hake Oy, collected used branches as a return load for further use. Delivery distance is not very long, about 100 kilometres. These branches are taken from roadsides and other places where they are a disadvantage. Branches are sustainable feed.

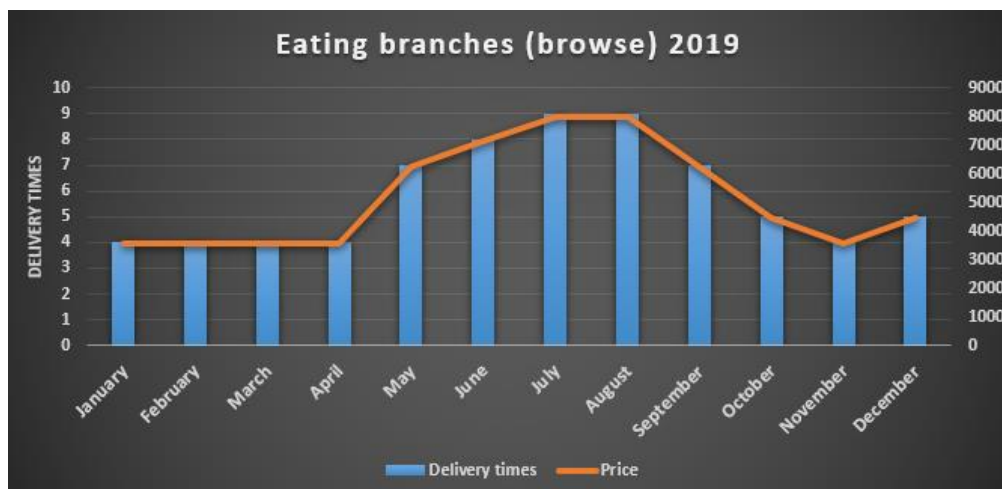


Figure 7. Delivery times and price of eating branches

5.1.2 Grass

Fresh grass was delivered in summer months by farmer Pentti Huppunen. Grass is natural food for ruminants, and it is important part of their diets. In 2019, grass was delivered 49 times, between May and August, and cost of grass with delivery was EUR 24 450. Grass was farmed in traditional cultivation methods, but it is not organic.



Figure 8. Delivery times and price of grass

The costs of deliveries with both branches and grass were large. They were half of the costs. The relevance in delivery times in branches and in grass is important, because reducing the number of deliveries in these products can provide huge savings.

5.1.3 Meat

Meat was purchased from six retailers: Lihatuokku Harri Tamminen Oy, Savo-Karjalan Liha Oy, Ollikkalan Sikatila Oy, Murren Murkina Oy, Kött - Liha Eriksson and Lallin Lammas. In addition, zoo paid for deliveries of road kills to two game management associations, Helsinki, and Vantaa. Total amount of the meat was 11 264 kilos. The most used meat was road kills with 4 200 kilos. Pork was purchased with 3 917 kilos and beef with 2 219 kilos. Road kills were calculated as meat products because the whole carcasses were delivered straight to Cat Valley where they were cut to smaller pieces.

Total cost of meat was EUR 37 609. The most expensive meat was beef with EUR 19 062. Pork was EUR 9 740, and delivery costs of road kills were EUR 6 200.

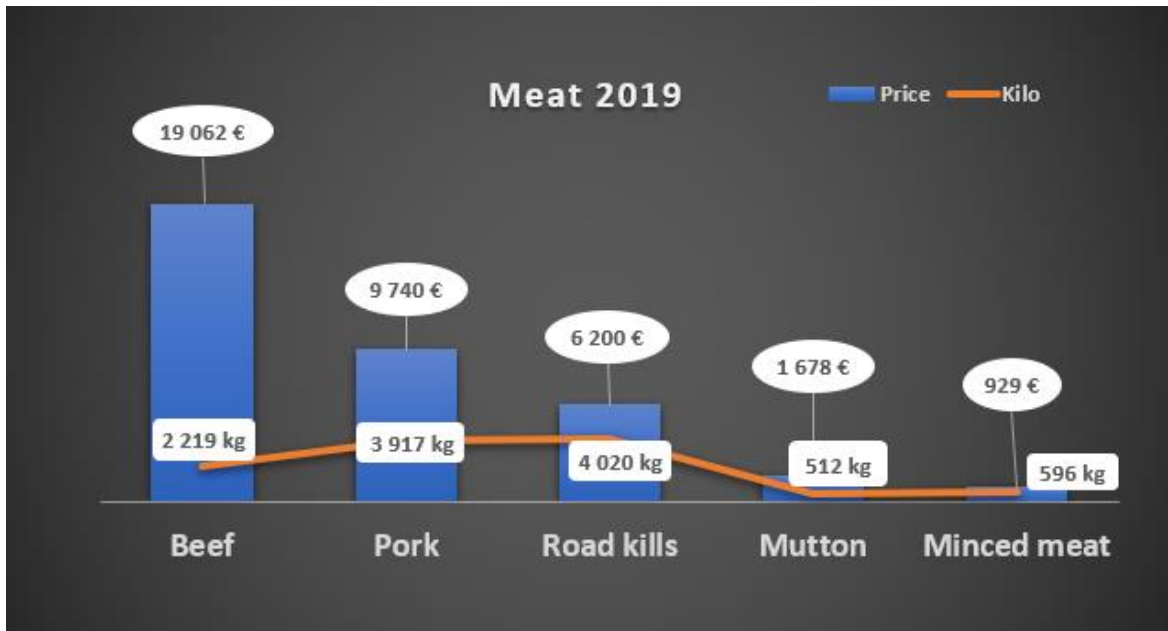


Figure 9. Prices and kilos of meat

Origin of all meat is in Finland and three retailers out of six sell only organic meat. All mutton and 1 900 kg of pork were produced organic. Beef was produced completely without antibiotics, it was GMO-free, and livestock had possibility to graze grass freely in herds.

