

18-6-2021

Functional agrobiodiversity, the added value for grower and environment

A cost-benefit analysis from Interreg
FABulous Farmers



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Functional agrobiodiversity, the added value for grower and environment

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Date: 18-6-2021

Foreword

Before you is the internship report 'Functional agrobiodiversity, the added value for grower and environment'. The research for this report was written in response to cost and benefit analysis carried out for ZLTO within the Interreg FABulous Farmers project. This report was written within the framework of my third-year internship at the study programme of Business Administration and Agri-Food Business at Has Hogeschool in 's-Hertogenbosch.

In this internship assignment, my interests and, in my eyes, the main driving forces behind the agricultural business come together. Namely, on the one hand, the economic possibilities within a company and, on the other hand, the plant and cultivation technical possibilities which are inextricably linked to each other. From my education, experience at home and during my internships, I have a lot to do with the economic side of a company and its implementation in practice, so this internship assignment fits well with my knowledge and experience and has certainly broadened it.

For carrying out this assignment, I received guidance from my internship supervisor at ZLTO, Wico Dieleman, whom I would like to be the first to thank through this way. I would also like to thank Wim de Bont of HAS University of Applied Sciences for guidance and the help he put into the research. Thirdly, I would like to thank Tijmen Hoogendijk of ZLTO for guiding and the help he put into the research. Fourthly, I would like to thank the six demo farms for the time and information they provided me with. Fifthly, I would like to thank Stefan Muijtjens for the time and information he enhanced this research. Finally, I would also like to thank the interviewees for their time and effort.

I wish you much reading

pleasure. Jac van Eck

Herkingen, 11 June 2021

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Summary

Measurement with the PG tool concluded that at company 1 from Kamperland, there is progress in place found at the 'agri-environmental management' and at the 'soil management'. 'Agri-environmental management' has increased from 3.5 to 3.7 as a result of implementing FAB measure 9. 'Soil management' has increased from 3.5 to 4.3 points by implementing FAB measure 4, with more green manures over the winter. Progress was also concluded at demo farm 2 from steenberg. 'Soil management' went from 4.3 to 4.5 points by implementing FAB measure 4, with more hectares going over the winter with green manure. Next, 'energy and carbon' has increased from 2.4 to 2.6 this is a result of implementing FAB measure 7 'agroforestry'. And finally, the 'Social capital' increased from 3 to 3.2 points. This is a result of implementing FAB measure 3 extensifying the cropping plan. 'Water management' also increased but this is not a result of implementing a FAB measure in the farm.

Glossary

Meanings of words, abbreviations

- **FAB measure**
FAB stands for Funcional AgroBiodiversity. There are 10 FAB measures for the project FABulous farmers drawn up. The aim is to implement a FAB measure in the farm and thus move from a Linear agro-system to a circular agro-ecosystem. These two concepts are further explained in the glossary below.
- **Fabulous farmers template**
Fabulous Farmers Template is an Excel file where the costs and benefits are worked out. This file can be filled in by each agricultural entrepreneur.
- **NKG**
Non-turning tillage, NKG involves not turning the soil in a way as it is done in the most common cases is done with deep ploughing up to 30 cm but only light tillage of the top layer of the soil.
- **Zero-meeting**
Is the first meeting done on the demo farms with the 2019 data, this measurement is seen as a starting point after which follow-up measurements provide insight into the outcome.

- **PG tool**
Public Goods Tool is a sustainability assessment tool. Which is used on the demo farms to mapping the baseline measurement. The sustainability of the farming system of the demo farms is quantified using this tool.

- **Linear agro-system**
High production, but also high dependence on external inputs + negative effects on the (biodiversity)

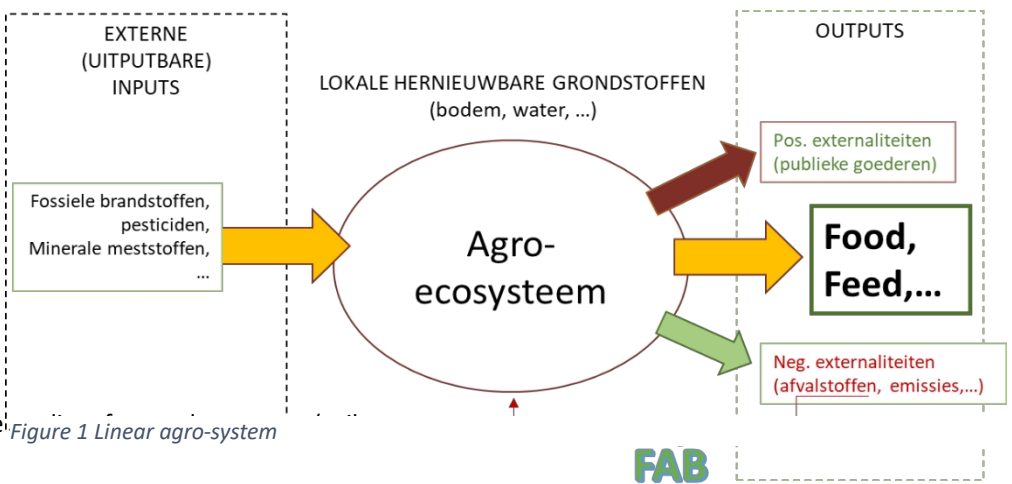


Figure 1 Linear agro-system

- **Circular agro-ecosystem**
More robust in case of disruption, optimises reuse of natural resources and less reliance on exhaustible external inputs while delivering benefits to farmers, society and the environment.

- **Carbon Farming**
Carbon Farming is project of ZLTO where work is being done on improving the soil. This is done by sequestering carbon in the soil and measuring it. For this purpose market research is being done on who is going to pay for that carbon sequestration.

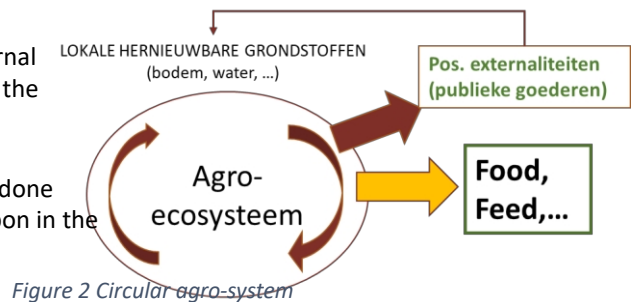


Figure 2 Circular agro-system

- **Ecosystem services**
An ecosystem service is a service or benefit provided to people and the economy. (Ecosystem Services, sd) The ecosystem services that apply in the FABulous Farmers project are:

Carbon sequestration (long term)/ climate regulation	Carbon sequestration (long-term)/climate regulation
Water retention (fresh water)	Water retention (fresh water)

Water flow regulation	Water flow regulation
Pollination	Pollination
Nutrient cycling	Nutrient cycle
Erosion control	Erosion control
Soil formation & fertility	Soil formation & fertility
Habitat for biodiversity	Habitat for biodiversity
Aesthetic values	Aesthetic values
Spiritual values	Spiritual values
Education and research	Education and research
Recreation and eco-/ agrotourism	Recreation and eco/ agritourism
Pest control	Pest control
Disease control	Disease control

The green ecosystem services are ecological benefits and the yellow ecosystem services are social services.

- **Social services**
These are ecosystem services that mean something to society.
- **Ecological benefits**
Services that make a positive contribution in line with the natural relationship between environment and the organisms living in it. Examples include reduced greenhouse gases, more resilient soil, cleaner air, cleaner water and increased biodiversity.

1. Introduction

This report contains a cost-benefit analysis for growers participating in the FABulous farmers project. It was compiled during an internship period using the knowledge learned at the educational institution and the knowledge gained in practice during the internship period.

1.1 Reason

The current Dutch agricultural system is highly dependent on inputs of external resources and the pressure on natural resources such as soil structure, soil life, water holding capacity and natural pest control is increasing. For a more sustainable and less dependent farming practice, these natural resources are actually of great importance. There is also an increasing demand from society to produce products more sustainably and with less impact on animals, humans and the environment. This has led, among other things, to a reduction in the permitted range of crop protection products. To respond to the above issues, agricultural entrepreneurs can take a wide range of different measures. This also has financial implications for agricultural operations. To properly weigh up which measures best fit within an agricultural business, it is important, among other things, to understand the costs and benefits of different measures. This was therefore the reason for this study.

Farmers are boosting biodiversity, improving soil fertility and water quality. ZLTO wants to keep abreast of this by actively participating in Interreg FABulous Farmers project. FAB stands for Functional Agro Biodiversity.

FABulous farmers apply measures for improved soil fertility, good water quality and availability, encouraging functional biodiversity on and around the farm and circular agriculture. For this, you can think of forms of non-rotational tillage, green manures, other forms of fertilisation and the creation of flower borders or landscape elements on or alongside crops. Moving from a linear agro-system to a circular agro-ecosystem. In all this, the soil is the foundation and it is all about resilience. With a resilient soil, you grow crops that are more resistant to diseases and pests. This should ultimately lead to a reduction in the use of and material resources such as fertilisers, antibiotics and plant protection products and nutrient run-off and leaching.

Within the Interreg FABulous Farmers project, ZLTO is a project partner. In this project, it is working on robust cultivation systems. This project started in 2019 and will last until 2023. For this project, there are six demo farms in the Midden-Zeeland and West-Brabant areas. An area plan has been prepared for the two areas and thematic meetings have been held and study groups with the area parties have been set up in these areas. For knowledge exchange, there is cooperation with the foreign project partners. As the Interreg FABulous Farmers project is an international project with the countries Belgium, France, Luxembourg, United Kingdom and the Netherlands. It is important to exchange knowledge between the countries to make crossovers and learn from each other. For this purpose, an Excel (FABulous Farmers Template) file is prepared that is internationally aligned. The FABulous Farmers Template file zooms in on naming the costs and benefits of the 10 FAB measures. The cost and benefit analysis is designed so that the Excel file can be completed by any country. At the end of the project (2022), comparisons are made in this. This comparison will conclude what the positive and negative effects of the 10 FAB measures at an agricultural farm.

The reason for the assignment is to visualise the added value of applying the FAB measures for FABulous Farmers. By means of a template to which the costs and benefits are linked for the ten FAB measures, this can be made clear.

To fill in the costs and benefits, it is essential to research these numbers. The internship assignment is to fill in the FABulous Farmers Template by researching substantiated figures from desk research and real-life data. In addition, zero situations are measured from the six demo farms using the PG tool with the 2019 data and a second meeting is done from two demo farms with the 2020 data to then conclude a difference from this. Finally, research is still being done on which of the 10 FAB measures are agricultural members interested in from this project.

1.2 Objective

From the reason, the following objective can be concluded for the research task:

"By 18 June 2021, a cost-benefit analysis has been prepared of the FAB measures that the project participants can apply on the farm."

The aim is to complete this internship assignment within 20 weeks and in this period have an overview of the pros and cons of FAB measures, what are the costs and benefits and how can the entrepreneur cope with this that it cannot come at the expense of his cost price. To support this, an Excel format "PG-Tool" was used. With this PG-tool, ZLTO can gain insight into the status of the farm in the initial situation and at the final situation. ZLTO can use this information to provide substantiated advice, education and support.

1.3 Main question

The main question of this study is as follows:

What are the additional costs and benefits for a farmer when the farmer implements one or more of the 10 different FAB measures on the farm, what social services does the farmer provide by doing so, and in what way can compensation be offered in return?

The ten FAB measures consist of:

1. Reduced tillage techniques
2. Mixed crops
3. Crop rotation
4. Cover crops
5. Organic matter input
6. Manure quality
7. Agroforestry
8. Construction and management of hedgerows
9. Field margins
10. Mechanical and biological crop protection

Of these 10 FAB measures, the first 6 are completed first. For each FAB measure, sub-questions 1 to 5 are asked.

To answer this problem statement, the following research questions have been formulated: The 1 to 5 sub-questions relate to the 6 FAB measures:

1. What do the FAB measures consist of?
2. What are the ecological benefits of these FAB measures?
3. To what social services do these FAB measures contribute?
4. What are the advantages and disadvantages (impact) of these FAB measures for operations?
5. What costs and benefits should an entrepreneur consider when implementing this FAB measure?

Subquestions 6 and 7 relate to the PG Tool:

6. What is the baseline measurement of 2 demo farms in the PG tool in 2019?
7. What (potential) progress on 2 demo farms has taken place after implementing a FAB measure using the PG Tool in 2020?

Sub-question 8 relates to kitchen table discussions:

8. What are agricultural entrepreneurs interested in regarding the 10 FAB measures, and where is their support need?

1.4 Working method

To construct this report, we started by learning about the FABulous Farmers project. For this purpose, desk research was conducted. Next, the FABulous Farmers Template was prepared. To fill in the cost and benefit file correctly, a lot of desk research was done on reports, reports and the Kwin- AGV 2018 was purchased. Then, in the meantime, the baseline measurement was done with the 2019 data at the 6

demo farms and at 2 demo farms there is an additional measurement with 2020 data. This measurement also included questions for data to further complete the FABulous Farmers Template. Finally, a survey was conducted to find out what agricultural members in the South-West Netherlands region are interested in from the 10 FAB measures.

1.5 Reading guide

When you opened this report the first thing you came across was the glossary, this glossary is needed to understand the report. Next is an introduction with information about ZLTO and then the reason for this report with the main question and subquestions. H2 will describe the ZLTO organisation, including an internal analysis using the 7-S model. Following this, H3 explains the research method and justification of the methods. This describes how the research was conducted and the research methods used. Next, H4 discusses the FAB measures; this chapter explains what the FAB measures entail and the ecological benefits, social services and advantages and disadvantages of the first six FAB measures. H5 explains the costs and benefits. What is ultimately important is what the merits and costs are for each FAB measure, which is explained in this chapter. And in H6, the PG tool is explained, this chapter compares two demo farms using a sustainability tool. And one last thing is the interest of agricultural entrepreneurs. In this chapter, a survey was conducted to find out what agricultural members from West Brabant are interested in from the FABulous Farmers project. Finally, there is a conclusion and recommendation of the report concluding with personal performance.

2 Description and analysis

The first paragraph of H2 introduces the ZLTO organisation. It then describes the organisation through an internal analysis, using the 7-S model.

2.1 Organisation

ZLTO is an association of about 13,000 market gardeners and farmers from southern Gelderland, North Brabant and Zeeland. The association has existed since the year 1999 and has over 175 years of knowledge in agriculture (De ZLM, sd). ZLTO currently employs 145 workers. The employees can work in the offices in Den Bosch (head office) and in Colijnsplaat (About ZLTO, sd)(Annex 5).

ZLTO's services are first and foremost representing the interests of its members in the agricultural sector. In doing so, ZLTO also offers services in the field of advisory and knowledge development through projects. ZLTO operates in:

- ✓ Networking;
- ✓ Innovative projects are underway;
- ✓ Collaboration with other economic sectors is underway;
- ✓ With members, services are performed in organising the best purchase;
- ✓ Licensing and construction;
- ✓ Business plan;
- ✓ Energy;
- ✓ Soil and water;
- ✓ Biodiversity and ecosystem services;
- ✓ And further professional knowledge in the agricultural sector;
- ✓ Finally, ZLTO works on programmes, projects and marketing in the agricultural sector.

This assignment relates to the work at ZLTO of the programmes department, in this department there are 26 colleagues. In this department, some 200 projects are carried out in the green spectrum such as: emissions, biodiversity, vital countryside, climate, plant health and digitalisation. The projects have a broad spectrum but do vary in size, project budgets range from €5,000 to more than €7 million and the duration can be from a few months to several years.

2.2 7-s analysis

Strategy

ZLTO's strategy is determined by the question: 'Where can we assist the farmer?' A starting point is set within ZLTO which is formulated as follows: "Farmers have a solution." After all, farmers not only provide food, but also have an important role as suppliers of green energy, natural materials, care for nature management and biodiversity, among others. ZLTO's ambition is to develop solutions for farmers together with partners. This could then be about high-tech devices, logistical aspects, about soil, but also about sustainability in the field of energy and water. Furthermore, ZLTO is also concerned with the relationship between society and the farmer.

ZLTO's mission is well intertwined with its ambition and where ZLTO wants to stand for the farmer. The mission is therefore formulated as follows: "*ZLTO is a leader in creating and realising perspective for its members who do business in the green space by contributing to the continuity of agriculture and horticulture. Whether it concerns healthy and safe food, vitality of the countryside or energy and climate*" (About ZLTO, sd). In addition to the mission, a vision has also been formulated: "*Farmers and horticulturists have a key role in society and contribute to solving social issues of today and tomorrow*" (About ZLTO, sd).

The strengths and weaknesses of the ZLTO have been drawn up in the confrontation matrix, which is attached as Annex 1. By adding the opportunities and strengths herewith, it is easy to see how the weaknesses and threats should be met. Strengths and opportunities together form the ability to 'build on' in the confrontation matrix. These ensure that the real story will be told in a nuanced way. This is possible because of the large network and information coming in from all kinds of organisations. The stricter regulations are an opportunity because they can be anticipated by ZLTO. Opportunities and weaknesses form 'opportunities for improvement'. Improvements consist of increasing the number of members. Threats and strengths form 'defend'. With the shrinking number of farmers, membership will decrease. The strength here is that an advocate is always needed for communication. The increasingly stringent

regulations for farmers makes it difficult to do anything well. The strengths in return are the huge network and the privilege of ZLTO being at the table of many organisations. This therefore gives ZLTO opportunities to consult with many organisations about the opportunities that do exist. Threats and weaknesses are the core problem. These core problems are mainly that the agricultural sector is difficult to understand for people outside the sector. This creates more and more regulations while there is not always certain whether the additional regulations will have a positive impact. The related weakness is public affairs. This is because it is complicated to explain in a simple way why some measures are taken in the agricultural sector (Annexes 3,4 and 5).

To follow ZLTO's strategy, plans have been made. There is a review of what ZLTO wants to focus on for each year. A multi-year plan is also drawn up to arrive at long-term goals. In addition to the plans, goals are also set (Annex 5). These are:

- 100% membership of agricultural entrepreneurs within the operating area.
- Getting more external funds in is good. This will then allow more to be done for members.
- Having more influence, they want to be more decisive in how decisions are made.

