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EXECUTIVE SUMMARY

This report presents a detailed value chain analysis of agroforestry adoption across a diverse set of farms in Europe, highlighting a range of business models, motivations, and challenges. Farmers adopted agroforestry for various reasons, including sustainability, biodiversity enhancement, climate resilience, animal welfare, and landscape restoration. Case studies from Belgium, the Czech Republic, Germany, and the United Kingdom reveal that agroforestry systems are integrated into farms of different scales and types - from family dairy farms and community-supported agriculture models to university research sites and regenerative demonstration farms. Common success factors include direct-to-consumer marketing, diversification of farm income through carbon credits, food processing, and agritourism. However, barriers such as labour intensity, lack of initial financial support, market limitations for niche products, and competition with industrial supply chains persist. Agroforestry adoption often strengthens community ties and improves the ecological resilience of farms, but achieving profitability requires careful planning, ongoing adaptation, and support through subsidies, cooperative models, and consumer education. The report concludes that agroforestry has strong potential to contribute to sustainable farming transitions in Europe, provided structural and market barriers are addressed.

LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
AF	Agroforestry
FAO	The Food and Agriculture Organisation
EU	European Union
CAP	Common Agricultural Policy
WP	Work Package
VC	Value Chain
FB	Farm Belgium
FCR	Farm Czech Republic
FD	Farm Deutschland
FE	Farm England
FP	Farm Poland
FS	Farm Spain
FH	Farm Hungary

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1. INTRODUCTION

This report presents value chain analyses of several AF systems in Europe. With the growing ambitions of the European Green Deal, it is crucial to provide relevant stakeholders, such as farmers, with economic solutions and advice to create prosperous farming businesses, thereby transforming the European Union (EU) into a modern, resource-efficient, and competitive farming economy. Agroforestry is a multifunctional system that has been used for centuries and may have untapped potential as a modern solution to environmental and economic issues. Given its known ecological, economic and social benefits, agroforestry could be at the centre of this transformation in Europe. In this context, this report presents various case studies and their individual approach to integrating agroforestry within their farming business. The report is divided into three distinct sections.

Section 1 covers the background and motivation of this report, defines agroforestry, outlines the objectives and expected outcomes of this report, and explains the methodical approach and data collection.
Section 2 presents and analyses the individual farms and their value chains, including inputs, supply, production, agroforestry system, processing, distribution, consumer and additional activities.
Section 3 presents the report's conclusions and includes final remarks.

Overall, this report aims to present various case studies and their individual approach to integrate agroforestry within their farming business to provide relevant stakeholders, such as farmers, with economic solutions and advice to create prosperous farming businesses in order to transform the European Union (EU) into a modern, resource-efficient and competitive farming economy.

1.1 BACKGROUND AND MOTIVATION

ReForest is an interdisciplinary project lying in the field of social science (co-creation, stakeholder engagement, knowledge transfer), with the integration of ecosystem science (ecosystem services), agronomy (productivity), technology development (remote sensing and neural networks), and economics (business models, value chains, finance and policies). The project's overall objective is to enhance the sustainability of food production in the EU by co-creating solutions to key barriers that hinder farmers' wider adoption of agroforestry.

One of the most critical barriers to agroforestry adoption in Europe includes the lack of knowledge and experience, the impact of tree planting on farm business, and unclear policy support positioned between agriculture and forestry. The expansion of agroforestry systems is related to the assumption that only the food production function can be readily monetised by farmers, which is why many farmers do not switch to agroforestry.[1] Therefore, farmers need access to examples of profitable farming businesses and their methods for incorporating agroforestry into their farming operations. Farming is a risky and often costly process because agriculture relies heavily on the weather and climate, unlike other sectors. There is also an evident time lag between consumer demand and farmers' ability to increase supply. Farmers are under pressure from increasing global trade in food products and trade liberalisation. Finally, globalisation and fluctuations in supply and demand have made agricultural market prices more volatile, creating concerns for farmers. These business uncertainties in agriculture underscore the crucial role the public sector must play in providing a safety net for farmers' incomes and enabling them to adopt this practice.

[1] European Commission (n.d.). Agriculture and rural development Income support explained. Available at: https://agriculture.ec.europa.eu/common-agricultural-policy/income-support/income-support-explained_en

Taking this into account, the ReForest project aims to promote the adoption of agroforestry systems by providing farmers with the knowledge necessary to include agroforestry within their farms and thereby create profitable businesses.

1.2 DEFINITION OF AGROFORESTRY

Agroforestry is a traditional form of farming that has been practised for centuries. Over the past few decades, this practice has received particular attention from the scientific community as a multifunctional land use practice that can provide multiple environmental, social, and economic benefits. Agroforestry systems can help mitigate climate change, protect soils, enhance biodiversity and improve the overall condition of the landscapes. Moreover, farmers who adopt agroforestry practices can diversify their production, reduce certain costs and improve their productivity.[2]
Although agroforestry is a traditional land-use type, its definition within the regulatory environment is often rudimentary or nonexistent and differs across countries. The Food and Agriculture Organisation (FAO) of the United Nations gives the following definition of agroforestry:[3]"*Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as crops and/or animals, in some form of spatial arrangement or temporal sequence"*. According to the FAO, agroforestry can also be defined as: "*A dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels*".

In other words, agroforestry enables farmers to continue producing food while significantly enhancing the environmental sustainability of their operations by leveraging the benefits of woody vegetation. Integrating trees into agricultural businesses can provide multiple ecosystem services, such as carbon sequestration and biodiversity enhancement.[4] Many studies have attempted to classify the existing EU agroforestry systems. This task is very challenging, given the number of possible combinations of woody components/crops/livestock and livestock, as well as the variety of criteria to be considered. In a relevant study, Rigueiro-Rodríguez et al. (2018) examine the role of agroforestry in mitigating climate change and how it is promoted within the CAP. These authors identify five main "spatial" forms of agroforestry. These are listed in a simplified format:

- **Silvopastoral**: Combination of woody vegetation (trees and shrubs) with forage and animal production;
- **Silvoarable**: Woody vegetation (trees and shrubs) intercropped with annual or perennial crops;
- **Hedgerows, windbreaks and riparian buffer strips**: Lines of natural or planted perennial vegetation (trees and shrubs) bordering croplands, pastures and water sources to protect livestock, crops, soil and water quality;
- **Forest farming**: Forested areas used for the production or harvest of naturally occurring speciality crops (e.g., mushrooms or medicines) for medicinal, ornamental or culinary purposes;
- **Home gardens**: A combination of trees and/or shrubs with vegetable production.