The climate impact of beef is great because natural digestion of cattle produces methane, which is a powerful greenhouse gas. Unlike chickens and pigs, cattle graze, which means they can take advantage of food unfit for humans and at the same time maintain important habitats. Natural pasture meat is one of the few food production methods that increases biodiversity. When grazing in traditional habitats, animals maintain valuable habitats. However, beef is not a very efficient way to produce food; cattle require a lot of feed to grow. As a result, their production takes up a large area and generates large amounts of emissions that accelerate climate change and eutrophicate water areas. Many countries use soybeans for beef production, for which there are no guarantees of responsibility. Irresponsible soybean cultivation causes deforestation and reduces biodiversity, especially in South America. However, production methods also vary within countries. (WWF Suomi.)

It would be more sustainable method to increase purchasing of other meat products and decrease the use of beef.

5.1.4 Whole Prey

Whole prey is entirety of prey animal including skin, feathers or fur, organs, glands, blood, and intestinal tract. Whole prey was purchased frozen from Kiezebrink International B.V. Total amount of whole prey was 2 245 kilos and total cost was EUR 17 634. Mice were

the most expensive product, EUR 8761 and rabbits were purchased the most in kilos, 1 267. In addition, zoo received from City of Helsinki approximately 200 kilos wild rabbits which were hunted in Helsinki area. These wild rabbits could be considered as sustainable food. Origin of mice, rats and quails is in France and hamsters in Czech Republic. Rabbits and guinea pigs come from Netherlands. These imported whole preys cannot be considered as sustainable food products. Since whole prey is very important part of diets to birds of prey, predator reptiles and cats, it cannot be replaced by any other product.

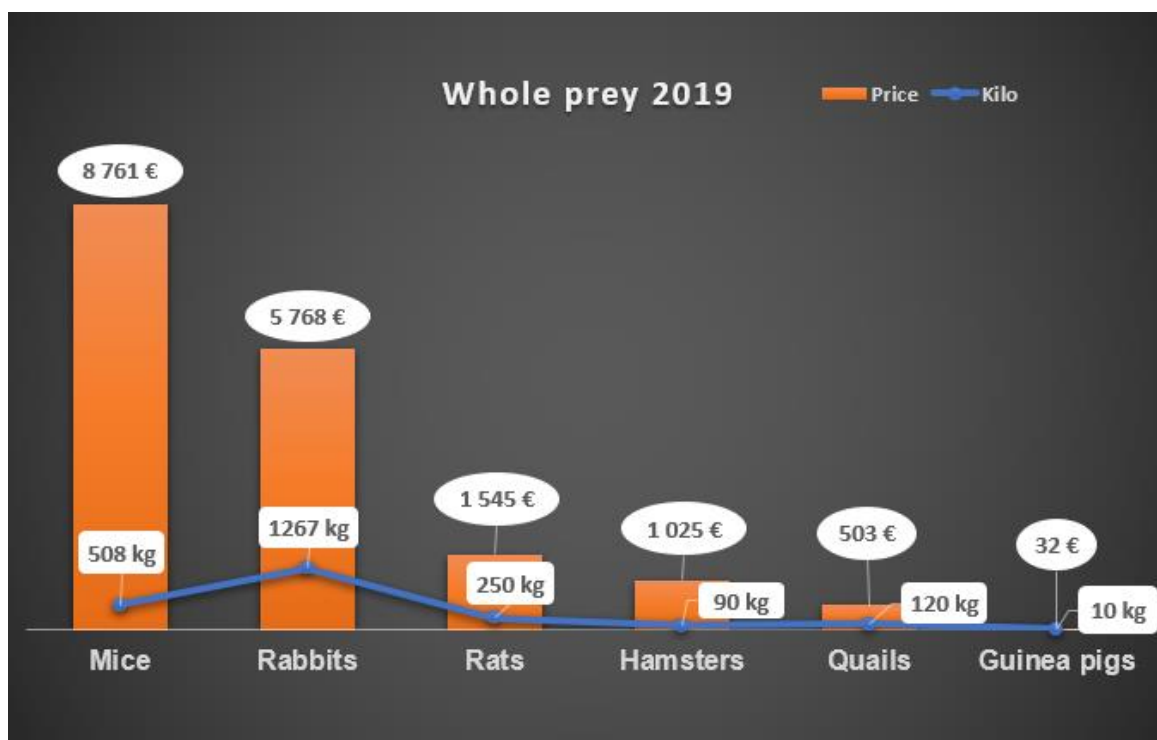


Figure 10. Prices and kilos of whole prey

5.1.5 Fish

Fish was purchased from three companies: Kalavapriikki Oy, Kiezebrink International B.V., and Arvo Kokkonen Oy. Total amount of fish was 3 630 kilos and total cost of fish was EUR 6 223. Origin of the fish is in Finland (lake fish, herring small, roach), in Denmark (mussel), in Netherlands (herring large), in North Sea (mackerel), and in Turkey (smelt).

92 percent of purchased fish (lake fish, roach, herrings, and mackerel) were MSC certified. Smelt and mussel were not MSC certified.