Structure

Annex 2, the organisation chart, shows how the 145 employees are classified within the organisation. Each box represents a department. Because each staff member knows who does what, it is also clear where staff should go with questions. The organisational chart is also useful so that staff know what their department is. Putting each staff member in a 'box' does not mean that there is no cooperation with other functions. In fact, there is a lot of collaboration (Exhibit 5).

ZLTO employees, together with their manager, have agreed which tasks fit within their function and which activities they perform. The employees themselves are then responsible for carrying this out and are accountable to their manager for this. The span of control of each manager is between 15 and 20 employees. The managing director is at the top of the organisation, ensuring that the entire organisation achieves the set goals. The general manager is accountable to the board of the organisation. The general manager and the managers jointly have a number of secretaries by their side. This allows the managers and the general director to focus on their work (Annexes 3 and 5).

When new projects arise, they must first be developed and then approved. This approval is done by the projects committee. If a project is rejected, adjustments may have to be made to the proposal or the project may not go ahead at all.

The structure of the organisation chart clearly shows that there are four departments (see Annex 2). These four are membership and marketing, advocacy, programmes and lastly advice. These four departments are divided this way because there really is a distinction. Members and marketing takes care of marketing and getting the right story out there. Advocacy ensures that farmers are heard both regionally and nationally, as well as liaising with other area parties and informing farmers and other departments. Programmes have the function of setting up group knowledge-sharing projects and guiding farmers in these. Advice gives farmers help with questions; these questions are answered individually. The questions that can be answered can be about legal, all questions about farming and also the purchase and sale of farms (Annex 6).

System

At the ZLTO, it can be said that different processes run through different subsystems. This is because the various investigations require employees, each with their own expertise. This creates working groups for a research and each group contains the people with the required expertise. All processes and subsystems within ZLTO ensure that farmers can continue to do business now and in the future.

Because ZLTO has a lot to do with the outside world and has to respond to it, there is an open system. Many studies are done together with partners or require companies to achieve the goal. So this makes it very important to look outside the organisation a lot. In a research with partners, among other things, research results are also shared with each other. This is another sign of an open system.

Processes include primary, secondary and managerial processes. At ZLTO, the primary processes comprise the surveys, advocacy and advice. So the primary processes are also the processes why a farmer comes to ZLTO. The secondary processes consist of the HR and operations departments. Administrative processes ensure that the primary and secondary processes run effectively and efficiently (Annex 5).

Besides the systems of how work is done, there are also supporting systems to make processes easier. The IT system used is 'Liv- Its', which is a CRM (Customer and Relationship Management system) system. The system contains a lot of reliable and sensitive member information. Such as personal data of members and information about companies. Financial administration is done by the AFAS system. The AFAS system is also there for the administration of sick leave and hours registration.

Employees collaborate a lot via SharePoint and Harmony. Here, they can easily share files, edit them and upload them to SharePoint straight from the mail. For administration, Whitevision is used; this system scans invoices and reads invoice numbers and amounts (Annex 6).

Staff

Employees experience freedom in making decisions within the authority of their position. Employees are also asked to set goals. These goals are discussed with their managers. In this, the manager gives the employees support to be able to achieve the goals as well. To keep an overview for the manager, discussions are held with the employees.

So far, money is available to pay for courses from. However, there is less value attached to this. Employees can take lots of courses, but as long as the way of working does not change after the course, nothing is improved. There is now more thought when the employee wants to do something better, he is left free to do so and this does not always require a course (Annex 5).

Recruitment of new employees takes place in various ways. New employees are recruited through LinkedIn, the website and through networking. To retain employees, they are motivated in various ways. Employees are involved in decisions, fringe benefits are good, salary is paid on time and other 'small' things are all very well organised. To get employees in the right place, the qualities required for the job are considered. After determining the qualities, the most suitable candidate is sought (Annex 4).

Finally, it discusses absenteeism. This is very low at ZLTO. If there are any sick people, however, this is tracked in the Afas system. To keep absenteeism low, efforts are made to keep employees fit. For instance, there is now an app from the Brain Foundation in which colleagues can compete to go for a walk. Besides keeping employees fit, a good workplace is also important to combat illnesses. The desks in Den Bosch and in Colijnsplaat are therefore height-adjustable and help to ensure that employees can adopt good posture (Annexes 3 and 4).

Skills

This sub-chapter describes the topic of skills with what key skills are present at ZLTO.

Because ZLTO has existed for more than 21 years since 1999, many networks have been built up and a lot of knowledge has been gained. At ZLTO, employees work together with colleagues, members, entrepreneurs, agribusiness companies, science, education, chain partners, governments, social partners and other sectors. ZLTO is an informal organisation and considers it important that colleagues know each other personally and seek cooperation with each other. To make the connection from involvement, to share knowledge and thus make themselves strong together for the members. This way, ZLTO knows what is going on in the sector and that is why entrepreneurship, sustainability and innovation are of paramount importance (Appendix 4).

ZLTO is a not-for-profit organisation that is results-oriented and works hard for the organisation's objectives and for its members. Similarly, ZLTO offers the space for employees to develop and implement new ideas in line with the strategy within the set policy frameworks (Appendix 4).

Style

There are different ways of leadership. At ZLTO, leadership is mainly participative. Employees are allowed to help decide on choices to a certain extent. This is done firstly to keep employees motivated. Secondly, it is important to involve employees in decisions. This style of leadership is in line with a positive view of people. A positive view of people assumes that people like to take responsibility (Annex 4).

Projects choose to put together teams. These teams consist of employees with the required expertise. Here, a team may then consist of employees from different departments. By default, a project leader is present within a team. This ensures that everything runs smoothly, and every employee in the team has his or her own expertise. Each team knows what it needs to work on. As a result, the goals are clear to everyone. Within the teams, everyone takes the initiative and wants to achieve the best (Annex 3).

Shared values

ZLTO is there for the farmers and market gardeners. As a result, it also focuses on projects of interest to farmers. The culture at ZLTO is therefore that things happen within ZLTO that can be justified to the farmers and that they are also in the interests of the farmers.

Looking at the professed values, there is an open door culture. In the office, in fact, there are no fixed workstations and only meeting rooms that can be closed. Otherwise, anyone can actually work anywhere. Communication between employees is informal. This can be seen in how people treat each other. There is a difference between the office in Den Bosch and Colijnsplaat. Namely, in Colijnsplaat, everyone eats together and there is a round of walking in the dining break in due time. In Den Bosch, there is no joint walking and lesser proportions eat together. The mainly reason is that the office in Den Bosch is many times bigger than in Colijnsplaat.

To complete projects successfully, there is a lot of cooperation between different departments. In doing so, however, everyone has their own tasks. To ensure experts, ZLTO offers employees a corporate culture of trust, freedom and responsibility to develop. The type of culture involved is task culture. Because of the high level of cooperation, many employees also know each other. This makes it easier to keep rituals in it. For instance, birthdays, new employees, results and other information are shared with each other through the 'insite' system (Annex 4).

Evaluation

ZLTO is an organisation where the employees have a heart for the farm and for agricultural entrepreneurs. What stands out is that the organisation is an advocate and also really listens to the agricultural entrepreneurs what is expected of them. The agricultural entrepreneurs find it important that ZLTO represents the interests for the stricter regulations. Therefore, after the reorganisation, a separate advocacy department was reinstated. Furthermore, it is striking that ZLTO is a large advocacy organisation and that everyone knows each other within the organisation. There is a lot of cooperation within the organisation, which goes well despite the corona. An important point for joining the organisation is that the new employee has knowledge of the agricultural sector. Otherwise, it is difficult to understand what is going on in the organisation. The knowledge now present within the organisation about the sector is great, this is also partly due to the large network ZLTO has and because of this ZLTO is decisive. Finally, a difference can be concluded between the office in Den Bosch and in Colijnsplaat. The people in Colijnsplaat have lunch together and occasionally go for a walk together. As a trainee, this experience was good, because this way people get to talk to other people. In Colijnsplaat, you could also call everyone by name from ZLTO and this was not at all the case in Den Bosch.

3 Research methods and justification of methods

This chapter explains the research method and technique. First, it explains the exploration, how the research started. And then how the research was carried out and the research methods used.

3.1 Exploration

Exploration has taken place through introductory talks. On 11 January 2021, an introductory meeting took place with Wico Dieleman and Tijmen Hoogendijk of ZLTO in Colijnsplaat. Here there was first an assignment clarification and then the main question and the research questions with the objective and problem definition were drawn up. The information needed for this was internal information at ZLTO. With this information, the plan of action was drawn up. How the data collection was delineated see H3.2 Research.

3.2 Research

To answer the research questions and the main question, research activities were carried out to gain information for this study. First, the desk research research activities are:

- Literature study
- Internal source research
- External source research

Second, the activities in field research:

- Surveys
- In-depth interviews
- Discussions with experts

Below are the research activities by research questions:

1. What do the FAB measures consist of?
 - Internal source research, information known within ZLTO.
 - External source research, WUR reports.
2. What are the ecological benefits of these FAB measures?
 - Internal source research, information known within ZLTO.
 - External source research, WUR reports.
3. To which social services does this FAB measure contribute?
 - Internal source research, reports and information within ZLTO.
 - External source research, WUR reports.
 - Discussion with expert, discussion with Stefan Muijtjens
4. What are the advantages and disadvantages (impact) of these FAB measures for operations?
 - External source research, WUR reports.
 - Discussion with expert, discussion with Stefan Muijtjens.
 - In-depth interviews at the six demo farms of FABulous Farmers.
5. What costs and benefits should an entrepreneur take into account when the entrepreneur has these Implementing FAB measure?
 - Internal source research, figures from Carbon Farming.
 - External source research, figure research, Kwin-AGV 2018 and WUR.
 - Discussion with expert, discussion with Stefan Muijtjens for figures.
 - Discussion with expert, C. Hoetmer of pixelfarming robotics
 - Discussion with expert, I. Dogterom of VOF Dogterom
 - In-depth interview, numbers not known ask the 6 demo companies.

Subquestions 6 and 7 relate to the PG Tool:

6. What is the baseline measurement of 2 demo farms in the PG tool in 2019?
 - In-depth interview at 2 demo farms, demo farm 1 from Kamperland and demo farm 2 from Steenberg for 2019 data.
7. What (potential) progress on 2 demo farms has taken place after implementing a FAB measure using the PG Tool in 2020?

- In-depth interview at 2 demo farms, demo farm 1 from Kamperland and demo farm 2 from Steenbergen for 2020 data. And conclude the differences from this.

Sub-question 8 relates to kitchen table discussions:

8. What are agricultural entrepreneurs interested in regarding the 10 FAB measures, and where is their support need?
 - Survey, take telephone survey.

3.3 Activity description

3.3.1 Internal source research

The activities for sub-questions 1,2,3, and 5 consist of internal source research. In an internal source research, desk research is done to have certain insights clearer and to look for the information already available within ZLTO.

Internal source research is done within ZLTO. This involves extracting information from information systems within the company. The information systems contain existing reports, other research or information sources.

3.3.2 External source research

For sub-questions 1,2,3,4 and 5, the activity is external source research. External source research involves desk research on various sources outside ZLTO. The most common sources are the Kwin-AGV 2018 and the WUR.

3.3.3 Discussion with expert

For sub-questions 2,3, 4 and 5, the activity involved a discussion with an expert. This expert is Stefan Muijtjens. Stefan Muijtjens Agricultural consultant is running in the FABulous Farmers project and has a lot of knowledge in the field of agricultural & strategic advice, organic farming and systematic crop guidance. The expert has provided additional information of figures and theories, in the project, advice is provided by the expert such as on soil, figures, theories and guidance in the project. Next are 2 more experts; I. Dogterom of VOF Dogterom and C. Hoetmer of Pixelfarming Robotics. I. Dogterom is an expert on irrigation and fertigation, the expert provided additional information on figures of fertigation. C. Hoetmer is an expert on pixelfarming, the expert provided information on figures of Robot One.

3.3.4 In-depth interviews

The in-depth interviews were conducted for sub-questions 5,6 and 7. The in-depth interviews were conducted at the 6 demo farms of the FABulous Farmers project. This is for qualitative research and for additional information not found through external source research. For the six demo farms, the in-depth interviews were used to do a baseline measurement of the farm with the year 2019 data. And for at 2 demo farms an additional measurement to be done with the data from the year 2020. This information gives new input for certain problem issues in the research question.

3.3.4 Survey

The survey was conducted for sub-question 8 on kitchen table discussions. The survey is about in which topics of the 10 FAB measures are the agricultural entrepreneurs interested in. The survey is a quantitative study. The census are the 30 interested agricultural entrepreneurs from West Brabant. There is completely random sampling because the census had already been determined by ZLTO.

3.4 Delineation

The following factors are delineated for the study:

- The report is written in Dutch. FABulous Farmers is an international project but the results of this report are for the Netherlands only.
- There are a total of 10 FAB measures. The initial assumption was to work out all 10 FAB measures but, in connection with an underestimate in time, the one to six FAB measures were agreed upon. These are the first six but also the most important six.
- In the report, the first six FAB measures are detailed and the last four FAB measures only describe what the FAB measure entails.

- The numbers in the FABulous Farmers Template are based on a regular Southwestern Dutch agricultural farm.
- The percentages from the FABulous Farmers Template are based on a good cropping plan and that the operations are done under der proper weather conditions.
- Of the six baseline measurements of the 2019 demo farms, two baseline measurements are included in the report. From two of the same demo farms, another measurement will be taken with the data from the year 2020. These two companies were chosen because they show the biggest changes and are located in two different provinces.
- The census of the kitchen table talks survey will only be taken from agricultural entrepreneurs who are members of ZLTO, who are located only in West Brabant and who have also previously been have indicated their interest in project general.
- The respondent list was prepared by ZLTO.
- In-depth interviews were completed at the six demo farms of the FABulous Farmers project in the Netherlands.

4 The FAB measures

This chapter describes what the 10 FAB measures consist of. First, it is good to know that FAB stands for Functional Agro Biodiversity. This is the promotion of biodiversity around and in the plot to improve pest and disease control, pollination, soil and water quality in the plot. The aim of the FAB measures is to move from a linear agro-system to a circular agro-ecosystem. It further identifies ecological benefits and social services for the first six FAB measures. The ecological benefits and social services together form the ecosystem services. These ecosystem services were drawn up in consultation with international partners, knowledge from ZLTO and with Agricultural Consultant Stefan Muijtjens. A reference was used with the ecosystem services to the meeting with the project partners where the ecosystem services for each FAB measure were discussed. The compensation to be paid against the ecosystem services is currently still being researched for Carbon Farming. When there are results of this, FABulous Farmers will broaden the results by conducting a market survey on the appropriate ecosystem services. Next, the pros and cons of the first FAB measures are listed.

4.1 Reduced tillage techniques

In reduced tillage techniques, the project looked at different topics namely: non-tillage, the fixed tramline system and eco-ploughing. For these three different topics, research was done on what investments are needed to apply one of these topics on a plot. Furthermore, research was also done into what yields this will yield when applied to a plot.

Non-inversion tillage involves longer use of the traditional plough. Non-inversion tillage, or NKG, is a system where the soil is worked as minimally as possible and is no longer turned. The subsoil is only loosened up to the compaction depth of the soil. This depends on many different factors but the main ones are: how wet is the soil, weight of the machine and pressure per square centimetre on the soil (Non-killing tillage, sd).

Fixed track systems are tracks that are driven over with the tractor and no crop grows on them. There are different widths where the same narrow track is always driven over. The aim is to save soil structure in which crops can grow optimally. In the Netherlands, the most common widths are 1.5m, 2.25m or 3.15m wide (Vaste rijpaden bieden veel voordeel, 2009).

An eco-plough is a plough that does not plough as deep. With an eco-plough, the ground is still turned just like a normal plough, only with an eco-plough it is ploughed shallower. With an eco-plough the soil is ploughed 10 cm to 15 cm deep. (Shallow ploughing, 2012).



Figure 4.2 Eco-ploughs

4.1.1 Ecological benefits

The ecological benefits of reduced tillage techniques are:

- Carbon sequestration (long-term)/climate regulation. Because with NKG, organic matter stays all the way in the top layer of the soil and with eco-plough, organic matter does not go deeper than 15cm. Organic matter consists of 58% carbon (Carbon sequestration and compost, 2019). Therefore, carbon sequestration is done with this FAB measure. (Meeting international partner meeting, 10 December 2020)
- Water flow regulation
Water flow regulation is counteracting water runoff by increasing organic matter at the top of the soil, this reduces runoff and leaching. As a result, this FAB measure helps this ecological benefit (International Partner Meeting, 10 December 2020).

- Nutrient cycle
NKG keeps the organic matter at the top of the soil. This keeps nutrients denser at the plants when not deeply rooted and the nutrients are more quickly absorbed by the plants (International Partner Meeting, 10 December 2020).
- Erosion control
Erosion control is counteracted by keeping the organic matter at the top of the soil, thereby the soil is less likely to leach out. Therefore, this FAB measure prevents erosion. (Meeting international partner meeting, 10 December 2020)
- Soil formation & fertility
Soil shaping & fertility is promoted at NKG, riding paths and eco-ploughs by different ways. With NKG, it is by keeping all the nutrients in the topsoil. And with row crops, it is promoted by avoiding driving over the ground. Only the same track is driven over and this is better for the soil on which the crop has to grow. For eco-ploughing, it is promoted by ploughing to only 15 cm. This is half of the normal regular ploughing and therefore also keeps all the nutrients at the top more than with the regular plough." (Meeting international partner meeting, 10 December 2020)
- Habitat for biodiversity
NKG, riding paths and eco-ploughs promote biodiversity. In the case of NKG, this is due to the organic matter build-up. As all organic matter remains at the top of the soil, there is a lot of soil life in the top layer. This in turn attracts many birds and insects and is therefore good for biodiversity. With tramlines and eco-ploughing, this is also related to soil life. When row paths are used, the soil structure will improve where there are no row paths. As a result, there is more soil life and this in turn attracts more birds and insects. Finally, eco-ploughing, this also keeps the organic matter more on top and attracts more soil life and therefore more birds and insects (Meeting international partner meeting, 10 December 2020).

4.1.2 Social services

The social service of reduced tillage techniques is:

- Education and research
Research on NKG, tramline systems and eco-ploughing is still underway. When new knowledge is this is shared with agricultural entrepreneurs and with education. This promotes education and research (International Partner Meeting, 10 December 2020).