[2] European Parliamentary Research Service (2020). Agroforestry in the European Union.
Available at: https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651982/EPRS_BRI(2020)651982_EN.pdf

[3] Food and Agricultural Organisation of the United Nations (2015). Agroforestry.
Available at: https://www.fao.org/forestry/agroforestry/80338/en/

[4] Jose, S. (2009). Agroforestry for ecosystem services and environmental benefits: an overview. *Agroforestry Systems*, *76*, 110. https://doi.org/10.1007/s10457-009-9229-7

Silvopastoral and silvoarable systems are forms of agriculture that feature a spatial mixture of trees and crops, or livestock grazing, in an open wooded area. In contrast, in linear systems such as hedgerows, windbreaks and riparian buffer strips, perennial vegetation is not interspersed within the cropping/grazing field. It is located exclusively on its margins.

Agroforestry systems can be classified according to several criteria:[5]

Components	**Agrosilviculture:** Crops and trees, including shrubs/trees and trees **Silvopastoral:** Pasture/animals and trees **Agrosilvopastoral:** Crops, pasture/animals and trees **Other:** Multipurpose tree lots, apiculture with three, aquaculture with trees
Predominant land use	**Primarily agriculture or forestry**
Spatial organisation	**Mixed dense** (e.g., home garden) **Mixed sparse** (e.g., most systems of trees with pasture) **Strip** (width of strip to be more than one tree) **Boundary** (trees on edges of plots/fields)
Temporal arrangements	**Overlapping, separate**
Agroecological environment	**Tropical, boreal, humid, mountainous or high/low land**
Socio-economic management level	**Based on the level of technology input:** Low, medium, high input. **Based on cost/benefit relations:** Commercial, intermediate, subsistence
Function	**Productive function (provisioning):** Food, fuel, wood, other products **Habitat function (supporting):** Biodiversity **Regulating:** Climate, flood and drought prevention, water purification, shelterbelt, soil and water conservation, shade **Cultural functions:** Recreation and landscape

Table 1: Classification of agroforestry systems. Source: AGFORWARD.

As a multifunctional land use, agroforestry has the potential to contribute to multiple Sustainable Development Goals. Therefore, the implementation and impact of agroforestry systems should be studied from legislative, financial, and policy perspectives.

1.3 OBJECTIVES AND EXPECTED OUTCOMES

The primary objective of this report is to provide qualitative data that uncovers all processes involved in the creation, enhancement, and capture of value from AF systems. This analysis includes context-specific strategies and success factors of the individual farms.

[5] Den Herder, M., Burgess, P.J., Mosquera-Losada, M.R., Herzog, F., Hartel, T., Upson, M., Viholainen, I. and Rosati, A. (2015). Preliminary stratification and quantification of agroforestry in Europe. Milestone Report 1.1 for EU FP7 Research Project: AGFORWARD 613520. Available at: https://www.agforward.eu/preliminary-stratification-and-quantification-ofagroforestry-in-europe.html

The objectives and expected outcomes of this report are to:

- Present a wide variety of farm businesses and their value chains
- Their implementation and economic use of agroforestry
- Provide examples of success stories for other AF practitioners and new farm entrants
- Inform on business solutions
- Lay the foundation for the purposeful development of a prosperous AG farming community

1.4 METHODOLOGICAL APPROACH AND DATA COLLECTION

This report utilises data from a merged research methodology encompassing ReForest WP 2, task 2.3 (Identifying knowledge gaps) and WP 3, Task 3.1 (Value chain analysis of AF systems). The rationale for adopting a combined research approach primarily aligns with the chosen data collection method—stakeholder surveys—stemming from various considerations:

1. Mitigating undue imposition on potential interviewees, such as Living Lab partners and farmers, was paramount to minimise disruption to their primary activities and sustain their engagement in the research process.
2. Both task domains necessitated a qualitative research approach for comprehensive examination.
3. Consolidating data collection endeavours not only optimised the time allocation of potential interviewees but also streamlined efficiency for researchers.

The data collection employed qualitative stakeholder surveys, ideally executed as personal expert interviews. This format facilitated the acquisition of valuable, extensive, and nuanced qualitative data. Expert interviews facilitated an open dialogue based on a structured interview guide, allowing for insights beyond predefined scopes. An essential aspect of the expert interviews involved tailoring the interview guide through an extensive preliminary study on the pertinent topic and the specific interviewee. While core thematic questions remained consistent across interviews, customisation to individual interviewees occurred post-desk study to maximise information retrieval based on their unique perspectives. Thematically, the interview guideline regarding the identification of knowledge gaps centred around the questions:

1. Which knowledge gaps regarding agroforestry are generally known to farmers?
2. What knowledge gaps are farmers aware of in connection to agroforestry business models/economics/investments?
3. How easily can farmers access agroforestry knowledge?
4. Which networks or actors provide access to agroforestry knowledge?

The interview guideline used can be viewed in the appendix.
The selection of interviewees relied on independent desk studies and recommendations from project affiliates. However, several challenges surfaced:

1. Time constraints prevailed among potential experts, notably farmers, due to seasonal commitments, impacting their willingness to participate.
2. Language barriers posed a significant hurdle, with some experts lacking proficiency in English, complicating conversation-based surveys or interviews.
3. Limited accessibility to potential experts necessitated heavy reliance on project partners for outreach, demanding substantial time and communication for coordination.

To overcome these challenges, questionnaires were shared in addition to conducting interviews. Unfortunately, using questionnaires negates the advantages of interviews already mentioned and therefore does not provide such high-quality data. Nevertheless, they served to overcome language barriers by enabling translation and facilitating distribution through project partners, as well as identifying promising participants for potential interviews. The questionnaire was created in two versions, which differ in length to provide further options for distribution, taking into account the participants' available time. However, both questionnaires only reflect a minimal part of the topics of the guideline used in the interviews and can, therefore, unfortunately, only generate a very limited amount of data. Both questionnaires are available for viewing in the Appendix of this report.