Marine Stewardship Council (MSC) is an international non-profit organisation. It recognises and rewards efforts to protect oceans and safeguard seafood supplies for the future. MSC certificate is only applied to wild fish or seafood from fisheries that have been certified to the MSC Fisheries Standard, a science-based set of requirements for sustainable fishing. (Marine Stewardship Council.)

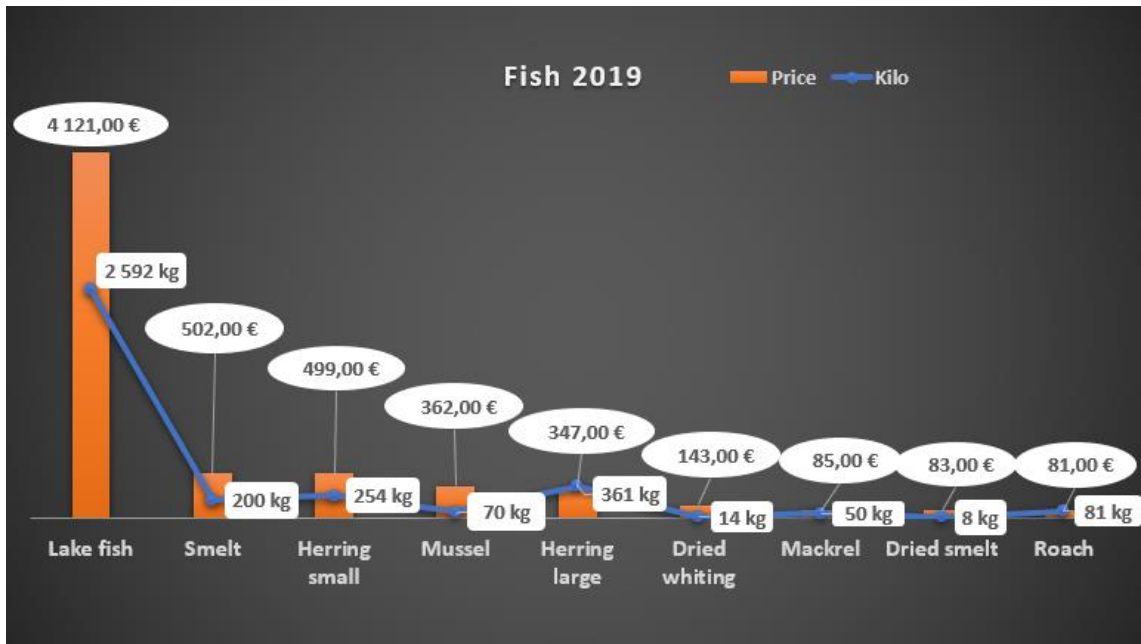


Figure 11. Prices and kilos of fish

In 2019, Helsinki Zoo purchased 200 kilos of smelt with EUR 502. Vendace (European cisco) could be more sustainable alternative to smelt. It could be possible to purchase MSC certificated vendace, but it is more expensive than smelt. Vendace cost approximately EUR 7.00 per kilo and smelt is EUR 2.50 per kilo. This method could increase total cost of purchased fish approximately EUR 900.

5.1.6 Fruits

The fresh fruits were purchased once a week from Kespro. Total amount of fruits was 4 576 kilos and total cost of fruits was EUR 9 131. Apple was the most purchased fruit with 2 064 kilos.

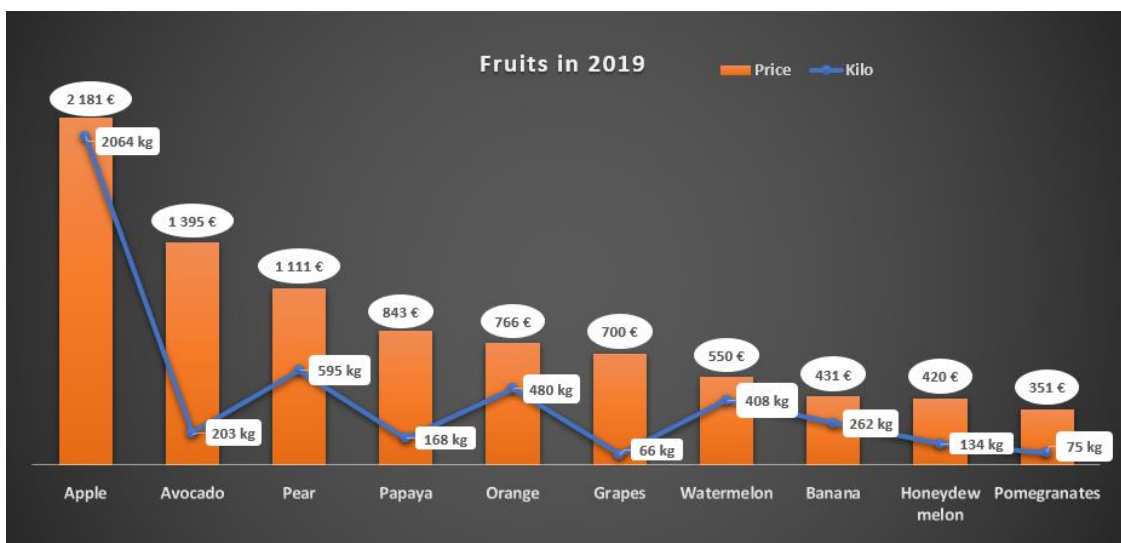


Figure 12. Prices and kilos of fruits

Origin of apples, pears, oranges, grapes, and watermelons was mainly in Europe (Spain and Netherlands). Origin of other fruits was in different South American countries. Exotic fruits, like avocado, papaya, honeydew melon and pomegranates, were expensive and cannot always be considered as sustainable fruits. Especially avocado is a controversial fruit, and it has serious environmental consequences.