4.1.3 Advantages and disadvantages

Non-tillage benefits:

- A more yield over a longer period of the plot.
- Higher product quality of the plot.
- Reduced costs for irrigation on the plot.
- In the longer term, fewer fertilisers are needed on the plot.
- There is less risk of erosion.
- Nutrients are retained at the top layer.
- In the longer term, better soil structure. This depends on soil, weather conditions and soil handling.
- In the longer term, better soil life status by not disturbing soil life. This does depend on the current soil life status in the soil. Furthermore, it has to do with the weather conditions and ground handling (Benefits of non-tillage, 2013) (Shallow ploughing, 2012).

Non-tillage disadvantages:

- There is a chance of additional seedbed preparation in spring, this depends on soil and weather.
- More weeds in the top 6 cm.
- Depending green manure is sown, extra seed is needed (Less deep ploughing good for soil, 2013) (Shallow ploughing, 2012).

Driving paths system advantages:

- In the longer term, increased yield due to unseeded land.
- Higher product quality due to uncultivated soil.
- The ground can be driven and worked faster after a rain, though this depends on the weather and soil.
- In the longer term, better soil structure. This depends on soil, weather conditions and soil handling (Fixed row paths offer many benefits, 2009) (Economic exploration row paths system 2011 on arable farms, 2011).

Driving paths system drawbacks:

- Depending on which driving track is chosen, it will be necessary to invest in a tractor for driving tracks.
- The tractor that comes on a 3.2m track width may have less weight than on the standard rear axle. This depends on which way the tractor has been converted and with which material.
- Many contractors do not have a tractor on the row-crop system. The contractor charges 10% higher prices when the contractor did make this investment for entrepreneur. The extra price that contractor charges depends on how much work is done with the machine that has been converted.
- To convert harvesting machines to a tramline system requires a large investment. This depends on which harvesting machine it is and which tramline system the machine will be converted to converted (Economic exploratory study 2011 row paths system on arable farms, 2011) (Fixed row paths offer many benefits, 2009).

Eco-shift benefits:

- Nutrients stay at the top of the soil more than with normal ploughing.
- In the longer term, more yield from the plot due to the greater amount of nutrients to be used.
- Less labour because eco-ploughing is faster than normal ploughing.
- In the longer term, better soil life by reducing disturbance of soil life. This does depend on the current soil life status in the soil. Furthermore, it has to do with the weather conditions and soil handling.
- In the longer term, better soil structure. This depends on soil, weather conditions and soil handling (Shallow ploughing, 2012).

Eco-plough disadvantages:

- Ruffling is needed now because eco-ploughing does not loosen the soil deeply.
- Eco-ploughs require a separate investment. This cannot be done with a normal regular plough.
- Additional cost for seedbed preparation, this does depend on soil and weather conditions.
- In the upper 12 to 15 cm, weed pressure increases.
- Eco-ploughing involves additional 10% herbicide spraying (Shallow ploughing, 2012).

4.2 Mixed crops

A mixed crop is referred to when there are multiple crops on one plot. It can vary from strip cropping, pixel farming to herb-rich grassland

Or a mixed crop.

Strip cultivation refers to growing several different crops side by side in strips. The strips can vary from 3m to 36m so from tractor track width to spray boom width because there is a maximum number of metres that natural enemies fly in a homogeneous crop. The different crops can also vary, this depends on the crop rotation and intensity of the cropping plan. With strip cropping, the idea is to grow a different crop on each strip (Mix crops, sd) (More nature on fields through strip cropping, 2020).



Figure 4.3 Strip cropping

In pixel farming, different crops are grown on an area ranging from 1.5m x 1.5m to 3m x 3m. The intention in pixel farming is the same as in strip farming. So many different crops are grown but now not in strips but in small cubes of 1.5m x 1.5m to 3m x 3m (Mix farming, sd) (Pixel cropping, sd).



Figure 4.4 Pixel farming

With herb-rich grassland, not only grass is sown more, various herbs and clover species are added to this. This can also be done with a mixed crop, an example of which is mixing peas with cereals. This

crops are thus sown and also harvested at the same time. With a mix crop, 2 different crops are also sown and harvested the same time an example is wheat and beans. (Mix crops, sd) (Herb-rich grassland, 2018).

4.2.1 Ecological benefits

The ecological benefits of mixed crops are:

- **Pollination**
because there are several crops on one plot in strip cropping, pixel farming and herb-rich grassland this promotes pollination. It varies which crops are grown because different crops are grown. But the crops are not all flowering at the same time. As a result, the FAB measure of mixed cultivation promotes pollination (International Partner Meeting, 10 December 2020).
- **Nutrient cycle**
In a mixed crop of grass clover, the clover binds nitrogen in the soil. This nitrogen is reabsorbed for the grass and can grow on that nitrogen. Through this FAB measure, the nutrient cycle is promoted (Meeting international partner meeting, 10 December 2020).
- **Erosion control**
In pixel farming, strip farming and a mixed farming, there are several crops. This therefore creates different root systems. These root systems provide better soil structure and will therefore also have less runoff. In pixel farming and strip farming, there are different crops that are sown and harvested at different times. As a result, there is almost always something green on the plot which also promotes runoff and wind erosion (International Partner Meeting, 10 December 2020).
- **Soil formation & fertility**
Soil formation & fertility is promoted as the FAB measure involves mixed cultivation different crops side by side or intermingled. This promotes soil and soil fertility (International Partner Meeting, 10 December 2020).
- **Habitat for biodiversity**
Pixel farming, strip cropping and mixed cropping promotes biodiversity. This is because different crops there are many insects and therefore more birds are attracted to these crops. This will increase biodiversity through the FAB mixed crop measure (International Partner Meeting, 10 December 2020).
- **Pest control**
Having different crops together in pixel farming, strip cropping and mixed cropping results in many natural enemies attracted. Natural enemies are a biological control of pests, an example of natural enemies is that aphids are eaten by ladybirds. This ensures that less damage is done to the plant. So the FAB measure mixed cultivation promotes pest control (Meeting international partner meeting, 10 December 2020).
- **Disease control**
Disease control is reduced by FAB measure mixed cultivation. The reason is if there is a disease in the crop and then there is another crop, it takes longer for the same crop to be affected. Figure 4.5 shows an example of this for the disease Phytoftora. Phytoftora spreads on a smaller area in strip cropping than in a large plot. For this reason, the FAB measure reduced

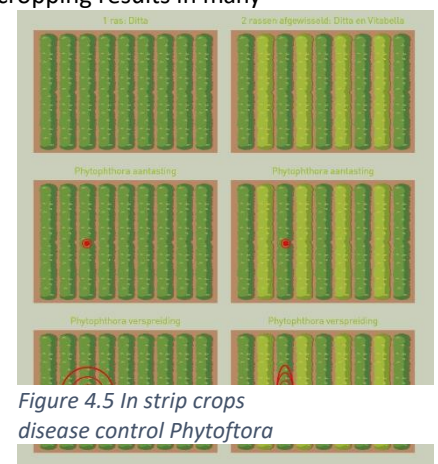


Figure 4.5 In strip crops disease control Phytoftora

mixed cultivation reduces disease pressure and thus contributes to disease control (International Partner Meeting, 10 December 2020).

4.2.2 Social services

The social services of mixed crops are:

- Aesthetic values
People from villages and towns like to see the agricultural entrepreneur engaged with nature and also value this. Through pixel farming, mixed cultivation and strip farming, people will see how well farmers are doing and many people value this (International Partner Meeting, 10 December 2020).
- Education and research
Pixelfarming, strip cropping and mixed cropping are still being researched. When new knowledge is this is shared with agricultural entrepreneurs and with education. This promotes education and research (International Partner Meeting, 10 December 2020).
- Recreation and eco/ agritourism
When there is pixel farming, strip farming and/or mixed farming on a plot, it looks like a lot of variation. People like to see this variation and it is therefore expected that people would like to take a walk along it (Meeting international partner meeting, 10 December 2020).

4.2.3 Advantages and disadvantages

Strip cultivation advantages

- Strip cropping encourages natural enemies.
- In the longer term, strip cropping gives yield increases.
- With strip cropping, crop registration is important with when did what crop stand in that strip.
- The two or more crops side by side can reinforce each other with pollination (Strokenteelt veel beloved, 2020).

Strip cultivation disadvantages

- The two or more crops next to each other may weaken each other through foraging.
- Strip farming requires more labour at the headlands and also more investment in machinery that fits into the system.
- Some customers do not want products from strip cropping as they fear wheat mixing.
- There is a loss based on the row paths associated with headlands (Strip cultivation much promising, 2020) (Economic exploration of row paths system 2011 on arable farms, 2011).

Pixel farming benefits

- Pixelfarming encourages natural enemies.
- In the longer term, pixel farming increases yields.
- Pixel farming is an alternative to crop protection products (circular agriculture WUR, sd).

Pixel farming disadvantages

- An investment in a robot is essential in pixel farming.
- In pixel farming, good crop records are important. When did which crop stand.
- Pixelfarming is currently in its infancy (circular agriculture WUR, sd). Herb-rich

grassland benefits

- Trace elements and minerals have a positive effect on cow welfare.
- In the longer term, herb-rich grassland is more resistant to drought.
- A consequence may be when there is a legume in the mixture, that less (artificial) manure can be applied (Benefits of herb-rich grassland, 2020).



Figure 4.6 Pixelfarming robot

Herb-rich grassland disadvantages

- The purchase of the seed is more expensive than normal seed.
- There may be less intensive grazing by livestock.
- It is not possible to use full-field herbicides (Herb-rich grassland, 2018).

4.3 Crop rotation

Crop rotation or also called crop rotation on a plot one after another and over years. By using crop rotation, the farmer's risk is spread across different crops. There are requirements attached to crop rotation, namely, the government has determined that potatoes may only return to the same plot after three years. This is for the reason of fighting disease in the soil, therefore But what is actually the purpose of a crop rotation is that it has a positive effect on the soil and thus also on the crops that are next to one. A crop rotation is essential for the soil, if no crop rotation takes place with certain crops, the soil will get sick and so will the crops (Crop rotation, sd) (Widening crop rotation in relation to mineral utilisation, soil quality and farm economics on arable farms, 2012).

4.3.1 Ecological benefits

The ecological benefits of crop rotation are:

- Carbon sequestration (long-term)/climate regulation
Including an additional resting crop in the crop rotation increases organic matter built up in the soil. This does depend on the crop and soil type. Organic matter consists of carbon, so carbon sequestration takes place (International Partner Meeting, 10 December 2020).
- Water retention
When more organic matter enters the soil through an additional rest crop in the crop rotation on take, water storage capacity is increased. As a result, the soil is less likely to dry out, reducing the need for irrigation (International Partner Meeting, 10 December 2020).
- Water flow regulation
A broadening in crop rotation will increase organic matter. By increasing organic matter reduces water runoff (International Partner Meeting, 10 December 2020).
- Nutrient cycle
When an increase in organic matter has taken place, more nutrients can be bind in the soil. The nutrient cycle is thus promoted by the FAB measure crop rotation (Meeting international partner meeting, 10 December 2020).
- Soil formation & fertility
A widening in the cropping plan means it takes longer for the same crop to return to the same plot. This gives the soil more rest and improves soil fertility. Besides fertility, soil formation is also promoted by the organic matter content when it increases. When an increase takes place, the structure of the soil becomes better and the soil can be worked better (Meeting international partner meeting, 10 December 2020).
- Habitat for biodiversity
Biodiversity is enhanced when there is a widening of crop rotation. If the organic matter increases then soil life also becomes more active. The consequence of more active soil life is that more birds come because there is more food in the soil (International Partner Meeting, 10 December 2020).

4.3.2 Social services

The social service of crop rotation is:

- Research and training
Crop rotation is still being researched. When there is new knowledge it will be shared with agricultural entrepreneurs and with education. This will promote education and research. (Meeting international partner meeting, 10 December 2020)

4.3.3 Advantages and disadvantages

Wider building plan benefits:

- Implementing a wider cropping plan on a plot will increase the yield in the longer term.
- When there is a wider crop plan, it takes longer for a crop to return to this plot and there are fewer ground-borne diseases.
- With more different crops, there is more risk diversification with crops and balance.
- If a crop stays away from a plot for a longer time, the harmful soil insects will reduce from this crop (Widening crop rotation in relation to mineral utilisation, soil quality and Business economics on arable farms, 2012).

Wider building plan disadvantages

- When there is an additional crop that requires separate mechanisation, it is essential to invest in mechanisation.
- There are still too few cash crops available for sufficient returns (Widening crop rotation in relation to mineral utilisation, soil quality and farm economics on arable farms, 2012).

4.4 Cover crops

A cover crop is a crop that can be sown as a green manure crop and as an under-sow. When grown as a green manure crop, it means that when the main crop is off the land, a new crop is sown and this is a green manure crop. This green manure crop can green over the winter or is ploughed under before winter (depending on the choice of tillage type and soil type).

Then there is under-seeding. Underseeding is often seen in maize. The timing of sowing varies greatly, but before the crop becomes dense, another crop sown under maize. (Green cover crops/catch crops, sd) (Green manure crops, sd)



Figure 4.5 Green manure crops

4.4.1 Ecological benefits

The ecological benefits for a cover crop are:

- Carbon sequestration (long-term)/climate regulation
The FAB measure cover crop involves a green manure crop grown. This green manure provides propagation of the soil organic matter content. The organic matter in the soil consists of carbon. As a result, this ecological benefit done (Meeting international partner meeting, 10 December 2020).
- Water retention
An increase in organic matter content by a green manure crop means that the soil has more water storage capacity and need less rapid storage. This will meet the ecological benefit water retention (International Partner Meeting, 10 December 2020).
- Water flow regulation
Water flow regulation is the prevention of water runoff by increasing organic matter at the top of the soil, this is reduced. As a result, this FAB measure helps this ecological benefit (International Partner Meeting, 10 December 2020).
- Nutrient cycle
After harvesting, a green manure crop is sown. A green manure crop reduces the amount of nutrients leach out, thus retaining all nutrients. Here, the green manure crop serves as a catch crop. And the nutrient cycle is promoted by this FAB measure (Meeting international partner meeting, 10 December 2020).
- Erosion control
By growing a green manure crop, less erosion occurs. The green manure fertiliser ensures That there is less wind erosion on a plot. Furthermore, in addition to wind erosion, there is also less runoff because the rooting of the green manure fertiliser retains the soil. (Meeting international partner meeting, 10 December 2020)
- Soil formation & fertility
Depending on which green manure crop is grown, the soil structure is promoted by the

rooting of the green manure crop. Soil fertility is also promoted by the green manure crop. This is also because a green manure crop stimulates soil life (International Partner Meeting, 10 December 2020).

- Habitat for biodiversity
Improving organic matter content by growing a green manure crop will bring in more soil life in the soil. When there is more organic matter, there are more soil insects. These soil insects are a food source for the birds and migrate to them. Thus, biodiversity is promoted by growing a catch crop (International Partner Meeting, 10 December 2020).

4.4.2 Social services

The social services for a cover crop are:

- Research and training
Research on green manures is still underway. When there is new knowledge this will be grown with agricultural entrepreneurs and with education. This will promote education and research. (Meeting international partner meeting, 10 December 2020)
- Spiritual values
Spiritual values are promoted by not having ploughed in the after year and/or winter plots to be seen but rather plots with a green manure crop on them. This promotes the spiritual values of the people in the area. (Meeting international partner meeting, 10 December 2020)

4.4.3 Advantages and disadvantages

Green manure benefits:

- A green manure crop gives a bedded soil. This prevents nutrient leaching and this also gives weed suppression
- When nitrogen fixation takes place with a legume, the green manure fertiliser ensures limited nitrogen leaching.
- Green manure provides carbon sequestration in the soil.
- Growing the right green manures will reduce nematodes in the soil.
- Green manure crops build up organic matter by sequestering carbon in the soil.
- A green manure crop gives structure improvement by building up organic matter (Green manure crops, 2003).

Green manure disadvantages:

- If the wrong green manure is grown, the harmful nematodes will be propagated.
- Growing costs of a green manure crop without direct financial returns.
- When the green manure is not properly undercut, an Inkuile effect can take place.
- If the green manure shoots to seed, it can cause storage of the seed in subsequent years (Green manures, 2003).

4.5 Organic matter input

To get the organic matter content of the soil to high, there are several ways that can be used on a plot, such as: crop residues, green manures, solid manure, compost, chompost and bokashi (bokashi is on fermented organic matter). Using these different subjects on your plot will increase the organic matter content. This study does not include the amount of fertiliser contained in the manure. (Organic matter input, sd)

4.5.1 Ecological benefits

The ecological benefits for organic matter inputs are:



- Carbon sequestration (long-term)/climate regulation
Carbon sequestration occurs when organic matter content is promoted by the organic matter inputs (International partner meeting, 10 December 2020).
- Water retention
If the organic matter has been promoted by the organic matter input, the water-storage ability also increase. The soil will be less likely to dry out and then there will be less need for irrigation (International Partner Meeting, 10 December 2020).
- Water flow regulation
Water flow regulation is reduced by the organic matter input. If more organic matter in the soil, there will be less runoff (International Partner Meeting, 10 December 2020).
- Nutrient cycle
When organic matter inputs are promoted, nitrogen is more easily bound in the soil and more is available to plants. Further, the manure used as organic input will also promote this (International partner meeting, 10 December 2020).
- Erosion control
When the input of organic matter is promoted, runoff from a fallow plot decrease. In addition, wind erosion will also be less because there is more organic material on the plot and this is more difficult to blow away (International Partner Meeting, 10 December 2020).
- Soil formation & fertility
By using different types of manure and the residues of crops on the land leaving, organic matter content is promoted. This promotes soil life and then also soil structure (International Partner Meeting, 10 December 2020).

4.5.2 Social services

The social service of organic matter inputs is:

- Research and training
Organic matter inputs are still being researched. When there is new knowledge this will be grown with agricultural entrepreneurs and with education. This will promote education and research. (Meeting international partner meeting, 10 December 2020)

4.5.3 Advantages and disadvantages

The advantages and disadvantages this subsection discussed with S. Muijtjens (personal communication, 11 May 2021). Crop residues advantages:

- Leaving crop residues behind on the land promotes soil structure, as it boosts organic matter content in the longer term.
- When crop residues are not removed from the land, the soil receives less preparation, because to remove crop residues from the land, preparation of the plot cannot be avoided.