Interviews were predominantly conducted via virtual conferencing platforms, with occasional in-person meetings. The interviews were recorded. The Recordings were systematically transcribed after the conversation to facilitate data processing and preservation. Subsequently, analysis encompassed assimilating interview protocols and questionnaire responses, culminating in drawn conclusions and interpretations synthesised within the final report. A total of 10 interviews were conducted, and 14 completed questionnaires were returned. The interviews are divided into the different partner countries as follows: Denmark (1), England (7), Poland (1), and Spain (1). The questionnaires are divided into the following partner countries: the Czech Republic (6), Belgium (4), Poland (3), and Hungary (1).

2. AF VALUE CHAIN ANALYSES

Section 2 provides value chain analyses of the individual farms, uncovering all processes involved in the creation, enhancement, and capture of AF systems. This analysis encompasses aspects such as inputs, supply, production, agroforestry systems, processing, distribution, consumer behaviour, and additional activities, as well as context-specific strategies and success factors of the individual farms. A high-level analysis of value chains and farm business models reveals that several models can be considered typical for European agroforestry across different geographies and contexts (Table 2).

Agroforestry / Value-Chain Type	**Main Products and Services**	**Marketing and Distribution Approach**	**Distinctive Features and Lessons**
Food-based diversification farms (silvopasture, alley cropping, orchard–livestock integration)	Meat, dairy, fruit, vegetables, eggs, and honey	Direct on-farm sales, local butchers, CSA boxes, farmers' markets	Agroforestry improves animal welfare and microclimate; diversified outputs stabilise income. Success depends on short food supply chains and strong local identity (e.g., FE1, FE2, FB1, FH1).
On-farm processing and value addition enterprises	Cheese, yoghurt, cured meats, juices, jams, bakery products	Farm shops, online subscriptions, restaurant supply, and regional fairs	Processing captures added value and enhances brand visibility. Labour-intensive but increases profitability and consumer trust (e.g., FE3, FB2, FP1).
Carbon-farming and ecosystem-service innovators	Carbon credits, soil-carbon monitoring, biodiversity stewardship	Private carbon buyers, voluntary carbon markets, pilot PES schemes	Monetises ecosystem services; early examples of blended finance models combining CAP support and private funding (e.g., FB1, FE5).

Renewable-energy and circular-bioeconomy systems	Biomass fuel, woodchip heating, compost, biogas	Energy self-sufficiency, local energy cooperatives	Integration of tree residues into energy systems reduces input costs and carbon footprint. Demonstrates circular resource use (e.g., FE5, FS1).
Tourism, recreation, and educational farms	Farm visits, workshops, eco-lodging, school programmes	Direct booking, partnerships with local tourism boards	Diversification into experiential services fosters public awareness and supports rural employment, with strong social and cultural co-benefits (e.g., FCR2, FH2, FS2).
Community-supported and social-enterprise models	Subscription-based food boxes, cooperative processing, community kitchens	CSA schemes, local cooperatives, social-media marketing	Strengthens social cohesion and food citizenship, ensuring a steady income and shared risk between farmers and consumers (e.g., FB3, FE4, FH1).
Territorial agro-food and landscape partnerships	Mixed outputs—food, timber, landscape services—managed at the landscape scale	Regional branding, landscape cooperatives, LEADER and municipal collaborations	Integration across farms fosters regional identity and shared ecosystem management, supporting multifunctional landscapes and circular economies (e.g., FE3, FP2, FS1).

Table 2: Summary of key value-chain models identified across ReForest case-study farms.

2.1 FARM FB1

Overview of the Farm

Farm FB1 is a 4th-generation family farm. The farm has a history of different farming approaches. Currently, it is mainly a dairy farm. The farm spans 68 hectares, comprising 53 hectares of ecological grassland, 5 additional hectares of regular grassland, and 10 hectares of arable land. 60 cows are kept for the dairy operation. The farm has a farm shop where the farm products are sold directly to consumers.

The current farmer began officially practising agroforestry in 2021. Before 2021, the farmer also systematically planted trees around his meadow and applied a so-called 'AF light', which acted as a windbreak for shade and shelter. The system implemented in 2021 focuses on trees and shrubs that produce fodder and provide shelter for the livestock. The trees were planted in an alley cropping system. The farmer's planning process was supported by BoerenNatuur Vlaanderen and ILVO, which helped him to choose the right tree species for his system. In 2022, the farmer expanded his agroforestry system by planting a food forest.

2.1.1. Value Chain Analysis

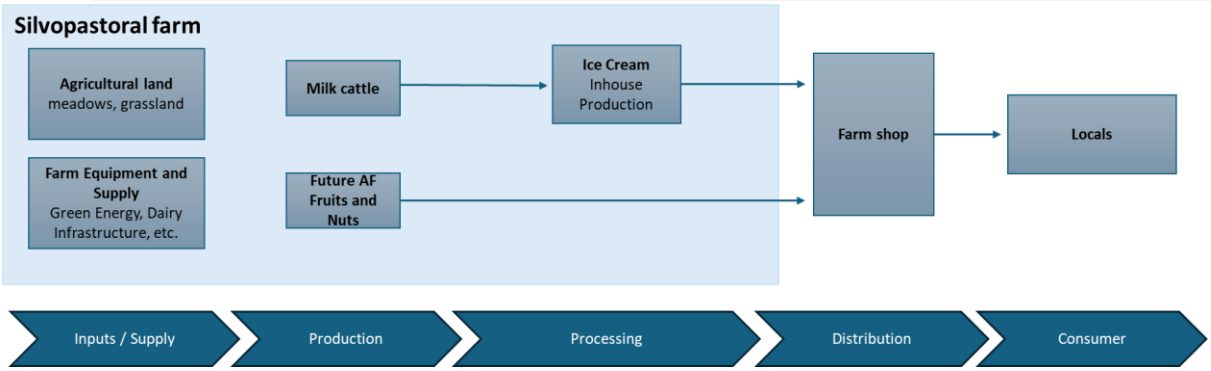

Figure 1: Value Chain from farm FB1

Inputs/Supply

The farmer and his assisting spouse do the labour on the farm. To have more time for the family, the farmer stopped growing rye as fodder for the livestock. As a result, fodder concentrates are purchased for the livestock, leading to lower cow productivity. This lower production is no problem for the farmer, so 5000-6000 litres per cow is enough, instead of the usual 10,000 litres.