Avocado has a carbon footprint five times bigger than a banana, because of the complexities involved in growing, ripening, and transporting the green fruit. (Powell 2017.)

Each avocado tree requires 320 litres of water. This is fresh ground or surface water that is applied via irrigation or other methods to produce a crop of the fruit and does not include rainfall or natural moisture in the soil. Approximately 70 litres of applied fresh ground or surface water are required to grow one avocado. In Chile there are avocado plantations which have been convicted of water code violations. Local communities live in lack of freshwater because the avocado farmers are draining water in the area. (Voller 2017.)

Avocados are grown in monoculture with high agrochemical inputs and exploitative practices that degrade soil fertility. These practices drive up productivity to the detriment of the environment. There have been accusations of deforestation associated with plantation expansion, which has negatively impacted biodiversity. Global demand of avocados has caused prices to rise, and it has become difficult for local communities to afford to purchase a food stuff which is culturally associated with their region. There is a strong presence of drug cartels in the central region of Michoacán, in which are 80 percent of Mexican avocados produced. Gangs have been known to demand protection money from farmers and have repeatedly threatened USDA inspectors when they visit farms. There has also been a marked upsurge in violence in the region due to the profits associated with the cash crop, forcing farmers to invest in expensive fencing and armed security. (Eldridge 2020.)

Reducing purchasing of exotic fruits (avocado, papaya, honeydew melon and pomegranates) is sustainable and it gives savings to the zoo.

5.1.7 Vegetables

The fresh vegetables were purchased once a week from Kespro. Total amount of all vegetables was 12 398 kilos and total cost was EUR 34 043.

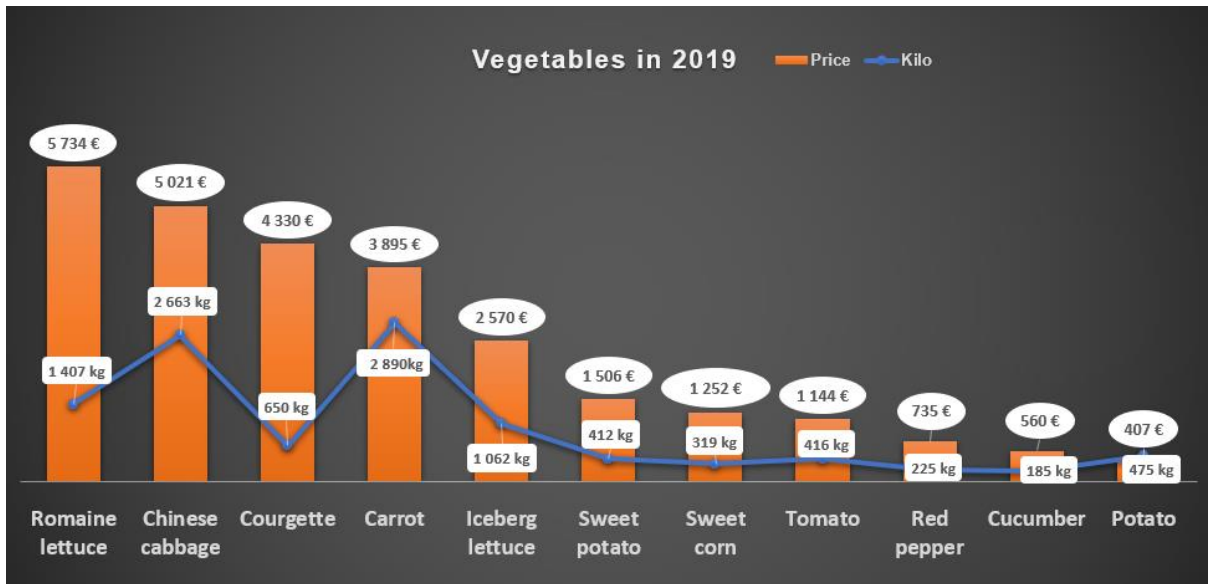


Figure 13. Prices and kilos of vegetables

The origin of vegetables was mainly in Netherlands and in Spain. In summer it was possible to purchase vegetables from Finland. All year around origin of carrots and potatoes was in Finland. Seasonal thinking in sustainable vegetable procurement should be favoured. The amount of purchased Chinese cabbages and courgettes was huge. Mainly Chinese cabbages and courgettes were given to mealworms and crickets as a water source. These insects could be given cheaper and more sustainable vegetables as well. Reducing procurement of Chinese cabbage and courgettes in half could save approximately EUR 5 000.

5.1.8 Compound Feeds

Compound feed refers to feed that is produced based on animals' different growth stages, different physiological requirements and different production uses. (ABC Machinery 2020). Compound feed was purchased from four retailers: Hankkija Oy, Kiezebrink International B.V., Brogaarden ApS and Feedcon Oy.

5.1.9 Hankkija Oy

Helsinki Zoo purchased five compound feeds from Hankkija Oy. Total amount of feeds was 19 290 kilos and total costs with the delivery were EUR 8 237. Domestic content of these Hankkija products is currently as follows: Poro-Elo 88 percent, Kombi-Nasu 87 percent, Punahelmta Kasvatus 86 percent, Punahelmta Poikanen 77 percent, and Lammas-Krossi 71 percent. Hankkija's compound feeds fill up the goal of domestic food, and company has taken environmental issues seriously in their operations.