Crop residue disadvantages

- There is no secondary income besides the main crop, as crop residues can still sometimes be sold such as straw.
- When there is too little nitrogen available in the soil, crop residues will not digest well.
- For the crop residues to digest properly, it is essential that the crop residues are mixed with the soil.

Solid manure advantages

- Solid manure increases/maintains soil organic matter build-up
- Solid manure improves soil structure by promoting organic matter content.
- Solid manure is cheap and often even free.
- Solid manure reduces the risk of (wind) erosion.
- Solid manure stimulates soil life and improves water holding capacity.
- Solid manure promotes longer-term yield increases (The benefits of solid manure, sd).

Solid manure disadvantages

- As solid manure is not digested, there are still weed seeds in this and it gives an increased chance of weeds.
- With solid manure, it is mandatory to mix it directly into the soil.
- Chance of a slight increase in the PH (acidity) of the soil. Depending on which soil, this is a disadvantage or an advantage. For the South-West region, this is a disadvantage (The gain of fixed manure,

sd). Compost

advantages

- Compost increases/maintains organic matter content.
- Compost does not need to be mixed directly into the soil.
- Compost improves soil structure and water holding capacity.
- Using compost stimulates soil life.
- Compost gives an increase in short- and long-term lessal availability.
- Compost reduces the risk of (wind) erosion.

Compost disadvantages

- Buying compost is expensive namely €4.50 per tonne.
- When compost is not composted well enough, there are still a lot of weed seeds in it.
- Compost can have bits of glass, rope and wood. The arable farmer does not want this on his land.

Champost advantages

- Champost increases/maintains soil organic matter build-up
- Champost improves soil structure through organic matter build-up.
- Champost stimulates soil life and promotes water-holding capacity.
- Champost promotes the likelihood of (wind) erosion.
- Champost contains no weeds. Because champost has been heated at 70 degrees, this kills weed seeds but also germs and nematodes.

Champost disadvantages

- Champost costs €3.50 per tonne before purchase.
- With champost, it is mandatory that champost is incorporated directly into the soil.

Bokashi benefits

- Bokashi has positive effects on soil life.
- Bokashi is a high organic matter product, so it promotes organic matter content in the soil.
- Bokashi promotes soil structure and water holding capacity.
- Bokashi reduces the risk of (wind) erosion.

Bokashi disadvantages

- When bokashi is made, the temperature is not high enough to kill the weed seeds, therefore the weed pressure may become higher on a plot when bokashi is spread on it.
- Through bokashi, diseases can be spread.
- Bokashi is more expensive than the other manure types namely the input material already costs €10 per tonne.

4.6 Manure quality

There are different types of manure. It is important for the plants and for the soil that the nutrients in the manure are easily absorbable. To ensure that the nutrients are easily absorbable, this topic includes a composting slab. On a composting plate, manure is brought in and here the manure can lie for a longer period. During this period, the manure is turned over to create a homogeneous product. (Manure quality, sd)

4.6.1 Ecological benefits

The ecological benefits for manure quality are:

- Carbon sequestration (long-term)/climate regulation
When manure quality contains less carbon, less carbon is also put into the soil. Hence, manure quality is important in carbon sequestration. When good manure is put into the soil, more carbon is sequestered (International Partner Meeting, 10 December 2020).
- Water retention
Depending on the quality of the manure, the organic matter content is promoted by the manure and the soil can retain more moisture. Soil water balance is enhanced (International Partner Meeting, 10 December 2020).
- Nutrient cycle
The input of manure into the soil increases nutrients in the soil. Depending on the manure quality and what type of manure, it can be different the how much nutrients get to the plot (International Partner Meeting, 10 December 2020).
- Soil formation & fertility
With good manure quality, soil life becomes more active than with manure of poor quality is. As a result, the ecological benefit is soil formation & fertility (Meeting international partner meeting, 10 December 2020).

4.6.2 Social services

The social service for manure is quality:

- Research and training
Organic matter inputs are still being researched. When there is new knowledge this will be grown with agricultural entrepreneurs and with education. This will promote education and research. (Meeting international partner meeting, 10 December 2020)

4.6.3 Advantages and disadvantages

Composting benefits

- Creating homogeneous product.
- Weed seeds kill by temperature with composting.
- Manure can always be supplied.
- Better nutrient utilisation.
- It requires less activity from the soil because the manure is already composted.
- The heat released during composting can be reused.

Composting disadvantages

- It is essential to make an investment in a composting slab.
- When the compost is spread on the land, one drawback is that sometimes the fertilisers are not available immediately. This depends on weather conditions and soil.

4.7 Agroforestry

Agroforestry is a cultivation system where forest is combined with agricultural crops or livestock on the same plot. The trees are planted in rows so that a crop can still grow underneath and machines can still drive past or underneath them. By combining forest with an annual or perennial crop, optimal use can be made of the different layers, both with light and with water and nutrients (Agroforestry or forest agriculture, sd).



4.8 Construction and management of hedgerows

Construction and hedge management comes mainly from England; there are hedges around or along the plots. The hedges have several functions, for example, the hedges reduce erosion, provide suitable habitat for natural enemies and pollinators. These hedges also provide shelter for small game and birds. When the hedges are a sufficient height, these hedges also provide a windbreak, for sensitive crops. A choice is made on which hedges to plant, as species vary. These different species also attract different insects. And the aim is to attract the right insects (Woodside Management, sd).



Figure 4.8 Hedge management

4.9 Field edges

In field edges as the name suggests, beneficial flowers are sown along the edges of a plot. These useful flowers attract pollinators and pest controllers. These field edges can also be sown in the middle of the plot. A second important function of the field margin is that the strip takes the place of the crop-free zone. This makes the use of plant protection products unnecessary (Edge Management, sd).



Figure 4.9 Field margins

4.10 Mechanical and biological crop protection

Mechanical and biological crop protection is not a FAB measure per se, but it does reinforce the other FAB measures. By

using mechanical and biological crop protection, chemical crop protection has less negative impact in or around the field (FAB supporting measure: use of physical and biological crop protection, sd).

5 Costs and benefits

This section explains the cost and benefit analysis. The cost and benefit analysis is made in Excel file 'FABulous Farmers Template'. For the first six FAB measure there is a subsection, in this subsection the costs and benefits are described. No tables are copied from the Excel file as they are too large. The FABulous Farmers Template is designed so that file can be used by agricultural entrepreneurs. These agricultural entrepreneurs can fill in the figures of their own farm for the investment made. Only if these figures are different from what has been filled in.

5.1 Reduced tillage techniques

Reduced tillage techniques can again be divided into non-return tillage, tramlines and eco-ploughing.

5.1.1 Non-tilling tillage

First, non-turning tillage. To stop turning the soil is an essential investment. For non-turning tillage, a 3m construction foreman 6 leg is an essential investment to still loosen the soil deeply. This investment costs €6750 with a residual value of €1500 (Voort, 2018). The residual value is 15% of the new value, which 15% is residual value is a fixed percentage the FABulous Farmers Template. Then comes the number of years the machine is used and the number of hectares it is used to cultivate per year. The FABulous Farmers Template assumes 50 hectares as the default. Once the hectares are entered, a price per hectare comes out and then the total cost per year. Furthermore, a choice can be made whether to make the investment as a farmer or have a contractor do the work. Option is to enter into the investment yourself, this then also breaks down the variables costs like fuel, labour and maintenance. Fuel varies which tractor will be in front of the construction foreman, but 18 litres per ha has been assumed and this is the average usage of the demo farms. Besides fuel, there is also the labour here, assuming that 0.9 hours are taken over 1 ha and the labour cost is €27.14 per hour (Voort, 2018) this amounts to €24.43 in fuel. 2% maintenance is calculated (Voort, 2018) and this amounts to €2.70 per ha. This does not further include the cost of the tractor. The total comes out to €55.63 when the investment is made by oneself and when the contractor comes, it is calculated at €72 per ha (Voort, 2018). Therefore, to take on this investment yourself as a farmer is more interesting. Furthermore, as costs with non-tilling, there are 10% more costs of seedbed preparation (personal communication, S. Muijtjens, 11 May 2021). The cost of seedbed preparation is €56 per ha (Voort, 2018) this is times the 10% done. This amount comes from the KWIN 2018 and was compared with the demo farms and this matches. Finally, there are further costs to weeds. Weed pressure will increase by 11% in the top 6 cm (Shallow ploughing, 2012).

Table 5.1 NKG costs and benefits

Option 1 auger	€	50
option 2 contract worker	€	72
Additional seedbed preparation	€	6
Additional seed	€	19
Longer-term more yield	€	344
Better crop quality	€	344
Saving on sprinkling	€	24
Saving on fertiliser	€	42

After the costs now come the yields of non-tillage. The longer-term additional yield is 10%, the 10% is due to organic matter increase of 1% in the longer term (Even slight increase in organic matter leads to significantly higher crop yields, 2017). Table 5.1 shows the longer-term yield. This is 10% of the reference situation €3435 sugar beet yield (Voort, 2018).

Furthermore, there is better product quality. With Chips potatoes, there is a yield increase of up to 5% because the underwater weight increases faster. With table potatoes, this increase is less, because the underwater weight in table potatoes prefers not to be so high so quickly (personal communication, S. Muijtjens, 11 May 2021). Furthermore, there is another saving from non-tillage and that is that there is less need for irrigation. With non-tilling, the organic matter content will increase. When this increases by 1%, water storage can increase by 10 mm on heavy soils (Akkerwijzer, 2020). Practice shows that watering can be saved by 30% (demo farms, S. Muijtjens (personal communication, 11 May 2021). Finally, not turning the soil shows that the nutrients remain at the top of the soil a saving to fertilise can add up to 10% (personal communication, S. Muijtjens, 11 May 2021).

5.1.2 Driving paths system

With the carriageway system, again option 1 and option 2 can be read off. Option 1 is the investment in widening a regular tractor to driveways at 3.20 m. This adjustment for 1 tractor is €16,500, with residual value again

of 15% and lifespan of 10 years. This investment of 16,500 is done times 2 in the FABulous Farmers Template, as it does require 2 tractors on 50 ha. In the variables cost, only maintenance has been entered. 2% of the investment is €660. For option 2, no amount has been filled in, because many contractors have a tractor are at 3.2m wide. However, WUR research does show that contract work rates rise by at least 10% over compared to traditional farming (Economic exploration of 2011 tramline system on arable farms, 2011). Furthermore, as an additional cost, there is loss of yield due to not having a head of field on a plot. This results in a loss of 8% and this does not yet include the loss of tracks (Agro-economic incorporation of strip cropping, 2019). Next, the yields of the tramline system. By not driving on the land where a crop

grows, there is a yield increase of up to 8% (Economic exploration of the 2011 tramline system on arable farms, 2011). The 8% is passed on to the reference situation sugar beet and that comes to a yield of €306. And there is also a 4% increase in product quality. The 4% has been passed on to the reference situation, which is sugar beet yield. The yield of this is €153. When longer term row paths are used, a product becomes more homogenous. This yields 4% product quality increase that is paid for (personal communication, S. Muijtjens, 11 May 2021).

Table 5.2 Driving paths 3.2 costs and benefits

Driving paths 3.	2m€ per ha
Widening 1 trigger	€ 16.500
Loss of headland	€ 306
Longer-term more revenue	€ 306
Better crop quality	€ 153

5.1.3 Eco-ploughs

To start eco-ploughing, it is essential to first purchase an eco-plough. The investment of an eco-plough 7+1 dab with straw inserts costs €18,750 (WN kramer eco-plough, 2018). This again assumes a residual value of 15% after 10 years and amounts to €2,812.50. The area worked with it is again 50 ha. Then there are the variable costs of fuel, labour and maintenance. Fuel is €15.70 per ha (Shallow ploughing, 2012). Next, the demo farms reflected that 1.5 ha per hour is being ploughed and this therefore comes to an amount of €18.09 variable labour costs. And maintenance costs are 3% of purchase value and come to €562.50 (Voort, 2018). Per hectare, this totals €76.83 (see table 5.3). The contract worker (option 2) comes down to €85 per ha (Demo farms M. Schippers). The investment is therefore more attractive to do this yourself as a farmer. Furthermore, as an additional cost, one additional land preparation comes to €68,- (Voort, 2018). And the weed pressure becomes higher with 11% in the top 15cm and more herbicides are sprayed with eco-ploughs, as much as 10% more (Shallow ploughing, 2012)(see table 5.3)

Apart from the costs, eco-ploughing also delivers a number of things. For example, there is a yield increase of 2% in the longer term in sugar beet and peas. And will improve water infiltration and capillary rise, but there are no further figures on that yet. (Shallow ploughing, 2012). However, organic matter content will increase, when it increases by 1%, irrigation can be delayed for 2-3 weeks. Shallow ploughing keeps the nutrients at the top there will be 10% less fertiliser needed in the longer term for crops to grow well. The 10% is times the cost of fertiliser sugar beet done from the Kwin 2018 (Voort, 2018) The other yields are still the

Table 5.3 Eco-team costs and benefits

Eco	plough€ per ha
Option 1 eco-plough	€ 77
Option 2 contract worker	€ 85
Additional seedbed preparation	€ 68
Additional spraying of herbicides	€ 2
Longer-term more revenue	€ 77
Less fertiliser	€ 24

saving time and fuel by eco-ploughing, though this is very much year-dependent. Some years a plot does not need to be pulled open and other years it does to prevent soil compaction, as only 15 cm is ploughed. It can therefore be said that the savings from eco-ploughing can be cancelled out under tilling the plot (personal communication, S. Muijtjens, 11 May 2021).

5.2 Mixed crops

This subchapter is divided into strip cultivation and pixel farming because for this type of cultivation it is essential to make an investment and for mixed cultivation it is not. For mixed cultivation, only the purchase of the seed is more expensive. Indeed, the cost of the seed is between €500 and €800 (Herb-rich grassland, 2018).

5.2.1 Strip cropping

To apply strip farming on a farm, it is essential that an investment be made. In this FAB measure, the calculation assumes an area of 25 ha. The first investment that is important is a sprayer. It depends on how

wide the strips will be on the plot. This can

range from 3 to 36 metres. It was chosen to be from strips of 36 metres. And this requires a sprayer that is 36 metres wide. This investment costs €59,000 with a residual value of 15% is €8,850 after a lifespan of 10 years. To this must be added variable costs such as fuel, labour and maintenance. This calculation takes into account 4 sprays. So fuel per ha comes to €5, labour to €8 per ha and maintenance costs of 2% to €12 per ha. Total this comes out to €75 per ha. And option is the contractor, the contractor costs €27 per ha (Voort, 2018). In this case, it can therefore not matter to do the

investment for 25 ha to start spraying. Besides spraying, fertigation was chosen (option 1). The investment of drip fertigation requires a pumping system and tap set. This

investment costs €83,300, to which must be added the drip hoses of €2300 per ha new. These hoses can last for 2 years. The labour involved for laying down and clearing the hoses comes to €210 per ha. And then comes the maintenance and checking of the strokes. This comes to €175 per ha. The total costs

per ha then come down to €2,970 and for option 2 the contract worker costs €3,000 per ha.

This was revealed in a conversation with VOF Dogterom (I. Dogterom, personal communication, 4 May 2021).

Furthermore, there are costs such as headland loss of 5% (Economic exploration of strip cropping with fixed row paths, 2020). As yields, the only thing that can be filled in is that crop quality is increased due to less forage damage of 2-10% (Strip cultivation much promising, 2020).

Table 5.4 Strip cropping costs and benefits

	Strip cultivation € per ha	
Option 1 sprayer	€	75
Option 2 contract worker	€	27
Option 1 drupper fertigation	€	1.820
Option 2 contract worker	€	3.000
Loss of headland	€	344
Longer-term more revenue	€	413

5.2.2 Pixelfarming

For pixel farming, option 1 includes an investment in a 'Robot One', this Robot One is still under development but can do tilling, hoeing and seeding. The investment in a Robot One costs €185,000 and has a residual value of 15% of the purchase price of €27,750. The

lifetime of the machine is 10 years, this costs per ha when 1 operation per year is done with it €629. Maintenance sits at 2% and amounts to €148 per ha. Furthermore, the cost of

pixel farming the same as for strip cropping. This includes the drip-fertilisation option 1 and option 2 and, lastly, headland turning costs. In yields, crop quality is also higher, further it can be said that pixel farming is still in its infancy and no further substantiated figures are known yet (personal communication, C. Hoetmer, 18 May 2021).

Table 5.5 Pixel farming costs and benefits

	Pixelfarming € per ha	
Investment Robo	€	629,00
Option 1 drupper fertigation	€	1.820
Option 2 contract worker	€	3.000
Loss of headland	€	344
Longer-term more revenue	€	413

5.3 Crop rotation

To extensify crop rotation, it is possible to make one or more investments. The first investment is an investment in a pneumatic seeder 4.5m, this investment costs €27,000 with a residual value of €4,050 (15% of the investment) with a lifetime of 10 years. Here, 50 ha per year are worked and the price per ha comes to €46 (Voort, 2018). The variable costs are fuel, labour and maintenance. For fuel, €15 is charged, depending on which tractor is in front of it and the weather conditions. From the demo farms, it appears that €15,- is an average for the fuel consumption of a 4.5m pneumatic seeder. The labour cost per ha is €14,- (assuming a working width of 4.5 m and a driving speed of 5 km per hour, so that 2 ha per hour are sown). Maintenance is 2% of the investment value and amounts to €540. Per

ha, this total comes to €86. Next comes option 2 and this is the contract worker, this is charged at €95 per ha (Voort, 2018). It is therefore interesting for an agricultural entrepreneur to take on the investment of a seeder. Next comes the second investment, here option 1 is the combine harvester 400 KW with an investment of €400.00,- and a residual value of €60,000 (15% of the investment). The combine harvester has a lifespan of 10 years and threshes 50 ha per year. This brings the price to €46 per ha, plus the variable costs of fuel of €40.