To reduce the farm's carbon footprint and operate more sustainably, the farmer invested in green energy. For example, green electricity is generated via solar panels, with a capacity of 60 kilowatts installed on the cowshed's roof. Additionally, the farm installed a 10-kilowatt digester, which produces biogas from organic material. This enables the farm to be self-sufficient, reducing its environmental impact while simultaneously generating a sustainable energy source for the entire business.

After the takeover, the farmer needed to invest significantly in dairy infrastructure, including a new ice cream machine, a freezer room, a milking machine, and a shed. The farm got a tractor, which is used to plough around 14 hectares of the farmland. The farmer intends to stop ploughing, switch to non-inversion tillage, and integrate more permanent crops.

Production

The farm's primary product is dairy from its milking cow herd. The goal of the first agroforestry plot is to improve the soil and produce nuts and fruits in the medium term, and in the long term, to extract wood, as the farm seeks a revenue model utilising trees on sandy soil. The farmer opted for a combination of poplars with groups of 6 oaks in between, an idea that came from ILVO at the time. These trees are anticipated to stimulate each other and grow nicely. After a while, a few trees are uprooted, but the most interesting ones remain and are allowed to grow into wood. In the long term, the farmer can prune some trees to generate wood yield early on. After about 20 years, the first poplar wood is expected. Currently, the system is still in the initial stages of the revenue model.

In addition, the farm is involved in carbon farming, earning CO_2 credits through the CLAIRE platform. Each year, a tree offsets approximately 18 kg of CO_2, which equates to 3,600 kg per year, accounting for 3.6 tons of carbon credits. Part of these credits will be sold to the Milcobel milk factory, while another part will be sold to an IT company outside the agricultural context. Thanks to CLAIR, the farm also receives funds from outside the agricultural sector. To obtain these carbon credits, the farmer had to take regular photos of the plot and provide this information with the collective application at the start. So, this includes some work at the start, such as soil analyses and taking photos. Currently, the

farmer is considering combining other plots with carbon farming and premiums for herb-rich grassland, aiming for a total revenue of 180€ per year in carbon credits.

Processing
The dairy output is processed into ice cream. Generally, farmers are not very keen on processing the fruit and nuts that the agroforestry system yields. He wants to sell these as soon as they are harvested at his farm shop. He stated that plums might be processed into jam, but this step might also not be worth the time invested. If the sales for the nuts are good, the farmer might want to invest in machinery that can process the nuts into nut oil.

Distribution
For the farmer, a short value chain is very important. Therefore, he plans to sell the produce of the agroforestry system, fruits and nuts, in his own farm shop. The sales strategy primarily focuses on the emotional value of the products and their strong local connection. Although the focus today is mainly on dairy and ice cream, this can be extended to the products from the agroforestry system. The main focus is on local sales to Temse residents, aiming to create a strong emotional connection with the products. Thus, finding a market for the products is generally quite smooth, as the focus lies on a specific local market that understands and appreciates the value of the products.

The farm doesn't spend much time on marketing efforts because the publicity created by the local press is enough to advertise the farm. Nevertheless, the farm got an online presence on social media. Besides this, the farmer considers planting pear trees for the people in the neighbourhood, with the possibility of allowing them to pick the pears from the trees they have planted. This enables the farm to establish a strong bond with the local community, even before the first fruit is harvested.

Consumer
The Farmer stated that more and more consumers prefer to buy locally, where they can see exactly where and how the products are produced. This has a great added value, especially for the local inhabitants of Temse. The value of the products remains here in the region, and wider sales would reduce that value. For people from Temse, it is acceptable to pay more for products grown within the territory of Temse, as this ensures the farmer can successfully sell his nuts and fruits locally in his shop.

Additional Activities
The farmer is considering inviting local schools for an educational walk, during which he will explain different types of crops, including annual cultivation, perennial cultivation, food forests, and agroforestry.

2.2 FARM FB2

Overview of the Farm
Farm FB2 is situated on a historic square-shaped farmstead in the Scheldt Valley. The farm has a long history, with records dating back as early as 1140 AD. The existing brick structure was built in the 17th century, though remnants of even older buildings can still be found on the property. Since 1898, the farm has been owned and operated by the FB2's family, now in its fourth generation. The family takes great pride in maintaining and preserving this historic farm while integrating modern, sustainable, and environmentally friendly agricultural practices. The farm spans approximately 60 hectares, with 16 hectares dedicated to pastureland and the remaining used for arable farming.

As a mixed farm, the farm engages in both arable farming and livestock breeding, striving to balance productivity and ecological responsibility. Crop cultivation follows integrated pest management (IPM) strategies. It implements conservation practices such as edge management with growing bird-friendly crops and erosion control, all designed to support and protect biodiversity. The farm's approach to livestock farming also aligns with sustainability and animal welfare principles. The farmer uses a direct sales approach. This short supply chain model offers economic advantages, reduces environmental impact, and fosters strong social connections with its customers. The farm features an on-site butcher's shop, where the farm's meat products are sold, ensuring full traceability and top-quality offerings. Red deer meat, beef, veal and lamb meat are sold.