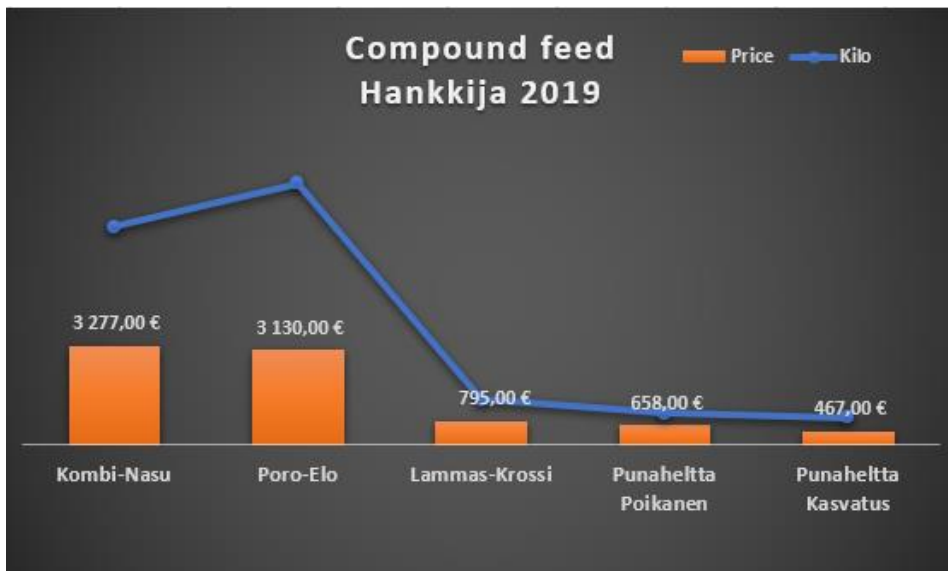


Figure 14. Compound feeds from Hankkija Oy

5.1.10 Kiezebrink International B.V

Twelve different compound feeds were purchased from Kiezebrink International B.V. Total amount of feeds was 2 280 kilos and cost of feeds was EUR 4 443. In these compound feeds were no palm oil or GMO soya used. Kiezebrink has developed their sustainable aspects consistently over these years. They use solar power as sustainable energy and heat recovery from freezer compressors to generate free hot water for washing and cleaning. Their trucks have been running on blue diesel since 2020. (Kiezebrink 2020.)

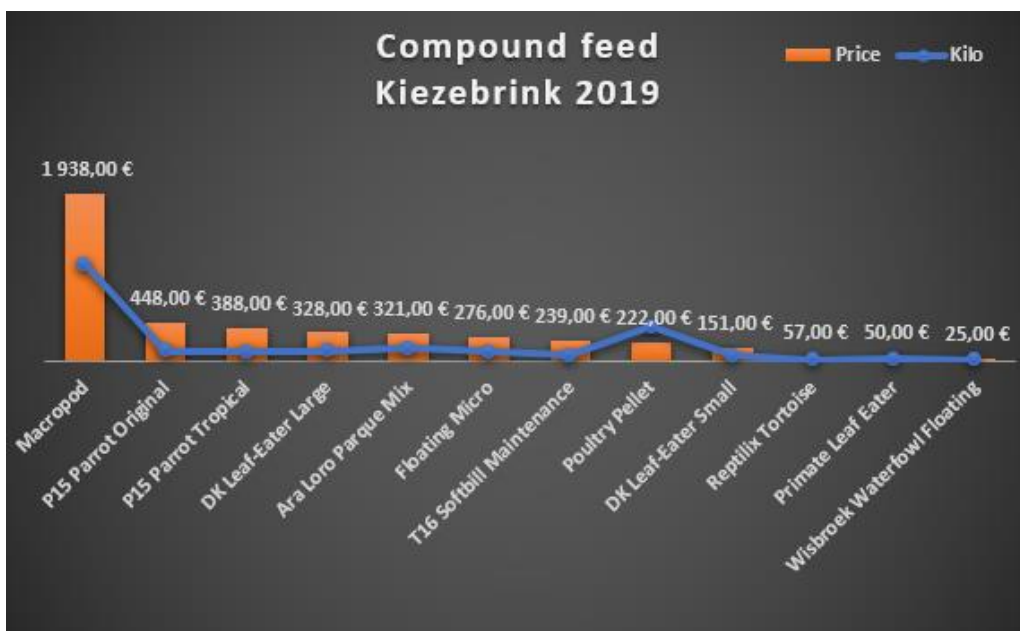


Figure 15. Compound feeds from Kiezebrink International B.V

5.1.11 Brogaarden ApS

Five different compound feeds were purchased from Brogaarden ApS. Total amount of feeds was 2 575 kilos and cost of feeds with delivery was EUR 4 721.

There were no completely sustainable products available in Brogaarden ApS.