Table 5.6 Crop rotation costs and benefits

Crop	rotation € per ha	
Option 1 seeder	€	111
Option 2 contract worker	€	95
Option 1 combine harvester	€	960
Option 2 contract worker	€	220
Longer-term more revenue	€	1.031

cost per ha. The variables cost of labour is €10 per ha due to 2.6 ha being harvested per hour and 1 labour hour costs €27.14. Maintenance is 3% of the investment value and amounts to €240 per ha. Total

this comes out to €940 per ha. Option 2 is the contractor for threshing, the contractor costs €220 per ha (Voort, 2018). So it is not interesting to take on the investment of a combine to extensify the cropping plan. Besides the investment, there are returns that are a positive consequence of extensifying the cropping plan. By extensifying the cropping plan, there will be an organic matter increase and in the longer term, crop yields can be expected to increase up to 15% (Valuing soil water measures, 2016). Furthermore, crop quality will also increase more but there are no further exact figures on this (personal communication, S. Muijtjens, 11 May 2021).

5.4 Cover crops

With cover crops or also known as green manures, there is a difference in whether to drive a green manure crop over winter or drive the green manure crop over before winter. The investments are the same for both and are therefore explained together. An area of 50 ha is taken into account.

To grow a green manure crop, seed is needed. The cost of the seed depends a lot on which green manure crop is chosen. In this FABulous Farmers Template, Japanese Oats was chosen. This seed costs €90 per ha (Japanese Oats, 2019). As investments, there are three points, the first investment is a pneumatic 3m with a 1400-litre tank. This investment costs €25,000 the residual value is €3,750 (15% of the investment). With a lifespan of 10 years, the price per ha comes to €43. Next come the variable costs. In the FABulous Farmers Template, these are added together because otherwise the table became too large. In this description, these have been broken down. Fuel consumption €17 per ha, this is a result of when a 3m wide machine drives 4 km per hour, 1.2 ha per hour is sown. With labour, this therefore costs

€22.62 per ha and maintenance costs 2% of the investment is €10 per ha. Total this comes to €49.62. This includes option 2, the contract worker. The contract worker costs €80 per ha (Voort, 2018). It is therefore attractive for a farmer to buy a pneumatic seeder himself. Next comes the 2^{de} investment the carried centrifugal spreader 3000 litres for a width of 12 to 36 metres. This investment costs €20,000 and has a residual value of €3,000 after 10 years. The residual value is 15% of the investment value. To this must be added the variable cost of fuel is

€2 per ha and labour €5 per ha in addition, maintenance of 2.5% is €10 per ha. In total, this comes to €51 per ha. With option 2, the

contractor, the contractor comes for €27 fertiliser spreader (Voort, 2018).

Finally, the final investment for cover crops. Here, a four-barrow plough was chosen to work the green manure under. This investment costs €17,500 and has a residual value after 10 of €2,625. For variable costs, fuel is calculated €30.60 and 1 hour per ha is ploughed so labour is €27.14 and finally maintenance costs of 5% is €17.50 per ha. This comes to a total of €105.24.

And for option 2 the contractor costs

€136, so it is more interesting to carry out this investment yourself as an agricultural entrepreneur (Voort, 2018).

Subsequently, yields for green manure crops will not go over winter. Crop yields will increase up to 3% in the longer term (Valuing soil water measures, 2016) (personal communication,

S. Muijtjens, 11 May 2021). Depending on which green manure is to be put, there is a saving on fertilisers. When a legume is sown, the legume can bind 20 to 30 kilos of nitrogen in the soil. If it is calculated with 25 kg of nitrogen fixation in the soil and 1 kg of nitrogen costs €1.14 (Voort, 2018), €28.50 kg of nitrogen can be saved per ha. In addition, savings are also made by green manure from runoff. 100 kilos of KAS can be saved and the cost of this is €21.43 (Voort, 2018). Finally, the last saving and this is pesticides, a green manure crop gives a reduced pressure of weeds so there is less need to spray. This saving can be as much as €12 per ha (personal communication, S. Muijtjens, 11 May 2021).

For the green manure crop going over winter, there is only one difference to note. And that is in the longer term yields will be up to 6%

Table 5.7 Green manure not wintering about, costs and benefits

Green manure not the winter over	€ per ha
Option 1 seeder	€ 93
Option 2 contract worker	€ 80
Option 1 fertiliser spreader	€ 44
Option 2 contract worker	€ 27
Option 1 team	€ 105
Option 2 contract worker	€ 136
Longer-term more revenue	€ 206
Less fertiliser	€ 50
Spraying fewer herbicides	€ 12

Table 5.8 Green manure over winter, costs and benefits

Green manure about	winter€ per ha
Option 1 seeder	€ 93
Option 2 contract worker	€ 80
Option 1 fertiliser spreader	€ 44
Option 2 contract worker	€ 27
Option 1 team	€ 105
Option 2 contract worker	€ 136
Longer-term more revenue	€ 413
Less fertiliser	€ 50
Spraying fewer herbicides	€ 12

increase (Valuing Soil Water Measures, 2016) (personal communication, S. Muijtjens, 11 May 2021). This is because the green manure crop over winter builds up more organic matter than the green manure crop before winter is driven over. Furthermore, there are no savings as nitrogen fixation does not take place in winter due to temperature (personal communication, S. Muijtjens, 11 May 2021).

5.5 Organic matter input

This section explains the various costs and benefits, namely of crop residues, green manures, solid manure, compost, champost and bokashi. This does not consider what nutrients are in the manure. However, some have to be incorporated into the soil. For this, soil is cultivated, the cost of which is €56 per ha (Voort, 2018).

5.5.1 Crop residues

To leave crop residues on a plot adds additional costs. Research has been done on whether wheat straw should be shredded or not. The cost of this when the straw is chopped is €40 per ha. This includes the additional cost of diesel and maintenance of chopping the straw by the contractor (demo farms). If the straw is not disposed of, a direct financial return (lost revenue) is missing. The revenue from the sale of the straw would generate €528, of this the baling will be €100

collected and the transport of €26. This leaves foregone revenue of €402 (Voort, 2018). Longer-term yields of the more intensive crops from crop residues are up to 1% higher if the straw is not disposed of (personal communication, S. Muijtjens, 11 May 2021). In the FABulous Farmers Template, the 1% yield taken is potato from the KWIN 2018. And finally, there is a saving of €65 per ha. This saving is based on no straw being disposed of and the straw contains a number of minerals. If these minerals are reintroduced separately, it costs €65 per ha (Which choice do you make: chop straw or dispose of it, 2020).

Table 5.9 Crop residues costs and benefits

Crop	residues€ per ha
Incorporating crop residues	€ 56
Straw shredding	€ 40
Straw sales	€ 402
Longer term revenue	€ 69
Less fertiliser	€ 65

5.5.2 Green manure

Green manure crops are included again in this FAB measure because it contributes to organic matter content. In the FABulous Farmers Template it is therefore double in there, here the costs and benefits are filled in the same and FAB measure 5 in the FABulous Farmers Template also refers to FAB measure 4.

5.5.3 Solid manure

Solid manure costs consist of spreading the manure and working it into the ground. In these calculations assume no payment for solid manure. For manure spreading, €125 is mapped (demo farms). This assumes spreading 20 tonnes of solid manure per hectare. To work in the solid manure, as already mentioned, the €56 is calculated with cultivators. Furthermore, with solid manure there is the problem of weed seeds in it because the manure is not composted to 60 degrees. Therefore, with solid manure there is a weed increase of up to 10% (personal communication, S. Muijtjens, 11

May 2021.) As yields, reports indicate that solid manure gives a yield increase of up to 5% (Valuing soil water measures, 2016).

Table 5.10 Solid manure costs and benefits

Solid	manure€ per ha
Spread and embed	€ 181
More weeds	10%
Longer term revenue	€ 344

5.5.4 Compost

GFT compost costs €4.50 per tonne. The FABulous Farmers Template calculates with 20 tonnes of GFT compost per ha the total cost is thus €90 of GFT compost. Added to this is the spreading of the compost. For spreading, €125 is charged. And further as costs, practice shows that compost is not composted very well, as there is still a 1% increase in weeds by using compost when this would not be possible after composting (personal communication, S. Muijtjens, 11 May 2021). The yield increase of compost can be as high as 5% (Valuing soil water measures, 2016).

Table 5.11 Compost costs and benefits

Compost	€ per ha
Purchase of compost	€ 90
Spread	€ 125
More weeds	1%
Longer term revenue	€ 344

5.5.5 Champost

For the purchase of champost, again a purchase of 20 tonnes per ha is assumed. Per tonne, champost costs €3.50. In total, this will come out to €70, to which is added the spreading of the champost, which is €125 per ha.

Champost must be incorporated immediately once it has been spread. The cultivator cost is €56 per ha. Remarkably, there are no weeds at all in champost. This is because champost is kept at 70 degrees for 12 hours and no weed seeds, pathogens or nematodes are left in it. (Champost, sd) When champost is used on a plot, the additional yield can be as high as 5% (Valuing soil water measures, 2016).

Table 5.12 Champ costs and benefits

	Champost€ per ha
Purchase champost	€ 70
Spread	€ 125
Inclusion	€ 56
Longer term revenue	€ 344

5.5.6 Bokashi

To spread bokashi on a plot, it is necessary to buy bokashi or to ferment it yourself as an agricultural entrepreneur. DLV Advies has calculated that the cost of bokashi is €12 per tonne to do it yourself as an agricultural entrepreneur (Bokashi you don't make just like that, 2019). There is in the FABulous Farmers Template calculated at €12 per tonne and 20 tonnes were assumed, so that comes to a total of €240. To this is added the spreading of the bokashi and this is €125. When bokashi is spread on a field, there is up to 10% more chance of weeds. And in the longer term, the additional yield will increase by up to 3% (personal communication, S. Muijtjens, 11 May 2021).

Table 5.13 Bokashi costs and benefits

	Bokashi€ per ha
Purchase of bokashi	€ 240
Spread	€ 125
More weeds	10%
Longer term revenue	€ 206

5.6 Manure quality

To get good manure quality, an investment in a composting slab where the manure can be composted is needed. In this calculation, an outdoor manure slab of 1000m² and 1583 tonnes was calculated (Manure;composting, nutrient losses and application, sd). The investment in a composting slab costs €28,219 with a lifespan of 15 years, a residual value of €4233 remains. The way to recoup the composting slab can be by delivering manure to other agricultural entrepreneurs the times in winter when, without a composting slab, manure cannot be received. Then the price of manure will go down or even €2 (personal communication, S. Muijtjens, 11 May 2021). If there are calculated at €2 toe per tonne then the composting slab will be earned back within 10 years. Depending on how the manure is stored or composted, weed pressure will decrease by 80% (personal communication, S. Muijtjens, 11 May 2021).

Table 5.14 Manure quality costs and benefits

Manure quality	By year
Purchase of compost sheet	€ 1.599
Longer-term yield	€ 3.076

6 PG-Tool

The PG (Public Goods) tool is an Excel file that helps farmers and herders test the sustainability of the farmers' and herders' farming system. The PG tool is a broad-based file that uses information that the farmer already has in his farm records. The information entered in the file is scored. And finally, the scored figures are displayed in a radar chart that gives a grower an immediate picture of the farm sustainability overview. Responses are scored on a scale of 1 (poor) to 5 (excellent). On the radar diagrams, this is indicated by green and red. The middle point is red and scores a 0.0. The further out the points go the greener it becomes and the higher the grade also becomes. This PG-Tool was completed at the six demo farms with the 2019 data and again at two demo farms with the 2020 data. From these two demo farms, the results are presented in this chapter. Company 1 is a farm from Kamperland (province of Zeeland) that farms clay and sandy soil. Company 2 is a farm with a poultry branch from Steenberg (West Brabant province) farming on heavy sandy and clay soils.

6.1 Measurements company 1

Table 6.1 shows the first radar diagram. This is the baseline measurement of company 1 from Kamperland. Then, right below it, the second radar chart can also be read from company 1 from Kamperland. The second radar chart is filled in with the company data for the year 2020.

From the first and from the second meeting, it was concluded that there are differences on 'agri-environmental management' and on 'soil management'.

'Agri environmental management' has increased from 3.5 to 3.7 points. Appendix 7 and Appendix 8 at the bottom show that 'agri-environmental participation' has increased from 3 points to 5 points. This increase is due to what Company 1 has improved with regard to environmental management. Action has been taken on environmental management, such as counting birds at long-term flower borders. The flower borders falls under FAB measure 9 this is therefore a result of implementing FAB measure 9. Further, one more difference can be concluded from Appendix 7 and from Appendix 8, as the 'habitats' has actually decreased in 2020 from 3 to 2 points. The reason the 'habitats' has decreased is because maintenance was done on the trees along the farm in 2019 and not in 2020.

'Soil management' has been taken from 3.5 to 4.3. This can be seen in Tables 6.1 and 6.2 of Company 1 from Kamperland. The increase in 'soil management' can be concluded from the Appendix 7 and from Appendix 8. The differences with the second meeting of

company 1 from Kamperland are 'soil analysis' and 'soil management'. Annex 7 and Annex 8 show that 'soil analysis' increases from 1 point to 3 points. This is because more soil analyses are taken. Another difference can be seen from Appendix 7 and from Appendix 8, as 'soil management' increased from 4 to 5 points. The reason for this increase is that there is less bare soil left in winter, a FAB measure 4 'cover crop' also said as green manures passing winter has been used. Lastly, it can be seen the Annex 7 and from Annex 8 that 'cultivation' shows no points. This is due to the fact that there is no erosion in the South-West region and therefore no points counted.

Table 6.1 Zero measurement of company 1 from Kamperland

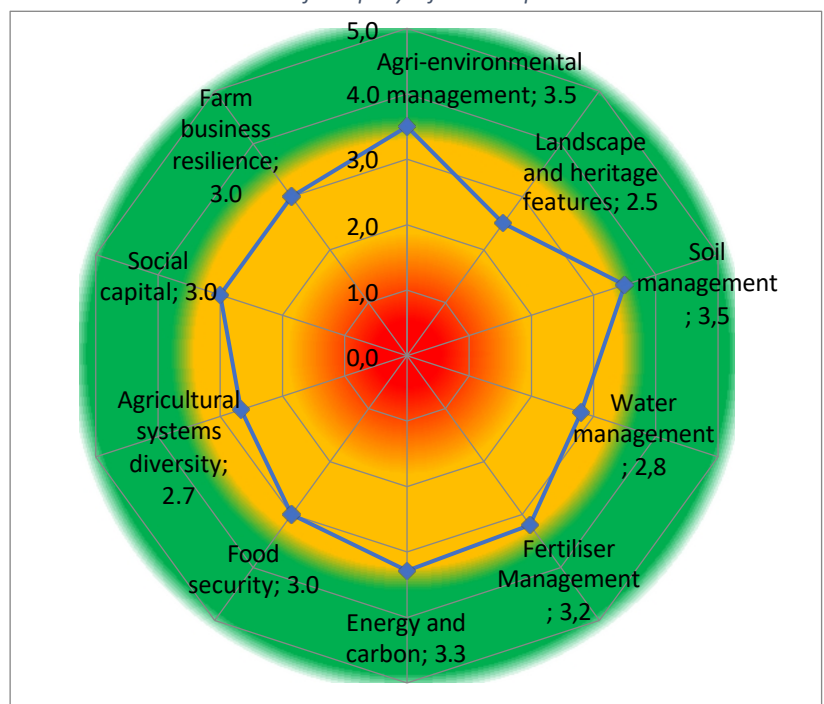
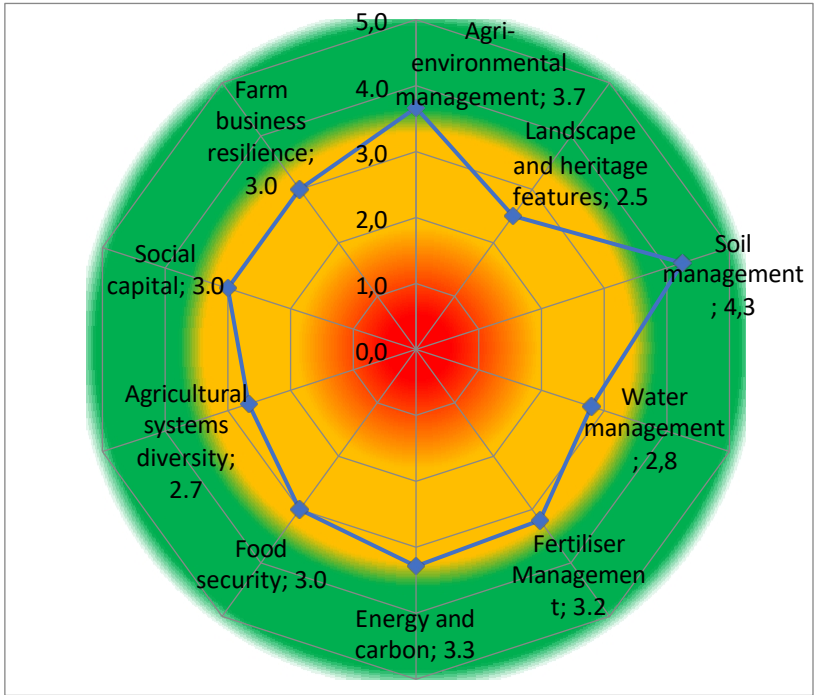


Table 6.2 Second meeting of company 1 from Kamperland 2020



6.2 Measurements company 2

Farm 2 is a mixed farm, this farm has an agricultural branch and a poultry branch. Here, first the baseline measurement was done with the 2019 figures. And then another measurement took place on farm 2, this second measurement was with the 2020 figures. Below in table 6.3 is in the radar diagram with the baseline measurement.