2.2.1. Value Chain Analysis

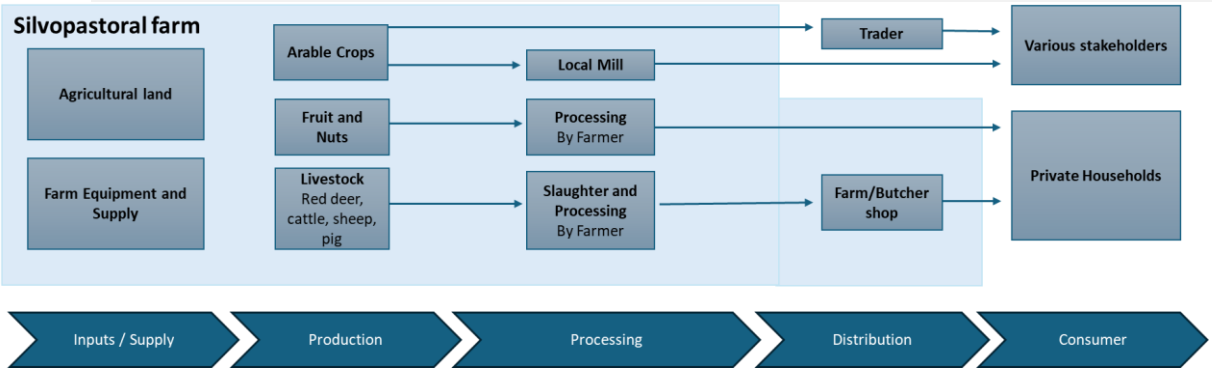

Figure 2: Value Chain from farm FB2

Agroforestry

The current family member in charge began running the farm in 1995 as a mixed agricultural enterprise, combining arable farming with cattle breeding. At the time, it operated under a milk quota of 60,000 litres. In 1998, the farm expanded by introducing red deer farming, and by 2000, it had further diversified with the launch of an on-site farm butcher's shop. Recognising the importance of landscape integration, a comprehensive business plan was developed in 2008 to enhance the environment with trees and shrubs around the farm and its meadows. A few years later, agroforestry was incorporated into the farm's practices. However, the farmer was unfamiliar with the concept at the time, and no subsidies were available to support it. Despite this, several key motivations encouraged the transition to agroforestry:

1. Restoring the Traditional Landscape & Enhancing Aesthetics:
   The farm had historically been surrounded by old orchards, which had gradually disappeared over time. Restoring this landscape was an appealing concept due to its historical and ecological value, as well as a strategic decision to enhance the farm's appearance. Since the farm frequently welcomes customers for tours, combining trees and shrubs helped create a more visually appealing and immersive experience.
2. Future Economic Potential:
   Beyond the visual and ecological benefits, the farmer recognised agroforestry's potential to provide an additional revenue stream. Trees planted on the farm could yield fruits for juice production and nuts such as walnuts and chestnuts, which could diversify the farm's product offerings in the future.
3. Benefits for Livestock:
   The integration of trees into the farming system also provided direct benefits to animals. For instance, deer could benefit nutritionally from acorns, while the trees would provide natural shade, improving animal welfare.

4. Sustainability & Ethical Considerations:
   The farmer sought to compensate for the extensive use of wood on the farm, such as wooden fences around the meadows and materials used in the stables. By planting trees, the farm could contribute to restoring the landscape and maintaining a sustainable balance, aligning with the farmers' ethical commitment to environmental stewardship.
5. Financial Incentives & Agroforestry Subsidies:
   Although financial support was initially unavailable when agroforestry was first introduced, the eventual introduction of subsidies provided an additional motivation to expand these practices. The availability of grants helped reinforce the decision to invest in agroforestry as a long-term strategy for both environmental and economic sustainability.

For the agroforestry design, the existing landscape management plan, which included oak trees, served as a foundation. This was further enriched with standard fruit trees, sweet chestnuts, and nut trees.

Inputs/Supply

The farm operates primarily as a one-man business, with the farmer's wife contributing part-time as a self-employed assisting partner. The oldest child occasionally helps out.

Beyond human consumption, the fruits and nuts within the agroforestry system play a role in animal nutrition. The direct fall of acorns and other tree fruits is especially beneficial for deer, offering them a natural and nutritious food source. However, managing tree protection from the deer has been a major challenge. Many trees had to be replanted due to initial damage, and the drought in the first summer further complicated their survival. Despite these obstacles, the farmer remains committed to sustainable production, continually adapting to challenges while enhancing his farm's productivity and ecological resilience.

Production

The farm's design was chosen to align with the current farmer's ethical principles and long-term sustainability goals. At the broader farm level, a key motivation was to move away from conventional livestock farming practices, particularly the use of hormones in beef cattle fattening. When the farm's management transitioned in 1995, such practices were still widespread, but ethical concerns, especially following the hormone crisis of the 1990s, led to the decision to pursue a more natural and responsible approach to livestock farming. As part of this shift, dairy farming was phased out in favour of a more direct-to-consumer meat production model. One of the most significant changes during that time was the introduction of deer farming. This decision was driven by the desire to rear animals in a more natural environment, free from the intensive manipulation often associated with industrial livestock farming. Deer farming improved the farm's ethical and environmental image, aligning well with consumer demand for high-quality, naturally raised meat. While venison became a core product, the farm also recognised a continued demand for beef. However, instead of raising traditional double-muscled cattle, which are often prone to health complications, the farm opted for the Blanc d'Aquitaine breed, known for its robustness and self-sufficiency. Additionally, customer interest in diversified meat options led to the introduction of sheep and pigs, catering to requests for mutton and pork. The sheep are sold with the Pastoral Flemish Lamb label. In winter, the farm primarily focuses on butchering, as this is the deer slaughter season, from October to the end of February.

Besides the livestock. the farm cultivates a diverse range of crops, including traditional staples like potatoes, winter wheat, and sugar beets. It also grows maize and alfalfa as feed for livestock, as well as grass seeds. Additionally, the farm sometimes produces vegetables such as beans and carrots. In the spring, there is a lot of work on the arable fields. One of the farm's notable crops is baking wheat, which is sold directly to a local mill at a fair price. The farmer maintains a strong relationship with the

miller, ensuring open communication and fair business practices. The fruit harvest within the agroforestry system occurs mostly in August and September.

Processing

The farm itself organises both processing and sales. Plums from the agroforestry system are used to make plum jam, approximately 100 kilograms annually. Looking ahead, the farmer plans to further diversify into fruit juice and pear syrup, increasing the variety of value-added products available to his customers. The farmer is also exploring the potential of chestnut-based products, such as pickled chestnuts and chestnut purée, and selling fresh chestnuts in the autumn. Additional nut trees were planted because the farmer wants to sell fresh nuts and process them into nut oil, which has strong consumer demand. However, harvesting nuts and chestnuts presents logistical challenges for the farmer, particularly in terms of collection efficiency. One of the current challenges is finding ways to utilise the fruits that the trees are beginning to bear. The farmer is exploring various options for processing and marketing this fruit to generate an additional income stream.