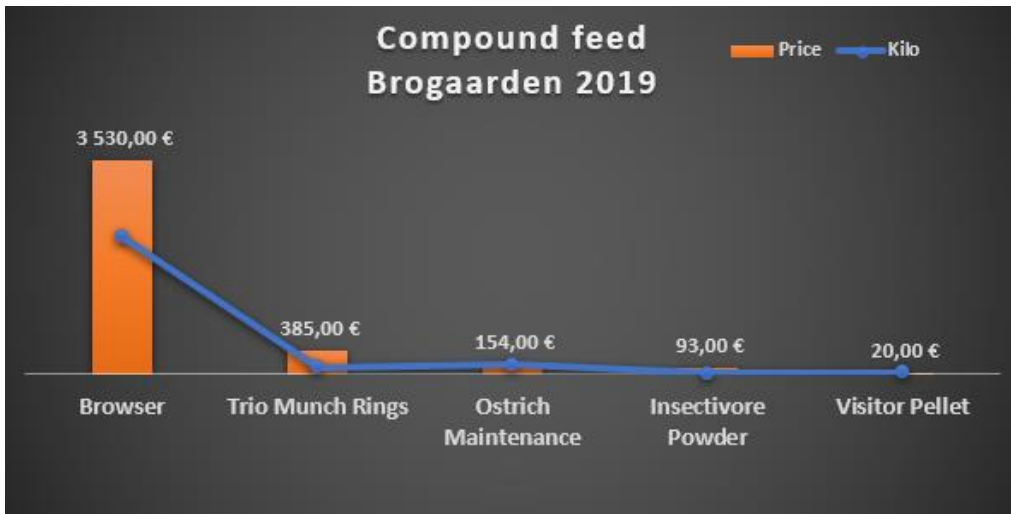


Figure 16. Compound feeds from Brogaarden ApS

5.1.12 Feedcon Oy

Feedcon Oy delivered four different feeds. Total amount of feeds was 1 538 kilos and cost of feeds was EUR 3 259. These feeds were imported from Germany and they were not considered as sustainable feeds.

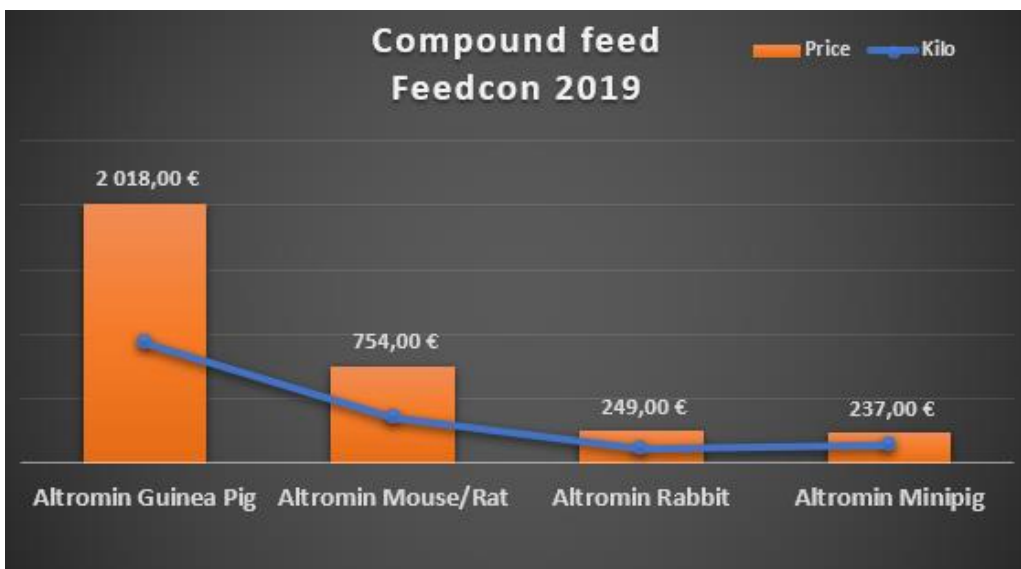


Figure 17. Compound feeds from Feedcon Oy

26 different compound feeds were purchased to Helsinki Zoo in 2019. Most of them were not considered sustainable. Compound feeds were purchased with 25 638 kilos and EUR

20 660. The compound feeds of Hankkija Oy were mainly produced from domestic raw materials, and Kiezebrink International B.V. had no palm oil (or used palm oil was certified), and non-GMO soya in their compound feeds. The other two retailers do not have any sustainable compound feeds to offer at this moment.

Compound feeds are very species-specific feed, and it can be hard to find completely sustainable alternatives for them. Discussion of alternatives should take place with veterinarian and nutritionist before any recommendations can be made.

5.2 Evaluation of the Research and Recommendations

This type of research has not been done in Helsinki Zoo before. Helsinki Zoo makes every effort to reduce its carbon footprint and promote sustainable development goals. Further research of sustainability in feeding should be continued in coming years. According to Lehtinen (2012) cost effectiveness does not necessarily run contrary to sustainability. Detailed calculations of costs provided a clearer picture of food procurement in Helsinki Zoo. The costs of most used food products were analysed and recommendations for sustainable feeding were given based on analysis of present feeding. The recommendations considered both economical and sustainable approach. (Attachment 4.)

5.2.1 Branches

Branches and their leaves have a decline in crude protein over the growing season. They have the best nutritional value during the summer months. (Kimball 2019.) Between May and August, branches could be delivered two times per week and rest of the year only once a week. This arrangement would reduce deliveries from 70 deliveries to 64 and Helsinki Zoo could save approximately EUR 6 000 in a year.