Table 6.3 Zero measurement of company 2 from steenberg 2019

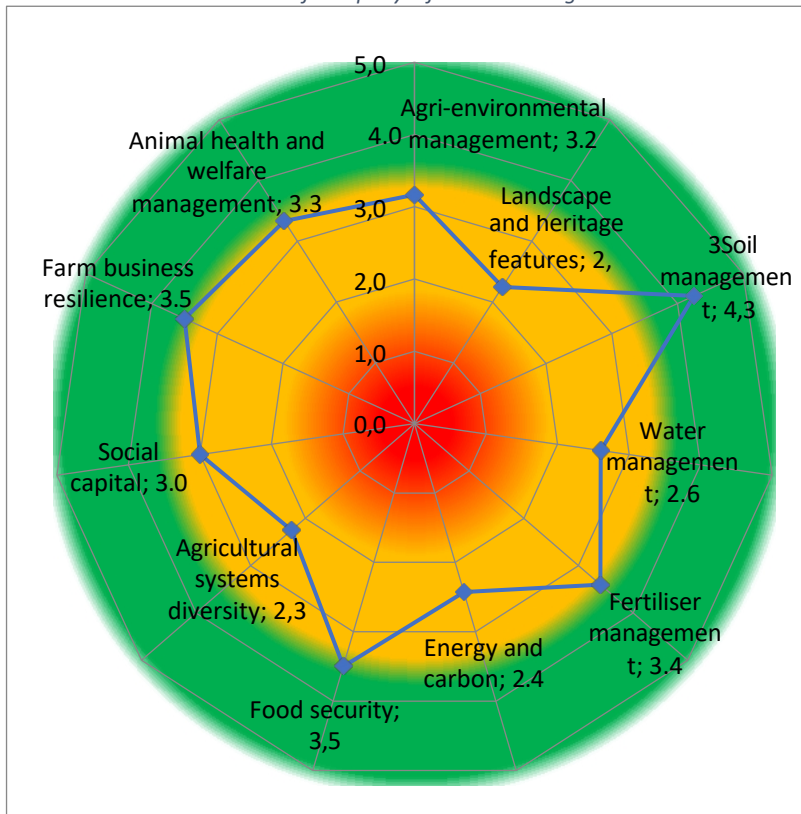


Table 6.4 Second meeting of company 2 from Steenbergen 2020

From the radar charts tables 6.3 and 6.4 a difference can be concluded. The first difference is 'soil management', this is at the zero measurement table 6.3 4.3 and at the second meeting table 6.4 4.5. The difference can be traced in the appendices. In annexes 9 and 10 at 'soil management' and again 'soil management', a difference can be concluded. In the zero measurement 3 points were measured and in the second measurement 4 points were measured. At company 2 from Steenbergen, more hectares went over winter with a green manure crop. This is an adjustment based on FAB measure 4 cover crop.

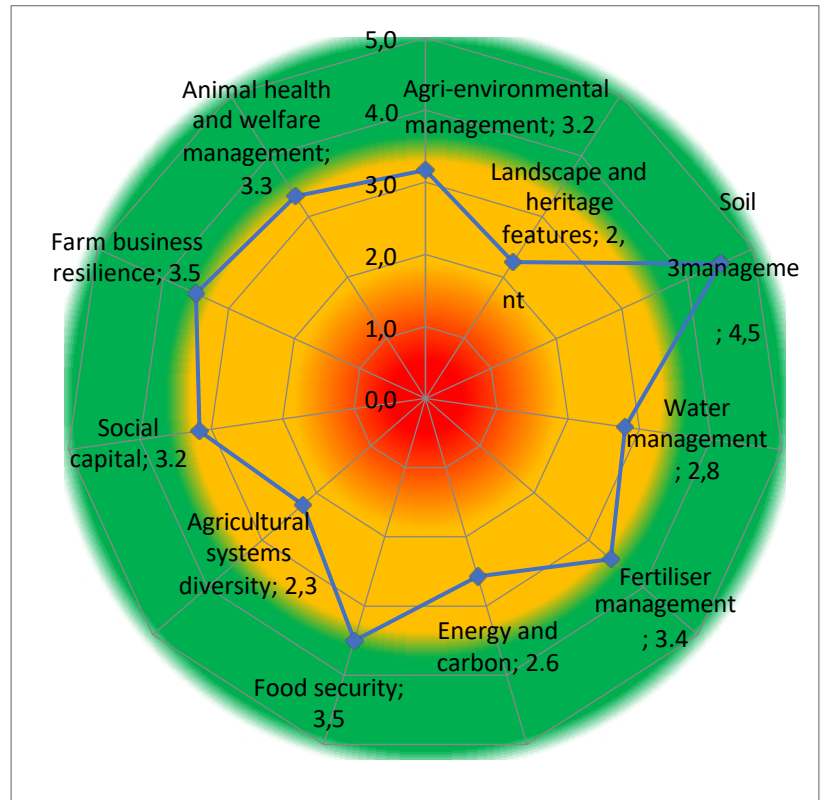
Furthermore, there has been an increase found at 'water management' this increased from 2.6 to 2.8 points. This can also be seen in Tables 6.3 and 6.4. In Appendices 9 and 10 to the theme 'water management' and the heading 'irrigation', a difference can be observed from the baseline measurement to the second measurement. In the zero measurement in Appendix 9 is that 3 points and in Appendix 10 at the second measurement is that 4 points. The change at the irrigation system of farm 2 is an extra pressure meter to irrigate with the same amount of pressure on each plot. This is not a result of implementing a FAB measure within the farm but does score better on sustainability.

Next, there is another difference to conclude and that is 'energy and carbon', it increased from 2.4 to 2.6. This difference can also be seen from Tables 6.3 and 6.4. The final difference between the baseline measurement and the second measurement is 'land use change', this has increased from 3 to 4. Tables 6.3 and 6.4 show this. The difference can be concluded to the fact that trees were planted in 2020. This is a result of implementing a FAB measure 'agroforestry' on the farm.

Finally, it can be concluded from Tables 6.3 and 6.4 that 'social capital' has increased from 3 to 3.2 in 2020. From Appendices 9 and 10 to the social capital theme, 'employment' shows that the score has increased from 3 to 4. This increase is a result of higher employment at company 2. The higher employment is based on the number of hours and hectares cultivated with the building plan. There has been a minor cropping plan adjustment and a shift of crops. For instance, the acreage decreased by 10 hectares and sunflowers were removed from the cropping plan, replaced by a rest crop. This has reduced employment. The building plan adjustment is FAB Measure 3 where a positive change has taken place.

Differences between the 2 farms can be seen in tables 6.2 and 6.4. The table also shows 'animal health and welfare management' at farm 2 in Steenbergen and not at farm 1. The difference here is that company 2 has a poultry branch and company 1 does not.

In summary, two FAB measures were applied at farm 1 from Kamperland in 1 year, the results of which became visible using the PG tool. These are the FAB measures 'cover crop' and 'field margins'. At farm 2, three FAB measures were applied with visible results from the PG-Tool. The following FAB measures applied, 'crop rotation', 'cover crop' and 'agroforestry'.



7 Interest agricultural entrepreneurs

This chapter presents the results of the survey conducted among agricultural entrepreneurs from West Brabant who expressed interest in the FABulous Farmers project.

7.1 Research design survey

In this study, there is field research and full random sampling, meaning that there is a full sampling frame (interested members file in FAB measures). Furthermore, there is a census because the number of the research target group is 30. The ZLTO determined the census, the census consists of the agricultural members of the ZLTO who are interested in the FABulous Farmers project in the West Brabant region. The census also makes the survey representative and reliable because the entire research target group is asked. The census was contacted by telephone to go through the survey one by one. A separate document was created for each respondent to create a good overview for ZLTO to know which respondent was interested in what (see Annex 11). All documents were checked within ZLTO and put into Excel file. An Excel file could then be used to create a pivot table to have a totally clear overview of what respondents were interested in.

7.2 Survey results

The survey results are summarised below to in Table 7.1.

Table 7.1 Outcome Survey

FAB - measure	Respondents West Brabant	Number interested parties	Supporting need
1.	Reduced tillage techniques	28	20
2.	Mixed crops	20	6
3.	Crop rotation	20	12
4.	Cover crop	30	10
5.	Organic matter input	23	7
6.	Manure quality	27	4
7.	Agroforestry	6	3
8.	Construction and management of hedgerows	4	1
9.	Field edges	17	3
10.	Mechanical and biological crop protection	27	8

From the result, it can be concluded that there is most interest in FAB measures 1,2,3,4,5,6,9 and 10. In FAB measures 2,3,5 and 9, however, there is less interest than for the others. In FAB measure 7 and 8, very few people are interested in it. What further stands out is the supportive need. Overall, there is less supporting need than there is interest in FAB measures 2,3,4,5,6,7,8,9 and 10. This is the result of many agricultural entrepreneurs saying that there is interest, but that it is not yet implemented in the farm and thus there is no supporting need yet.

Conclusion

In this internship assignment, the following main question was answered: *'What are the additional costs and benefits for an agricultural entrepreneur when the agricultural entrepreneur implements one or more of the ten different FAB measures on the farm, what social services does the agricultural entrepreneur provide by doing so, and in what way can compensation be offered in return?'* A quantitative and qualitative study was conducted for this purpose.

This conclusion answers the sub-questions. The first sub-question is; *what do the FAB measures consist of?* The first FAB measure consists of reduced tillage techniques, this includes several topics such as; non-dressing tillage, fixed row paths and eco-ploughing. FAB measure 2 consists of strip farming, pixel farming and herb-rich grassland. FAB measure 3 consists of extensifying crop rotation. FAB measure 4 consists of growing green manures. FAB measure 5 consists of using crop residues, green manures, solid manure, compost, champost and bokashi. And FAB measure 6 consists of manure quality.

The second sub-question is; *what are the ecological benefits of this FAB measure?* From the ecological benefits, it can be concluded that FAB Measure 2 alone does not promote carbon sequestration and water retention. However, FAB measure 2 alone does promote pollination, pest control and disease control. Water flow regulation is only not promoted by FAB measures 2 and 6. Of the ecosystem service, nutrient cycling is promoted by every FAB measure. This is the same with soil formation & fertility. FAB measure 5 alone does not promote biodiversity habitat.

The third sub-question is; *to which social services does this FAB measure contribute?* It can be further concluded that each FAB measure contributes to the social service 'education and research'. And that only FAB measure 2 contributes to aesthetic values and recreation and eco/agritourism. Finally, it can be concluded about the social services than only FAB measure 4 promotes spiritual values.

The fourth sub-question is; *what are the advantages and disadvantages (impact) of these FAB measures for business operations? Advantages and disadvantages?* (organic matter) the main advantages and disadvantages

The fifth sub-question is; *what costs and benefits should a contractor consider when implementing this FAB measure?* Of the 1^e FAB measure costs and benefits, it can be concluded that riding paths are the most expensive investment but eco-ploughing yields the least. Of the 2^e FAB measure, pixel farming is not yet developed far enough. For strip farming, it is profitable to buy a new sprayer. For the 3^e FAB measure, it is only profitable to purchase a seeder. Extending the cropping plan will result in 15% higher yields in the longer term. For the 4^e FAB measure, it is much more profitable to extensify the green manure green over winter. This gives a higher result in the longer term. In FAB measure 5, fixed comes out best as it is the cheapest. And lastly FAB measure 6, it is profitable to purchase a composting plate. (make table, total investments, total returns per fab measure)

PG tool conclude

Farmers' interests in FAB measures are mainly in cover crops, reduced tillage techniques, manure quality and mechanical and biological crop protection. Indeed, at least 27 respondents are interested in these. In agroforestry and construction and management of hedgerows, no more than 6 are interested. It is notable that few agricultural entrepreneurs want support needs. In FAB measure 1, most (20) agricultural entrepreneurs want supportive need.

From this internship assignment, it is concluded that each FAB measure requires different investment to implement this FAB measure in the company. With this comes other costs. The merits that this is going to yield is through better quality of the product and producing more tonnes of a product. And quality and quantity of tonnes is determined by the organic matter condition in the soil. If the organic matter content goes up, then the quality and tonnes go with it .

Recommendation

This internship assignment has shown that on by implementing different FAB measures in a farm that there will be a yield increase in the longer term. For this reason, it is recommended to combine FAB measures with implementation. This will already show results in the shorter term. The next recommendation is make sure there is compensation against social services. Either make this a separate certificate or combine it with Carbon Farming. This way, the FAB measures can be implemented faster on a farm and then it is even more attractive for the agricultural entrepreneur.

Personal functioning

This chapter describes how I functioned within ZLTO's programmes department. After a 20-week internship period, I can look back positive period where I grew in my knowledge. The subchapters describe my learning objectives, how I fit within the culture, thought process about business, network building and the criticism of my functioning within the organisation.

Learning objectives

The learning objectives I drew up were discussed with the internship supervisor and the internship teacher at the beginning of my internship period. Every Tuesday, I had a meeting with my internship supervisor Wico Dieleman and with Tijmen Hoogendijk. Here the progress of my internship was discussed, the issues surrounding the project, peculiarities within ZLTO and my learning objectives were also discussed. For each learning objective, they discussed how I could work on it. The learning objectives I worked on were:

- Improving my English. During my internship period, I had to deal with speaking English. This occurred because the project is an international project and there was that much contact also with foreign countries. In the Excel file FABulous Farmers Template I had to deal with English terms, furthermore the PG tool was also a full English file which I filled in. And finally, I attended project meeting and there was email contact with partners. All this was done in English. After my internship period, I can say that my English has improved.
- Being able to accept other people's comments better at work. With this learning objective, I had a lot to do. In preparing the FABulous Farmers Template, because in this file I made a lot of adjustments such as putting calculations in it and the English wording of headings. There was very critical feedback on this in the first 10 weeks. From the feedback I learned and this I can now accept better. The first time there was feedback, I was able to accept it well, but after the second feedback on the same piece I found it difficult. By talking about this at home, this improved and I was able to accept it better. If I would get feedback now, I would be more critical myself, so I wouldn't get feedback about the same piece after two times.
- Improving my empathy. During my internship period, I had to deal with a lot of different and especially new people. For me, it was a challenge to show empathy to these people in addition to the business part. Talking to people and continuing to show interest definitely helped this. I continued to show interests because I wanted to fit myself into the culture. The trigger for me was wanting to get to know people, because later I want to continue in the agricultural sector and it is important that I know people. Hence the saying 'it's not about what you can do, but who knows'.
- Getting a broader orientation in the agricultural sector. During my internship period, I had to deal with several companies I had no knowledge of at all. For instance, I was able to familiarise myself with the zero measurement in a cattle farm and a fruit farm. What I learned at these farms was what it takes to produce milk and how a livestock farm works. At a fruit farm, I also learnt how farms are roughly structured. Here, the interesting points for me were fertilisation in orchard and irrigation.
- Delving further into the added value of a FAB measure. During my internship period, I regularly dealt with a FAB measure. First, I figured out exactly what a FAB measure entailed and then I looked at if I implement this FAB measure at home in the company or at another company, what can become the added value for the company. I discussed this with my internship supervisor and with the demo companies. I learnt from this and will take this with me to my father's organic farm.

Within the organisation

At the start of my internship, I first met my internship supervisor online. Fortunately, during the first week I was allowed to visit the Colijnsplaat office despite the Corona. Then measures were tightened again and I was allowed to visit the office less often. From the 11^e week of my internship, I was allowed to visit the Colijnsplaat office once a week again. Because I couldn't go to the office very often at first because of the Corona, it was difficult to fit into the culture of the department. By having at least an hour and a half Team meeting every week with Wico Dieleman, Tijmen Hoogendijk and Dennis Rouw

(intern Has Hogeschool) and asking a lot of questions and showing interest, I was able to fit into the culture. From week 11, this did improve when we were back at the office in Colijnsplaat. Here I did then improve my empathy to fit into the culture. At the office, I was also able to strike up a conversation with several people from the ZLTO over coffee. During lunch, we went for a short walk to stretch our legs. While walking, I was able to ask good questions to fit in/make myself feel more at home within the culture.

By having a chat with everyone at the Colijnsplaat office, I have built up contacts, also networked through the project such as the demo companies, a consultant and the contacts abroad from the project. Of the demo companies, there are also 2 companies that I could share any knowledge with or benefit from later in my career. Furthermore, the contacts within ZLTO I could go to with any questions later in my career in the agricultural sector. I could also approach the advisor with any questions I might have later on in my career. Throughout the discussions with the advisor, I have also asked several questions about my father's organic farm at home. The same applies to the contacts abroad, I could also possibly contact these people later in my career which would also have a positive effect on my English.

My English did catch up during this internship, due to the criticism I received on the FABulous Farmers Template from ZLTO, in the file I have been working on adjusting the English terms in the tables. At the beginning of my internship, I found it difficult to accept the feedback and customisation because there was a lot of criticism and where I could actually start all over again. But the further the internship progressed, this went better and better. Besides the criticism on the FABulous Farmers Template, I received feedback on the English mails, I learnt a lot from this. Besides the criticism I got on my work, I also got criticism on functioning within the organisation. Such as working more with the other intern to share the data we had both collected and help each other more with the assignment. The further criticism I received was that I was not allowed to say 'you' to the people within ZLTO. This took me a lot of getting used to within the organisation. By paying close attention to it, this worked out reasonably well with the occasional slip of the tongue.

Furthermore, the focus of mine was whether I started thinking differently about the issues that affect business. And in doing so, I have come across the fact that I don't want to work in an office or behind a desk all my career. Variety is a must for me though, to do something else in between coffee and lunch. The reason for this is that I cannot work behind a computer all day in a concentrated way for several weeks. For the future, this also has the consequence that when I finish my studies, I won't be working entirely in the office on my father's organic arable farm. My work ethic now was to start early in the morning 6 to 7 a.m. and then do a round halfway through the day and after it, return to my internship until the evening to break up the day and get out of the office. This was therefore only possible if I could work from home. When I was in Colijnsplaat, there was only the occasional small round. When I was in Colijnsplaat at the office, we always had a meeting. With this meeting, it was mandatory that an agenda was sent out and then the minutes. In the beginning, I actually found this unnecessary, but as time progressed my internship became nice to still have a look at the minutes or action points. This is definitely something to make use of later in my career.