Distribution

All animal products and farm produce are sold directly to consumers through their own farm/butcher shop, reinforcing the commitment to short-chain and farm-to-table distribution. Baking wheat is directly sold to a local mill. Arable crops are sold to a trader with whom the farmer has confidence.

The farm's marketing strategy focuses primarily on local sales and offering fair prices. Word of mouth significantly promotes the farm shop, with less emphasis on social media. The farm differentiates itself from other local shops, particularly with its venison, a unique regional product. This approach has proven to be successful. However, the farm deliberately avoids further expansion due to limited labour capacity. If more labour were available, there is potential for growth, particularly in expanding home sales with products from their agroforestry system, such as jam, fruits, nuts, and oil.

Consumer

The pricing of the farm products is determined primarily by the production costs and the profit margin the farmer aims for. While he occasionally considers the market price, he doesn't rely on it as a key factor because it may not always reflect his unique situation. The focus is on striking a balance between setting a fair price for his products and staying competitive. He aims to ensure that his prices remain reasonable enough to maintain sales without making the products too expensive for customers.

The farm’s unique selling points include its distinctive venison, which is characteristic of the region, and the freshness and high quality of its products. A key quality aspect is that the owner cuts all the meat on the farm, providing a more personal connection to the product. This contrasts with other suppliers who may be less involved with the actual processing of the meat, making the farm's offerings stand out for their freshness and direct farm-to-consumer approach. Therefore, consumers are likely to be more aware and willing to pay a premium.

The farm's customers are largely unaware of the agroforestry practices in place, though this aspect is highlighted during guided tours and visits. Visitors generally respond with positive feedback and amazement, which has motivated the farm to continue investing in agroforestry and improving the landscape. A challenge, however, is educating visitors about agroforestry, as many are unfamiliar with the concept. The farm focuses on clear communication to convey the benefits of agroforestry and raise awareness among visitors, which may also attract potential future customers.

Additional Activities

The farm offers guided tours to educate visitors about its working methods and products, attracting potential customers and fostering stronger connections with its audience. Picnics are organised for

visiting groups, often combined with farm tours. The goal is to create a memorable experience that leads to future customers for the farm shop.

2.3 FARM FB3

Overview of the Farm

The organic farm FB3 was founded in 2019 by two friends who studied sustainable agriculture and Environmental Sciences. Neither came from a farming background, so they sought their own land and eventually found a 3-hectare orchard through Bioforum Vlaanderen, the organic farming sector association. The land, already occupied by high-stem fruit trees aged between 6 and 14 years, was available for rent under conditions that required organic farming, proper tree maintenance, and intercropping with a minimum distance from the trees. These conditions aligned with the founders' sustainable farming vision, leading them to initially integrate agroforestry, even though they had not initially sought a tree-filled plot.

The farm is committed to sustainability, going beyond standard organic farming by avoiding even organic-approved pesticides and chemical fertilisers. Instead, they rely on biodiversity, attracting beneficial insects and species, such as kestrels, through trees, hedges, grass strips, and wooded edges. The trees also serve as windbreaks, contributing to a visually appealing landscape and a pleasant working environment.

Vegetable cultivation is the farm's core business. They grow around 50 different seasonal vegetables, primarily sold through vegetable packages. The vegetables are cultivated in a structured agroforestry system, with rows of high-stem fruit trees planted in a 10 x 10-meter grid. The 7-meter-wide cultivation zones between tree rows contain five growing beds, where vegetables are rotated by family (e.g., cabbage, fruits, pods, leafy greens, and onions). The orchard comprises approximately 230 fruit trees, primarily regional cider and eating apple varieties, along with pears, plums, sour and sweet cherries, peaches, and quince. Additionally, they have seven 60-meter rows of grapevines, though they do not grow crops between them.

Since its inception, the farm has planted additional trees, primarily replacing those that have died. They adapted species to the land's conditions, choosing pears instead of cider apples for wetter areas. They also planted a mixed hedge along the roadside (including lime trees and oaks) and a few walnut trees in unused corners of the plot. However, they do not keep animals and have no plans to incorporate livestock.

Their approach integrates agroforestry for its agricultural benefits and to enhance biodiversity, ecological balance, and the landscape's aesthetic appeal.

The farm's design is centred around Community Supported Agriculture (CSA) principles, which provide financial stability by ensuring a known income at the start of each growing season. This allows for better planning and minimises food waste by aligning production with demand. While the farm is not a self-harvest model and does not sell directly from the site, it maintains strong connections between farmers and consumers, reinforcing appreciation for agricultural work. A key motivation for the farm's design is its integration of productivity with landscape aesthetics, soil health, and biodiversity. The visual appeal and ecological benefits are intrinsic values and play a role in shaping public perception of sustainable agriculture.

The farm is an example within the CSA and organic farming network, not necessarily for its cultivation techniques but for its agroforestry-based plot design. The agroforestry component was largely predetermined since the farm was established on an existing orchard. However, this provided an advantage: the founders knew from the outset what to expect from the trees in terms of production and available cultivation space. This predictability enabled a solid economic calculation, ensuring the farm could sustain two full-time farmers. The farm benefits from high species and variety diversity,

which enhances resilience against diseases, which is particularly important in an organic system where no crop protection products are used. While the founders are largely satisfied with the farm's layout, minor adjustments could have been beneficial. Increasing the tree spacing to 12 meters within rows would have prevented some trees, like cherries, from having overlapping canopies. Additionally, wider spacing between rows could have allowed for seven vegetable beds instead of five, improving efficiency. Organising tree species and varieties into more distinct clusters rather than spreading them across the plot would also have optimised labour during harvesting.