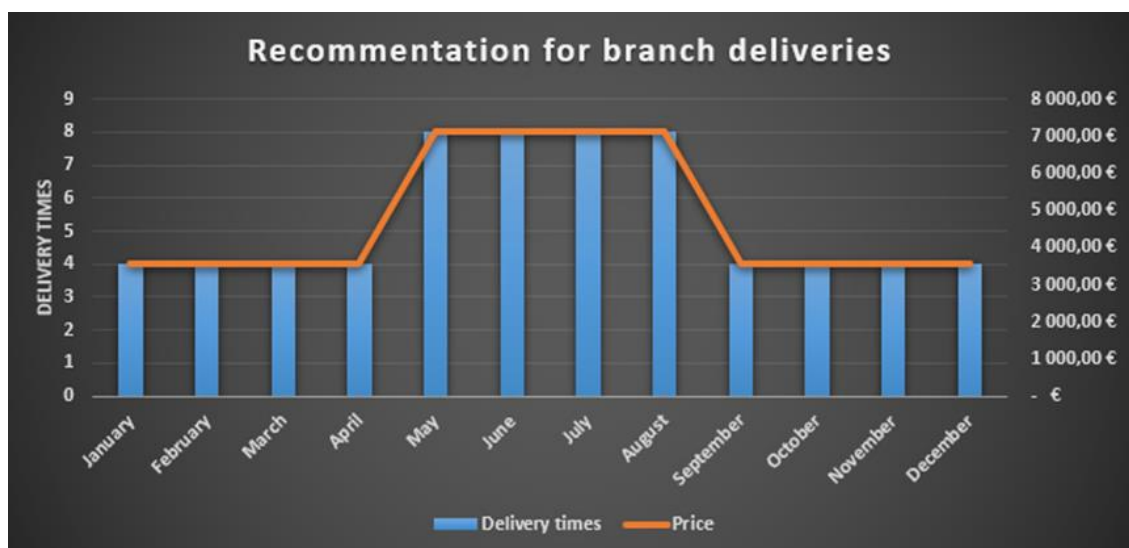


Figure 18. Recommendation for branch deliveries.

5.2.2 Grass

Grass has the best nutritional quality in June and July. Grass could be delivered only in those months and every second day. This arrangement would reduce from 49 deliveries to 32 and Helsinki Zoo could save approximately EUR 6 000 in a year.



Figure 19. Recommendation for grass deliveries

5.2.3 Growing Herbs and Collecting Plants

A very efficient way to provide fresh plants for animals is to grow them and collect them from surrounding areas. Island of Hylkysaari is a neighbour island to Helsinki Zoo. This island is now on sell. Helsinki Zoo could make a deal with the new owner that zookeepers could collect weeds from the area. Herbs and other smaller plants could be grown in zoo area. Costs of different herbs purchased in 2019 were EUR 2 242. Half of these herbs could be grown in zoo area. It would be more sustainable and savings with this method would be EUR 1 000.

5.2.4 Meat

Beef was the largest cost of meat procurement. Helsinki Zoo could reduce or stop the use of beef in feeding. Zoo could increase the use of sheep. Mutton was purchased from organic farms. This would be a more sustainable manner. If the amount of beef would reduce to half and that half would be replaced with mutton, costs would decrease by EUR 5 000. Horse meat is very nutritious and healthy. Increasing collaboration with stables can be valuable, zoo could get horse carcasses with delivery costs.

5.2.5 Fish

Most of purchased fish was MSC certificated and therefore considered as sustainable food. Smelt was the only non-certificated fish. Small water birds eat smelt and it could be replaced with other small fish, like vendace. If vendace could replace smelt, costs of fish would be EUR 7 120. Costs of purchased fish would increase with approximately EUR 900.

5.2.6 Fruits

Is it necessary to feed the animals with fruits every week throughout the year? Cultivated fruits for human use are generally higher in easily digestible carbohydrates and lower in fibre, protein, and calcium than wild fruits. A fruit-free diet might be beneficial in preventing nutrition-related problems, stimulate positive behaviour and overall adequate welfare. (Bionda, Dapper, Fens & Sijtsma 2017.)

In the case of avocados, and other exotic fruits (papaya, honeydew melon, pomegranate) special consideration could be given to whether they are necessary. These fruits were purchased with EUR 3 000. Avocados, honeydew melons, papayas and pomegranates could be purchased only occasionally and when they are in season. This method would save EUR 3 000 and it would be more sustainable practice.

5.2.7 Vegetables

In the summer it is possible to purchase Finnish vegetables. Rest of the year vegetables are mainly imported from Spain and Netherlands. Most of Chinese cabbages and courgettes were purchased mainly for insects, like mealworms and crickets. These insects are grown as food for certain species. Mealworms and crickets need vegetables only for water source. Chinese cabbages and courgettes are not a sustainable choice for that purpose. Insects could have their water source from Finnish root crops, for example carrots and potatoes. These are cheap vegetables, and it is possible to purchase domestic carrots and potatoes all year around. Seasonal thinking in purchasing is one of the goals according to managers of Helsinki Zoo.

5.3 Conclusion

Hanson (2015, 489-490) concluded that financial factors may ultimately be defining sustainable food procurement in zoos and it is also possible to have cost savings with sustainable food procurement.

Majority of food procurement was sustainable in Helsinki Zoo. Managers of Helsinki Zoo found seasonal food, local food, and transport distance, as well as price and transport costs to be the most important points in sustainable food procurement.

Branches are perfect example of sustainable food. They are cut from roadsides and other places from where they would be cut anyway. They are not delivered from long distance, and used branches are taken back with return load and used in heating plants. Savings can be made by reducing delivery times and this would benefit the animals as well.