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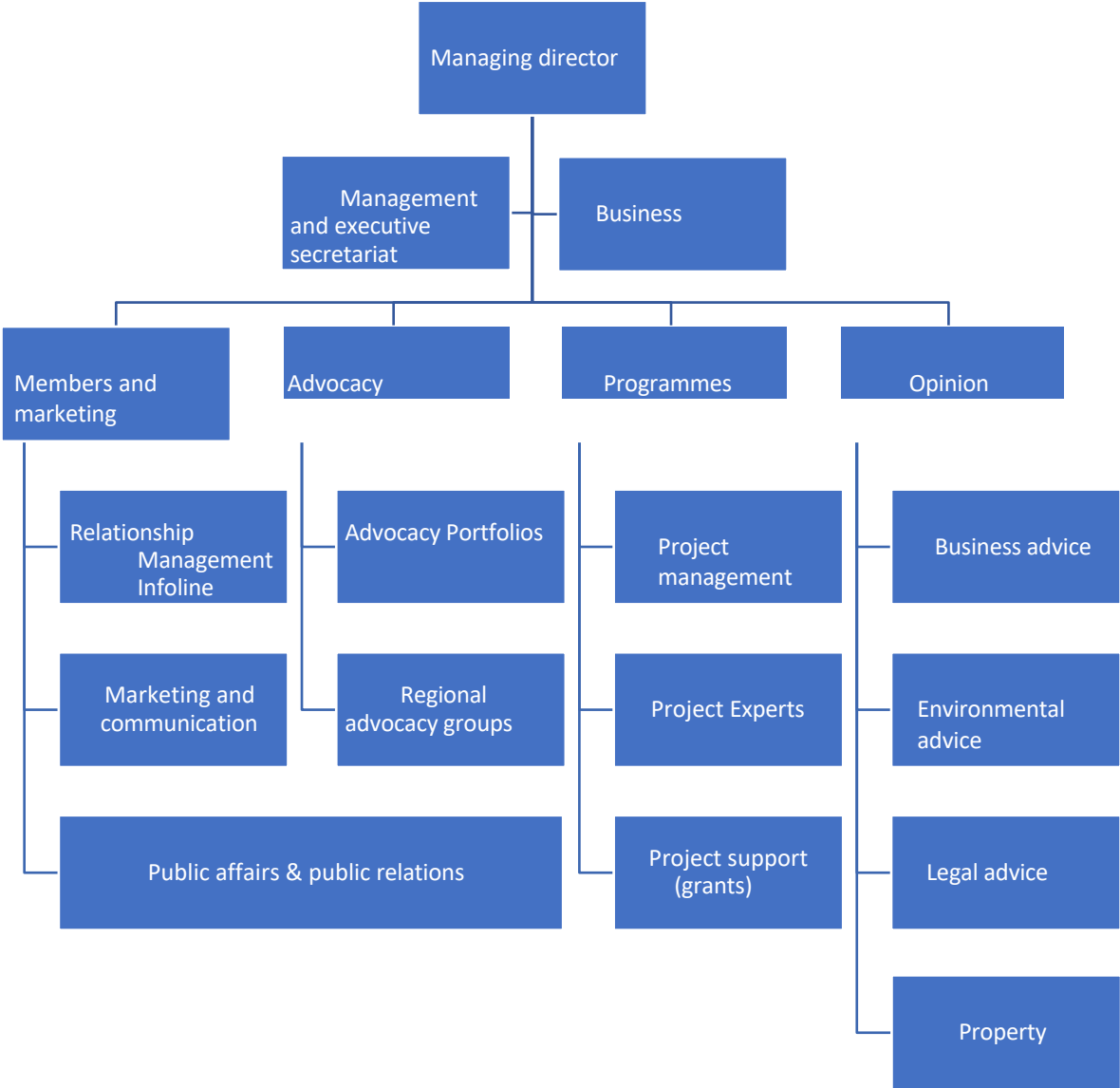
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Annex 1 confrontation matrix

		Strengths			Weaknesses	
		Large Network	They really know how it works within the sector	Sit at the table of many organisations	Interests - advocate still needed	Public affairs
Opportunities	Public affairs	Expand			Improve	
	Stricter regulation					
Threats	Difficult to understand	Defending			Core issue	
	The shrinking number of farmers					
	Financial erosion					
	Stricter regulation					

Annex 2 organisational chart ZLTO



Annex 3 Interview 1

Interviewee: Aniek de Jong

Position: project support

Company: ZLTO

Date: 3-3-2021

Strategy

- What are the strengths of the ZLTO?
ZLTO's strengths are that ZLTO is divided into different skills such as: advocacy and programmes, advice and so can ZLTO serve its stakeholders well? A
Another strong point is that there are many departments so there is a lot of knowledge and expertise.
- What are the weaknesses of the ZLTO?
The strengths are actually also a weakness, for example you just have something wrong with your neighbour and he is on the board of the ZLTO. Then yourself will not join the ZLTO.
- What is the ZLTO's strategy?
ZLTO's strategy is on several levels. The most important is representing interests. The purpose of representing interests is to allow entrepreneurs to do business in the green world. Furthermore, financial input comes from Vion, as ZLTO is a major shareholder of Vion. From the work organisation and from LTO nationwide, this goal is also pursued.
- There are several competitors, Delphy and DLV is a competitor with a project. LBI and WUR are very executive but are fishing in the same pond as ZLTO. Furthermore, Farmers Defence Force and Agraction can also be seen as competitors with advocacy this Ms De Jong does see as populism. There is also competition from Van Dun in the advisory branch.
- Is there a difference between the formal structure and the informal structure?
Super informal, always very personal also the director. Everyone is in the Whatsapp group and you can just call anyone

Structure:

- Horizontal or vertical division of labour?
There is a vertical division of labour. It is discussed together who gets which task. And there are more groups divided with each other (clusters). Recently there have also been core teams, in a core team there is someone from member marketing and advocacy so jobs are picked up together.
- Does everyone have their own task or do they also swap tasks?
A reorganisation has been done recently. So there is still a transition now. As a result, people still have the wrong position for what the employee does.
- Who reports to whom?
There is always 1 person responsible in the cluster, the employee reports to the manager and then the manager reports to the Director Ms Goense
- Who is responsible for which issues?
Each project has an ipl (internal project leader) but everyone has their own responsibility for their tasks
- How much freedom do employees have to make their own decisions?
Up to achieved powers in your project may be decided by yourself.

Systems

- How are the processes within the company managed?
When there is an idea, it goes to the project committee. This committee looks at how it looks financially and whether it matches the spearheads. When there is an agreement, a decision is made. Then it is implemented with a financial process (A-phase system), (how many hours and how much cost).
- What IT systems are being used?
the systems exist sharepoint, CRM system for supplier and customer contacts, Afas Insite for financial and still just A-fas.

- Outline the main processes (at least the primary process)
Knowing what your members want, and seeing what they may be up against. Making space for entrepreneurs make it possible for entrepreneurs to continue doing business.
- How does management know if the results match the targets?
Management is also just on the shop floor so there is a lot of contact between them. And if something goes wrong in the field, the management is addressed and the management links back.
- Feedback to employees on business results, how?
ZLTO is an association so no profit is made, but it is cost revolving.
- What does your profit consist of?
European grants, provincial contributions, water boards, governments LNV, EZ, Justice and security.
- How does ZLTO get feedback on farm performance?
Monthly management reports are sent out, furthermore, twice a year everyone is invited to the presentation of company results.

Staff

- In what ways is ZLTO improving the skills of its staff?
There is a training budget, if an employee wants to take a course it is facilitated and you can discuss it with your manager. Often courses from the company are also provided.
- Can employees have a say or is everything decided by the management?
There is an OR (enterprise council) that did co-decide with the reorganisation but with big decisions, it is still from the management or even board.
- How are decisions made within the organisation?
- How are new staff members recruited? LinkedIn, internally?
Employees are recruited with the help of HR department, LinkedIn. There is some reward when someone from internally brings in someone from outside.
- How are staff members motivated and retained?
Within ZLTO, everything is well organised. The salary and pension is well regulated.
- How is absenteeism tracked and minimised?
Absenteeism is low within ZLTO. There is also a confidential counsellor within ZLTO for those who are having problems about facing overwork.
- How do you ensure that the right person is in the right place?
Discussions with managers do determine the position the employee will work at based on your strengths.

Skills

- What excellent skills do employees have?
Each employee has their skills and these are mapped.
- What strong strategic points does the organisation as a whole have?
- What is the organisation proud of?
ZLTO is proud of the agricultural world as it grows and sells produce.
- What, above all, should you not do within the ZLTO? Cut corners.

Style

- What traditions does the company have?
Christmas tradition then everyone comes together, there is a serious moment in it. Easter is also when everyone comes together, once a couple of years together. In Zeeland, they do a lot of lunching together, celebrating birthdays. In Den Bosch it is bigger so it happens less. They also celebrated Saint Nicholas for a long time. And they often took part in activities such as boot camp sessions, yoga sessions, the Heart of Brabant run. This has become more diluted in recent years, though. And finally, there was also a youth programme, these young people invited speakers and went out together.

- How do managers respond to mistakes made by their employees?
Managers do really support the employees and this is what employees find a pleasant working atmosphere.
- Do managers know personal things about their staff (e.g. their family situation, when they have a birthday are, hobbies)?
Managers do often know the personal situations of employees.

Shared values

- Which slogan fits the organisation's purpose?
Farmers have the solution
- What is management doing to maintain the organisation's own identity? There are clear focal points.

Annex 4 interview 2

Interviewee: Jasmine van den Berg
Position: HR operations department
Company: ZLTO
Date: 6-4-2021

Strategy

- What are ZLTO's strengths? Creating a beckoning perspective:
 - Increasing complexity and required integrality used correctly in lobby advisory projects.
 - Overlooking the complexity of business, environment and the farmer as a human being, we focus on the opportunities for the new farm in the agricultural transition.
- What are the weaknesses of the ZLTO?
Coverage ratio, we need to improve this (recruit and retain members).
- What is the ZLTO's strategy?
 1. Putting **members at the centre of right activities** leads to better coverage and member satisfaction. Members expect ZLTO activities they joined for to do very much better than now and want to see this visible.
 - o This means focus on lobbying/public affairs, member engagement fuelled by substantive policy staff to make this happen.
 2. **Reverse financial erosion by steering for accountability.** There are some weaknesses that need to be brought to a minimum level (precondition) to do good advocacy for members.
 3. **Clarify focus & governance:** who does and determines what and is accountable for what results and reports on them?
 4. **Resources and capacity determine** the loading of the pitchfork; "*Politics, Public, Pooling and People are the core*" supported by advice (funding and knowledge) and projects (knowledge and network).
 5. **Integrality** - the choice at the heart of our activities.
- Who are ZLTO's competitors?
Basically, ZLTO has no competitors when it comes to advocacy and projects. For the Advice Department, however, there are competitors. This concerns individual advice to farmers and market gardeners.
Is there a difference between the formal structure and the informal structure?

Structure

6. Horizontal or vertical division of labour?
7. Does everyone have their own task or do they also swap tasks?
8. Who reports to whom?
9. Who is responsible for which issues?
10. How much freedom do employees have to make their own decisions?

Systems

11. How are the processes within the company managed?
12. What IT systems are used?
13. Outline the main processes (at least the primary process)
14. How does management know if the results match the targets?
15. Feedback to employees on business results, how?

16. What does your profit consist of?
17. How does ZLTO get feedback on farm performance?

Staff

18. In what ways is ZLTO improving the skills of its staff?
ZLTO talks to each employee. If it turns out that there is a development need, the best way to improve skills is looked at in more detail. This differs per question. Knowledge can, for instance, be gained through a course, workshop and/or seminar. But also through on-the-job coaching by a senior colleague.
19. Can employees have a say or is everything decided by the management?
Employees are regularly asked to help decide on new issues within ZLTO through surveys and workshops. We also have to deal with the Works Council. Through this body, employees help decide on major changes.
20. How are decisions made within the organisation?
Decisions are made by mutual agreement.
21. How are new staff members recruited? LinkedIn, internally?
Through network, linkedin, own job site, students etc.
22. How are staff members motivated and retained?
Employees are motivated and retained by the way we communicate with each other. Think about:
 - The way decisions are taken, where possible, with input from employees;
 - Good onboarding programme;
 - Development opportunities;
 - Secondary employment conditions
23. How is absenteeism tracked and minimised?
Absenteeism is minimised by having the conversation at the front with colleagues about their sustainable employability. Reflecting on the employee's state of mind. What gives them energy, what costs them energy? What is the work-life balance?
24. How do you ensure that the right person is in the right place?
This starts at the beginning by taking stock of what is needed for a particular job and selecting accordingly during job interviews. In addition, we keep talking to current employees about their wishes, needs and qualities, so that we can work towards another position in a targeted manner.

Skills

- What excellent skills do employees have?
Our core values what we stand for, what we care about:

We work together, with colleagues, members, entrepreneurs, agribusiness companies, science, education, chain partners, other sectors, governments, as well as civil society partners. We are an informal organisation and find it important that colleagues know each other personally and seek cooperation with each other. To connect from commitment, to share knowledge and thus make a joint effort for our members.

We are **experts**. We know what is going on in the sector and are committed to entrepreneurship, sustainability and innovation. To ensure this expertise, we offer our employees a company culture of trust, freedom and responsibility to develop.

We are enterprising people, result-oriented and committed to achieving organisational goals, for ZLTO and thus for our members. We offer our employees room to develop and implement new ideas in line with the strategy and within the set policy frameworks. Thus, with focus, they not only achieve the best result for members and for ZLTO, but also get the best out of themselves.

- 25.** What strong strategic points does the organisation as a whole have?
- 26.** What is the organisation proud of?
ZLTO is proud of the agricultural world as it grows and sells produce.
- 27.** What, above all, should you not do within the ZLTO? Cut corners.

Style

- 28.** What traditions does the company have?
- 29.** How do managers respond to mistakes made by their employees?
- 30.** Do managers know personal things about their staff (e.g. their family situation, when they have a birthday are, hobbies)?

Shared values

- 31.** Which slogan fits the organisation's purpose?
- 32.** What is management doing to maintain the organisation's own identity?

- 33.** Is an organisational chart available?

Annex 5 interview 3

Interviewee: Katleen Goense

Position: managing director

Company: ZLTO

Date:19-4-2021

Agricultural entrepreneurs make the Netherlands

Agricultural entrepreneurs once formed associations. These are 53 ZLTO associations that through a general assembly, a main board is elected. That main board appoints a director and that is Kathleen. The director then appoints the work organisation.

RLTOs LLtb, LTO Noord and ZLTO formed LTO Netherlands in 2015. The membership fee is partly passed on to LTO Netherlands.

Kathleen is on the LTO board and from here an annual plan with budget is made every year. From this budget, communication with Brussels and The Hague is paid for.

For agricultural entrepreneurs, it is important to be local with water board and municipality. Regionally in terms of energy strategies, but also provincially. These are tasks of ZLTO. But also nationally and in Brussels.

LTO family has 400 employees and ZLTO employs 145/150. 1,300 farm managers in the specialist groups.

Kathleen has always led organisations. Where should the organisation go and how will we do it.

Among members, it was not clear what they were actually paying for and saw little result. There was also a lot of confusion within the organisation about what ZLTO was doing.

Over all advocacy parties in the Netherlands, the highest coverage rate. ZLTO is slightly below 60%. 6500 farm heads and 13000 members. LTO noord has 12000 members. LLTB has 2000 members.

Kathleen reports to the board. There is super much work for the staff.

Together with the board, a process was set up. This involved investigating what the members now expect from ZLTO, because then this could be worked on. The following four points came out of this:

- Self-esteem
- License to operate (ensure in politics that we can do business)
- Pulling (I am impotent on my own)
- Social

These outcomes come from all ages of agricultural people. How can the ZLTO continue to exist for another 100 years?

- Money has to come in another way?
- The Netherlands should be proud of a Netherlands in terms of agricultural entrepreneurs.
- Ultimately, an advocate will always be needed. Because there has to be someone who can sit at the minister's table.

Before Kathleen came, a lot was unclear. Managers didn't really know what their people were doing. Everyone mixed up and because of this there was a lot of consultation. It was then that a member could call up and say I want this to happen. Now this has to be arranged through the projects committee. This also made it difficult to stay within budget. Staff also had a broad job profile. To organise clarity within the organisation, staff were given

Strengths emerge:

- Careful consideration is given to what is the content, what is our opinion and it is always nuanced. ZLTO is there for all agricultural entrepreneurs. While members are very different.

Weaknesses:

- So it got mixed up, there was no clear who is in charge of what? So that will now be resolved. Who does what now.
- The financial erosion
- Not visible for what you do.

Longer perspective

Created from weaknesses. On our strength of ZLTO and that is that you, it is becoming more and more difficult to be an agricultural entrepreneur. There is so much regulation and in space a lot is also happening. Who brings it together now? That's the profession, water and soil. That Integral as an advocate and forming the network around it. That's actually where the strengths and opportunities are for ZLTO to do optimum for members there: politics, pooling, public and people activities.

Strengths:

- Huge network, agribusiness, provinces, political parties, environmental organisations about is in contact with them. As a result, they also sit at all kinds of tables
- They really know their stuff within the sector

Weaknesses:

- The content there is tricky for someone outside the industry.
- There is now investment in public affairs now the story will be better publicised What

is the strategy?

- Added value for farmer and

gardener. Are there any competitors?

- Agraction, FDF, Delphy are competitors on advice.

How does ZLTO differentiate itself?

1. On whose behalf are you speaking?
2. Do you understand the issues at hand?
3. In touch with everyone, but own line. And thus own course.

Ecology and economy must be balanced. Citizens feel that farm shops are going to be the future. Some farmers also just have a farmer next door. Some organic greenhouse farmers wonder if they are more sustainable now than when they were conventional greenhouse farmers.

Does ZLTO still want to grow?

- 100% membership agricultural entrepreneurs
- Getting more external funds in so we can do even more.
- Having more influence, being even more decisive

in how things go. Is there a difference in the informal structure and formal structure?

- It is important to have clarity on who does what.

Does everyone have their own task?

- Everyone has their own function, but there is collaboration. By giving everyone their own function, everyone knows who does what. Employees can therefore trust that a task will be done.

How much freedom do employees have to make their own decisions?

- In the past, employees could start their own projects. To better regulate this, it now goes through a projects committee. So being able to make your own decisions has declined somewhat. But in the field, employees do have a lot of freedom to set it up themselves.

System

- Member system
- Afas financial system

How will employees get better?

- The employees are all highly trained. But there is not much confidence in taking courses. After all, if you keep working in the same way after, the course has been of no use. There is more confidence in just doing it.

Does the management decide?

- No the management does not determine everything, there is simply too much for that.

We are simply spoilt here in the Netherlands. After all, we only have to drive a few kilometres here and you are already at fresh fruit and vegetables.

How do you get staff?