2.3.1. Value Chain Analysis

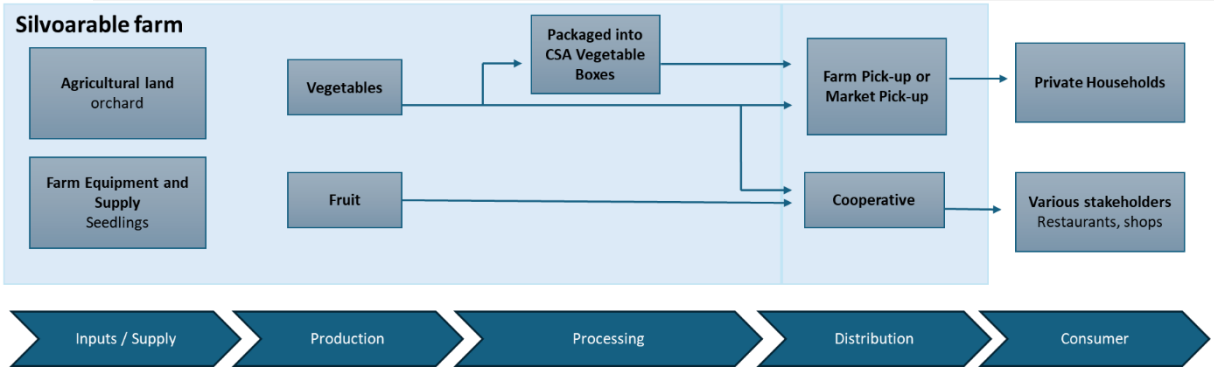

Figure 3: Value Chain from farm FB3

Inputs/Supply

Both friends hold 50% ownership and work full-time on the farm. During the 36 weeks when vegetable packages are distributed, they also employ two additional staff members on Wednesdays to assist with operations. The farm primarily relies on manual labour for harvesting and uses a small tractor with a 1-meter track width for other tasks. Due to their 10x10 meter grid pattern, the limited space between trees requires equipment tailored for small-scale farming. The fruit is harvested manually, and a ladder is used for this task. A nearby farmer provides storage for the harvested fruit. Each year, a contractor is hired for soil work, with a preference for non-tilling techniques. While most contractors initially find the farm's methods unconventional, especially the integration of trees into the farm layout. This made sourcing contractors more challenging, but they have found partners who meet their needs.

Regarding environmental and social standards, the farm adheres to organic principles, producing without the use of pesticides and focusing on sustainability. The farm sources its planting material and seeds from the same suppliers as most organic farmers. Their tree suppliers come from the National Orchard Foundation, and for planting new hedges and trees, they collaborate with the Regional Landscape, which provides local species and varieties of shrubs and trees. The relationships with suppliers are based on practicality and common industry practices, ensuring a steady supply of materials suited to their farming system.

The farm takes a sustainable approach to managing waste materials from its trees and vines. Pruned tree branches are chopped and left on the farm, previously being injected into the soil, but are now used for infrastructure, such as paths and composting. Similarly, prunings from the grapevines are left under the rows of vines to contribute to carbon build-up in the soil, promoting sustainability. Fallen leaves from the trees are also left to decompose naturally, enriching the soil with organic matter. Additionally, apples at the top of the trees are left unharvested, as harvesting them is not profitable. Instead, they are left for the birds, contributing to the farm's ecological balance. This practice ensures the farm remains environmentally conscious while minimising waste and enhancing the ecosystem.

Production

Vegetable cultivation is the farm's primary focus, with around 50 different types of organic vegetables grown between 230 high-stem fruit trees. The trees serve both ecological and economic functions, contributing about 5% of total revenue through fruit sales in the summer and autumn. The farm's food production system, which incorporates agroforestry, differs from conventional farming systems in several ways. Specifically, the farm grows vegetables in a system where plastic tunnel greenhouses are placed between rows of trees. This approach is more complex than traditional practices, as it requires careful management of tree pruning to ensure that machines can operate between the rows of trees. Root pruning is also done annually to prevent the trees' roots from interfering with the vegetable crops, involving deeper tillage with specialised equipment.

The farm operates on a 36-week production cycle, commencing around the Easter holidays and concluding by Christmas. During this period, the farm offers a variety of vegetable packages that provide diversity. Each package contains at least six different vegetables, which is part of the farm's strategy for risk management. Growing a variety of crops ensures that, even if one crop fails due to factors such as extreme weather, other crops can fill the gap, providing a consistent product for customers. The farm's fruit production is spread throughout the year due to the diverse varieties of fruit grown. Early-season fruits, such as plums and cherries, begin to appear in May, and the season continues until October or November, with apples and other varieties following. However, fruits like plums and cherries present challenges, as they all ripen almost simultaneously, creating a surplus that is difficult to sell in a short period. This makes it difficult to sell all the fruit individually. While apples can be processed into juice to manage surpluses, the sales of juice often do not match the volume produced, resulting in leftovers. The farm partners with a nearby farmer to store apples, which helps maintain profitability by minimising transportation costs and facilitating storage. Without this partnership, marketing surplus apples would be more challenging.

The farm enters a rest period from Christmas to February, intentionally halting vegetable production. This seasonal break is part of their production planning. Offering vegetable packages during winter would mainly consist of cabbage, which might not appeal to customers. Additionally, providing variety would be difficult without supplemental purchases of off-farm vegetables. This period of rest is also seen as beneficial for the farm team, allowing time for pruning and greenhouse work.

Processing

Leftover fruit is converted into juice, which is also sold on-site. For example, apples are juiced and sold in 3-litre and 5-litre barrels. While fruit sales are not the main income source, they cover the rent of the farm's land.

Distribution

The distribution process for the farm's products is largely managed in-house, minimising reliance on external distributors. The farm's products primarily reach consumers through these main channels: private sales via vegetable packages, loose fruit sales, and restaurant sales via a cooperative. Private sales contribute about 80% of the farm's total turnover. Most vegetables are sold through vegetable packages, known as 'abos' (subscriptions), which customers subscribe to for a full year. Throughout the year, each Wednesday, the customers can pick up their package at "PAKT" market in Antwerp or can come to the farm market stall and pick it up there. These packages are available in two sizes: Small (€486 per year) and Standard (€720 per year).

Each year, the farm sells approximately 95 small and 65 standard package abos. Private sales through the market stall and CSA abos are financially more advantageous as the farm can

charge higher prices. It's less labour-intensive than restaurant sales due to the direct relationship with customers, and the flexibility in product appearance can make it easier to sell.

Beyond direct sales, the farm cooperates with other organic farmers and a beekeeper. This allows them to supply vegetables, fruit, and juice to local restaurants twice a week, a packaging-free grocery store in the area, and a fellow cooperative farm's on-site farm shop. This second channel accounts for 20% of the total turnover. Of this, approximately 50% comes from the sale of products, while the other 50% is generated from the farm's role as a driver in the cooperative. While useful for finding a market quickly during the startup phase, the cooperative model requires more flexibility. Restaurants typically have stricter quality standards, especially regarding the aesthetic appearance of vegetables. The farm faces variability in the size and appearance of vegetables due to the different farmers involved in the cooperative. This can create challenges for the farm, but they maintain strong customer relationships by focusing on flexibility and the story of local, sustainable production.