Branches have the best nutritional value in four summer months, from May to August.

This procedure could save approximately EUR 6 000 in a year.

The delivery times of grass could be reduced as well. The quality of fresh grass is in its best from June to July. Reducing delivery times of fresh grass could save EUR 6 000 in a year.

Growing herbs and other eatable plants in zoo area could be developed and collecting weeds from non-used areas could be considered as a sustainable option.

Predators, like big cats, bears, and wolverines, need meat in their diet. Beef is not environmentally friendly choice, and it also the most expensive of purchased meat. Organic mutton could replace part of the beef. Road kills and horse carcasses are very sustainable food. They would end up to waste incineration plant, but now they are used efficiently for feeding the predators.

Reducing the amount and variety of fruits, zoo could save approximately EUR 3 000 in a year, and this would not harm fruit eaters.

Insects are indispensable part of diet for certain species. Growing insects in large scale is not the most sustainable mode, especially with Chinese cabbages and courgettes which are now used for it. Insects need their water source, but there are more sustainable sources than previously mentioned vegetables. Domestic potatoes and carrots could give the amount of moisture that insects need.

Compound feeds are very important part of diets, and they are usually species-specific feeds. Two of current retailers offer sustainable choices. Helsinki Zoo aims to phase out the use of soybeans and uncertified palm oil. All compound feeds could be evaluated again. Trying to find options which do not include uncertified palm oil or GMO soya beans could be the key for sustainability in compound feeds.

Sustainable food procurement is an important goal, and it is a value of Helsinki Zoo. The results of this research showed it is possible to have sustainable food procurement and save money. (Attachment 4.) According to recommendations of sustainable food procurement the savings would be 13 percent from the costs in 2019.

5.4 Reflection on Learning

When I wrote this thesis, I learnt a lot. Before this research I ordered food for animals without thinking so much of sustainable aspect. Calculating and analysing all food items which were purchased in 2019, has given me a much clearer picture of sustainability. It was nice to discover that most of food products were already sustainable. During this research, accounting program (Procountor) has become very familiar and even easier to use. The most difficult part was developing theoretical framework. There has not been so much research in this field and most of the articles were not peer reviewed. Analysing the replies of target groups (managers and retailers) and researching payments has been the most interesting part in this study. I hope that in the future I could do more this kind of research, expand my job description, and get more pay.

I would like to thank retailers and wholesalers for their replies and encouragement. I also would like to thank my teachers in Haaga-Helia, my colleagues in Central Kitchen, my supervisor, and managers of Helsinki Zoo for supporting me with this project.

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Attachments

Attachment 1. Retailers and their share of deliveries in 2019

Retailer	EUR
Ilkan Hake Oy	63 838.22 €
Lehtisaaren Tila Oy	37 354.59 €
Kiezebrink International B.V.	28 817.01 €
Lihatukku Harri Tamminen Oy	25 300.97 €
Pentti Huppunen	24 449.80 €
Kespro (Kesko Oyj)	23 947.47 €
Kellon Lavapuutarha Ky	9 790.01 €
Hankkija Oy	8 344.40 €
Vantaan Riistanhoitoyhdistys Ry	5 300.00 €
Brogaarden ApS	4 831.12 €
Feedcon Oy	4 678.82 €
Kalavapriikki Oy	4 121.03 €
Ollikkalan Sikatila	2 235.50 €
Eläintarvike Murren Murkina Oy	2 082.88 €
Kött - Liha Eriksson	1 591.50 €
Arvo Kokkonen Oy	941.09 €
Helsingin Riistanhoitoyhdistys Ry	900.00 €
International Zoo Veterinary Group	826.89 €
Näsiviehe P.Koskinen	562.26 €
Nekton GMBH	528.80 €
Savo-Karjalan Liha Oy	512.62 €
Lallin Lammas Oy	357.84 €
Total	251 312.82 €
Total of 10 most used retailers	231 973.59 €
Percentage share of 10 most used retailers	92.3 %

Attachment 2. Open-ended questions to Helsinki Zoo managers

Q n:o	Questions
1.	What are the zoo's goals for sustainable food procurement?
2.	Order of precedence in food procurement? <ul style="list-style-type: none">- Domesticity- Price- Transportation distance- Transport costs- Organic- Local food- Seasonal food
3.	What is the significance of price?
4.	Definitions of the boundaries in sustainable food procurement in the future?
5.	Human rights issues in sustainable food procurement?

Attachment 3. Open-ended questions to retailers and wholesalers

Q n:o	Questions
1.	Where do the products you deliver to Helsinki Zoo come from (country / place of origin)?
2.	How big part of your products are your own production?
3.	How big part of your products are sustainably produced (fair trade products, organic, etc.)?
4.	From where do you deliver your products to Helsinki Zoo?
5.	Could it be possible for you to supply sustainably produced products to Helsinki Zoo and at what price?

Attachment 4. Comparison between 2019 feeding costs and estimated costs of sustainable feeding according to recommendations.

Product	Cost in 2019	Estimated cost
Branches	63 838.22 €	58 000 €
Meat	37 608.35 €	33 000 €
Vegetables	34 042.86 €	29 000 €
Grass	24 449.80 €	18 000 €
Whole prey	17 633.77 €	18 000 €
Fruits	9 130.66 €	6 100 €
Compound feeds	8 344.40 €	8 000 €
Fish	6 222.13 €	7 120 €
Herbs	2 241.60 €	1 200 €
Total	203 511.79 €	178 420 €