- LinkedIn
- Via via

- Website
- Sometimes at the table things get really

fun How is sick leave tracked?

- This is tracked and discussed in the OR. It is not high, but there are long-term sick people.

What is the organisation proud of?

• What all is happening, for the sector. What, above all, should you not do within the ZLTO?

• You can't just sign off, of course There's just a lot of good stuff going on within the ZLTO.

Are there traditions

- Christmas, general meetings, intertwined with the sector.

Annex 6 interview 4

Interviewee: Matthijs Osse

Position: financial affairs manager

Company: ZLTO

Date:25-5-2020

Systems

- How are the processes within the company managed?
It works with an ERP system and that is the A-phase system. This runs the entire financial process. But also around staff, salary payments, time registration, holiday recording. The A-fas system is really the core.

- What IT systems are used?
The IT system used is "Live Its". This is the CRM system Customer and Relation management system, contains all members' info, dues are determined in the system, when members are contacted this is also recorded and the website system. In addition, sharepoint and harmony. With harmony, you can create a bestan
d save right out of your mail in sharepoint.
Whitevision scans the invoices, where is the invoice number and the amount.
There are also as many as 25 small systems within ZLTO.
An important item is that there is a lot of sensitive information available within ZLTO. And working with many different systems, it is important that this works well with each other and there are no leaks.

- Outline the main processes (at least the primary process)

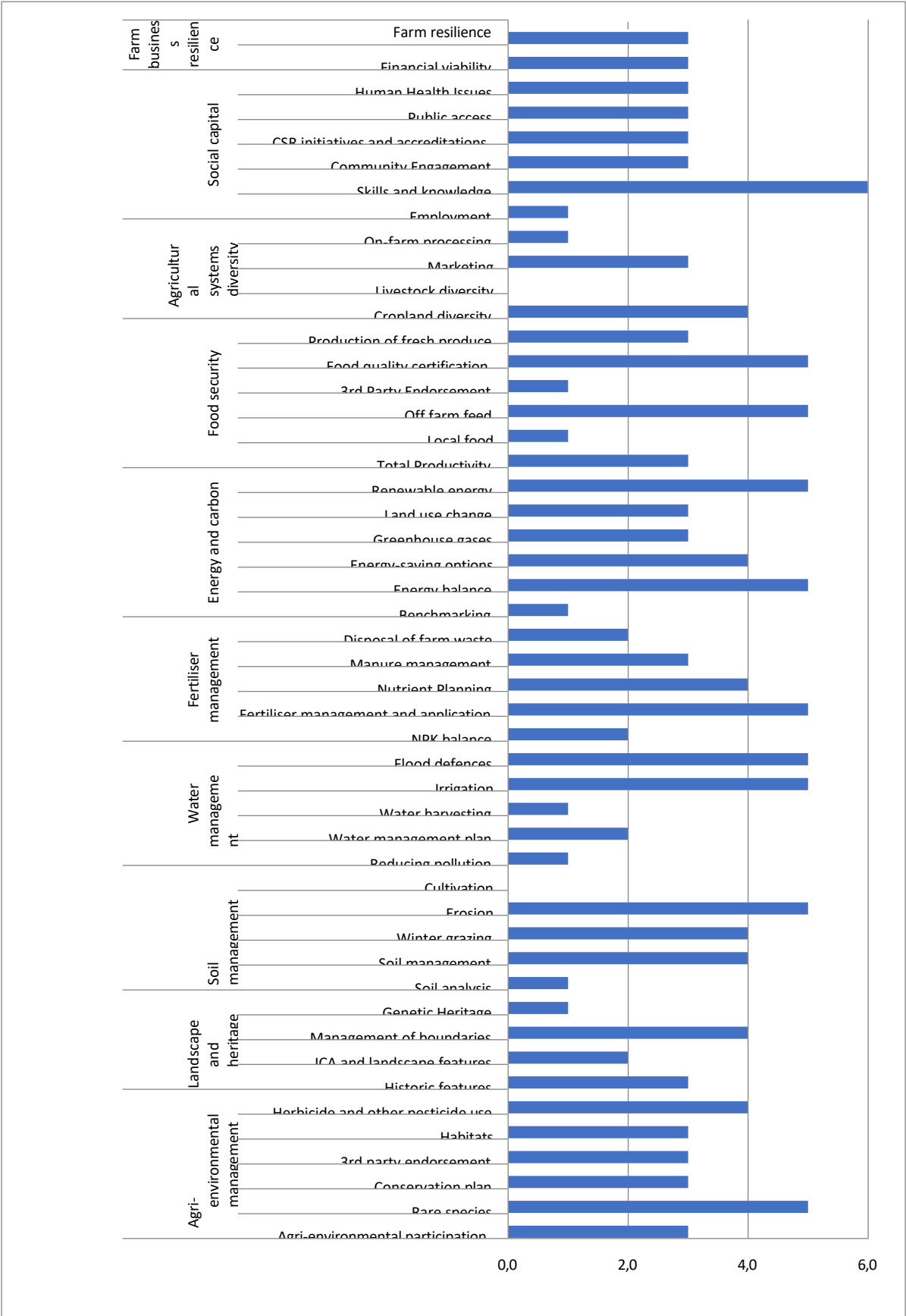
- How does management know if the results match the targets?
There are 2 different routes. Finance department that reports once a month and makes a presentation to MT members once a month. With the financial results per department. And shows the differences between the targets and the results.
There are further applications that are insightful for the MT members. This involves looking at how hours are written and how many hours are written.

- Feedback to employees on business results, how?
The quarterly report is put on the site every quarter so that all employees can read it. All employees can also look at their own hours worked.

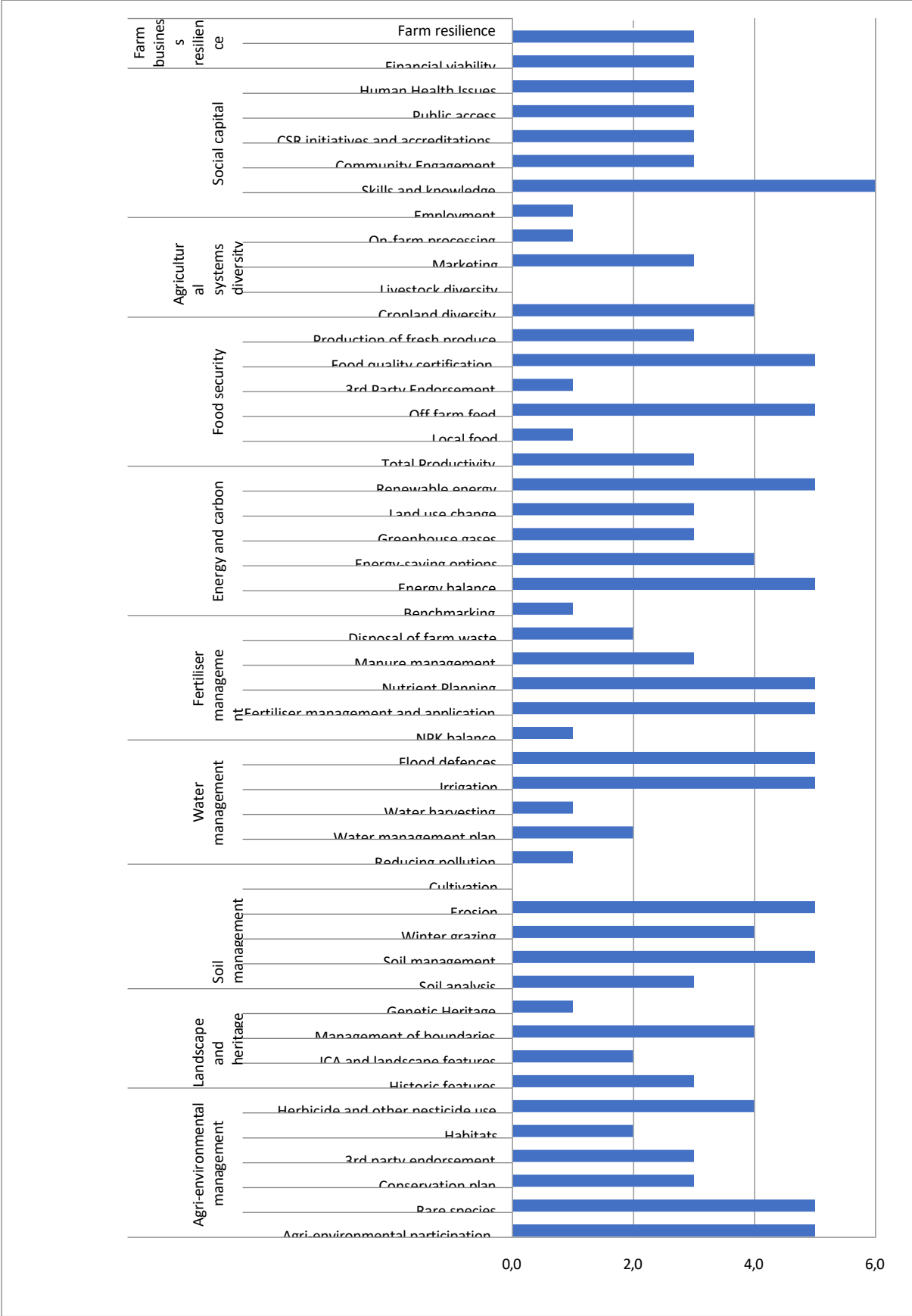
- What does your profit consist of?
Actually it is special about ZLTO, there are 4 companies in 1. Because you have department programmes that Sells hours to grant providers. Advice
department sells hours to farmers.
Department advocacy does not actually sell hours. Its purpose is to get results and get in consent with politicians.
Members and marketing department is precisely trying to keep members happy.
Profit consists of NCB development, this is for the purpose of advocacy

- How does ZLTO get feedback on farm performance?
The results will be discussed with the MT and with the board, this will lead to actions if needed.

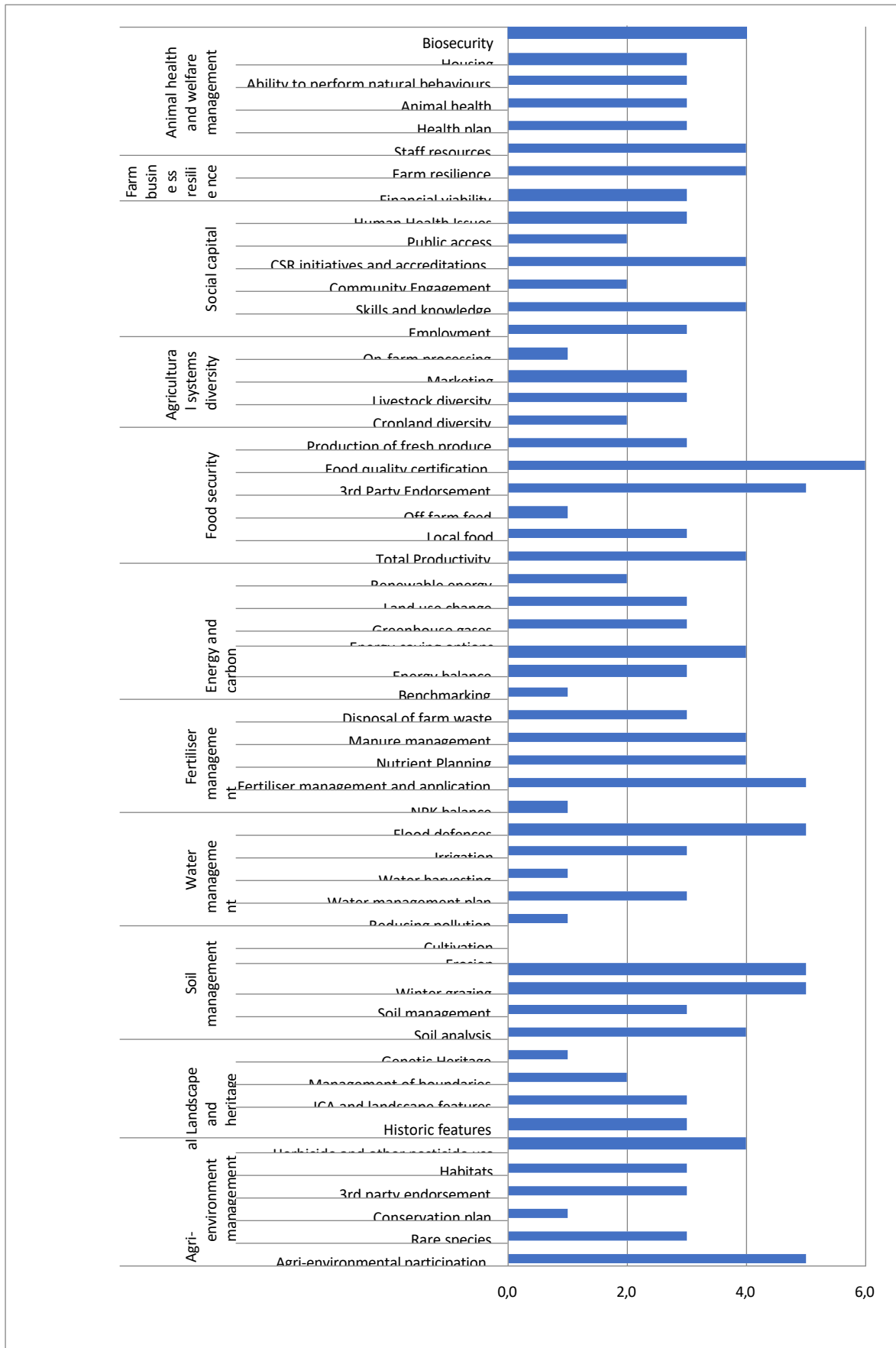
Annex 7 baseline measurement company 1 from Kamperland



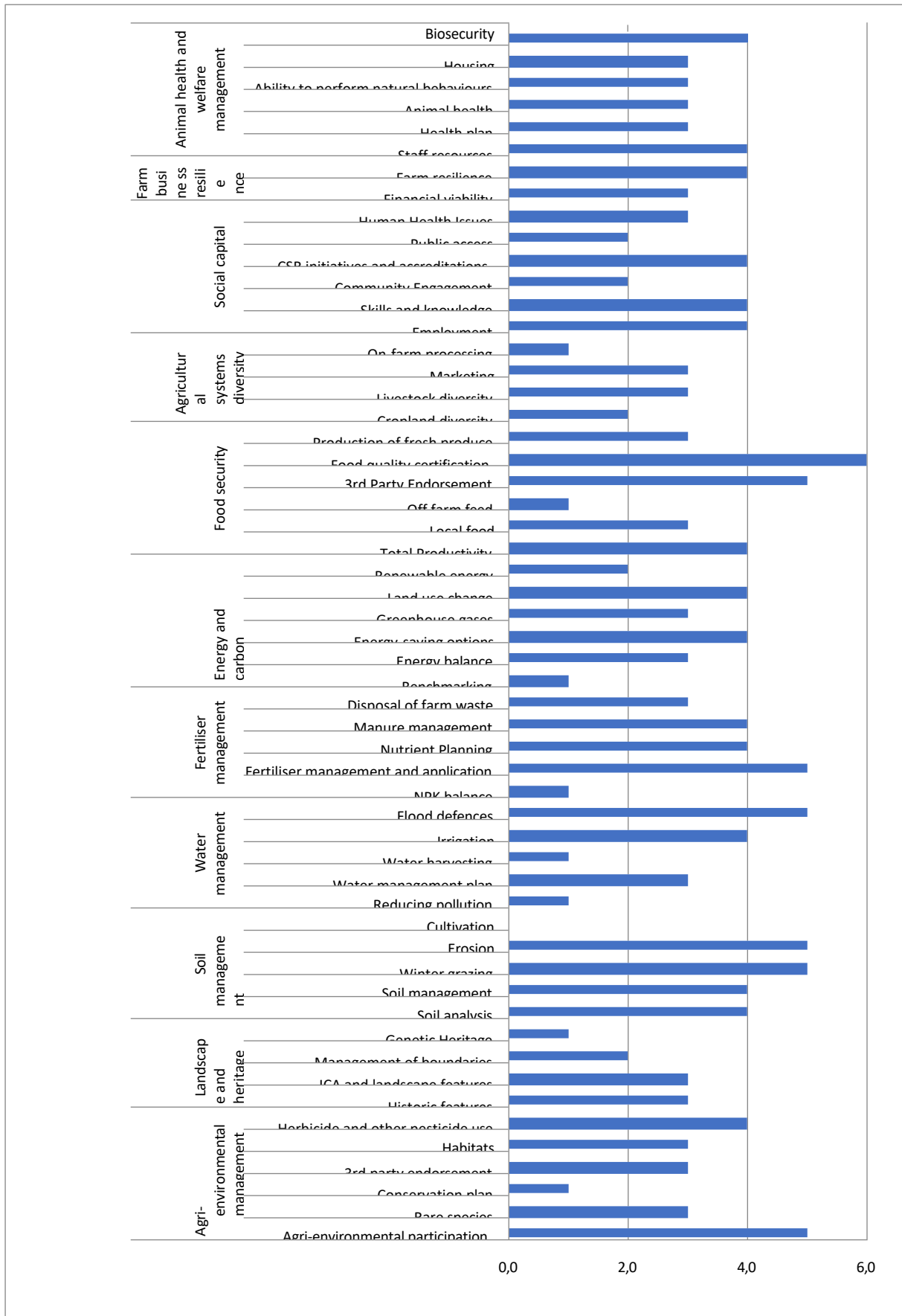
Annex 8 second measurement company 1 from Kamperland 2020



Annex 9 baseline measurement company 2 from Steenbergen



Annex 10 second measurement company 2 from Steenbergen



Annex 11 Survey

Comment on project FABulous Farmers

Interested in the FAB topics below/ What would you like to know more about?

No.	FAB opportunities	Interest	Supporting need
1	Fewer tillage techniques (reduced soil disturbance and compaction)	+	+
2	Mixed crops	+	+
3	Crop rotation	+	+
4	Green manures	+	+
5	Input organic matter (plant residues, wood chips, biochar,	-	-
6	Manure quality	+	+
7	Agroforestry	-	-
8	Hedges / management - maintenance	-	-
9	Field edge management	+	+
10	Limiting use of plant protection products <ul style="list-style-type: none"> • Insecticides • Weed control • Fungicides 	+	+