Since they do not use pesticides, the fruit does not meet commercial aesthetic standards. Instead of selling it through large markets, they offer it as individual sales during vegetable package pick-up at their market stall. Passers-by, rather than vegetable package subscribers, mainly drive fruit sales. However, the farm attracts a niche market interested in old regional fruit varieties, which are difficult to find elsewhere. These fruits often have a more sour and distinctive taste than the sweeter varieties found in supermarkets. The farm is considering offering fruit packages, but this would require collaboration with other local farmers to ensure a diverse selection, which would add logistical complexity. Since last year, the farm has also started selling cider apples to cider makers, who come to harvest the apples themselves. This provides another income stream while ensuring the apples are used efficiently.

The presence of existing fruit trees influenced the farm's overall design, and while the goal was to produce organic vegetables, the farm quickly adjusted its plans in response to the surrounding agricultural landscape, avoiding direct competition with local self-harvest farms. This led to the decision to focus on vegetable packages and establish a market stall in the city.

Regarding fruit production, the farm initially expected higher financial returns from the trees. While the trees produce well, finding a market for the fruit has proven more challenging than anticipated. The farm's use of local and regional apple varieties gives it a unique niche, though these varieties may not be as marketable as well-known types like Boskoop. However, the farm has leveraged its short supply chain and the story behind its apples, highlighting their unique taste and pesticide-free production, to differentiate itself and achieve higher profit margins.

Despite this, certain fruits, such as plums and cherries, present challenges. These fruits do not store well, have a limited market, and require labour-intensive harvesting at a time when the farm is busy with other tasks. Although the fruit trees provide a steady income stream and help cover the farm's rent, the farm recognises there is potential for fruit marketing and sales improvement. The farm aims to expand its fruit marketing efforts in the future, focusing on minimal processing to avoid the lower-profit margins associated with juice production. One avenue for growth could be increasing collaborations with cider makers, potentially positioning their cider in local liquor stores and utilising QR codes to link consumers to the farm's story and the origin of the apples. This kind of traceability and consumer engagement is a way to increase value. The farm is also hopeful about the increasing processing opportunities in the market. As demand for local fruit, particularly cider apples, grows, the

farm is optimistic that these processing options will expand, making it more economically viable. However, while mobile presses exist, their cost remains a barrier for small-scale operations like theirs. The farm's annual turnover is approximately €120,000–€ 130,000, allowing the owners to pay themselves a net salary of around € 2,000- € 2,500 per month. While they are satisfied with this, they believe there is potential for slight financial improvement.

Consumer

The farm's products are premium-priced due to the work required and the high quality. The farm's products are primarily sold directly to private customers and restaurants, who purchase them due to their quality and taste. The clientele is willing to pay a premium for the unique aspects of these products, which are valued for their exceptional quality and innovative production methods. The farm engages directly with customers, explaining its vision and sustainable practices, which helps justify the slightly higher prices than store-bought products. CSA customers commit to a full growing season and subscribe to vegetable packages, ensuring a stable income and fostering a close relationship between farmers and consumers. Pick-up moments and a market stall in Antwerp strengthen these connections, as they emphasize knowing their customers personally.

The farm employs several marketing strategies to promote its products, strongly emphasising storytelling and connecting with customers on a personal level. Their primary marketing channels include social media platforms like Facebook and Instagram, along with a website that showcases their vision, offerings, and farm photos. To reach local customers, they distribute paper flyers annually to households near their pick-up point in Antwerp, as well as to restaurants. The farm's presence at the PAKT market on Wednesdays is a key part of their strategy, where customers collect their vegetable packages. Here, the farm highlights the unique aspects of its products, focusing on its story as a young farm doing things differently and offering products that aren't commonly found in stores. While the farm doesn't focus heavily on marketing its agroforestry practices, it mentions them on its website and during customer interactions. The sustainability of their products and production methods is the core message in their marketing, with agroforestry being presented as part of that broader approach. They also invite customers to visit the farm twice a year, allowing them to witness the agroforestry model firsthand and understand how trees are integrated into their cultivation process.

Additional Activities

In the past, the farm offered event services by hosting events on its premises, such as weddings and birthday parties. The orchard's setting, with its lush trees, provided a beautiful backdrop for these events. However, the lack of parking facilities led to challenges, including congestion on the streets and difficulties with access during events. After discussions with the local municipality, it was decided to phase out this aspect of the farm's operations. This transition has been beneficial due to the elimination of alleviated stress associated with managing the events, ensuring that crops and vegetables were not damaged during busy periods. Additionally, since one of the farmers had recently moved to the site, managing the hustle and bustle of hosting events alongside farm activities became more challenging.

Despite the discontinuation of events, the farm continues to host community-building activities for the CSA network. It offers educational sessions about agroforestry in collaboration with Landwijzer, which brings students to the site on an annual basis. Although they receive a small fee for hosting these educational activities, it doesn't form a major part of their revenue. From time to time, pruners visit the farm to practice their skills, but these sessions are offered at no charge, emphasising the farm's community spirit and contribution to agricultural education.

2.4 FARM FB4

Overview of the Farm

Farm FB4 began its operations in 2020, initially focusing on cultivating vegetables and herbs. The farm started as a private garden but expanded in 2022 by purchasing 6 hectares of agricultural land, which is being systematically developed. The farming system integrates vegetables with fruit and nut trees and includes sheep. From the start, it unknowingly incorporated agroforestry practices, gradually realising that integrating trees and natural elements into farming was aligned with agroforestry principles. The primary reason for not adopting agroforestry consciously earlier was a lack of formal knowledge and awareness of the approach. However, as the farm gained a deeper understanding of sustainable agriculture, the benefits of agroforestry became more evident. The key motivations for adopting agroforestry were sustainability, biodiversity, ecological balance, and soil health. These principles have been fundamental to the farm's operations since its inception, shaping its commitment to an integrated and resilient agricultural system.

2.4.1. Value Chain Analysis

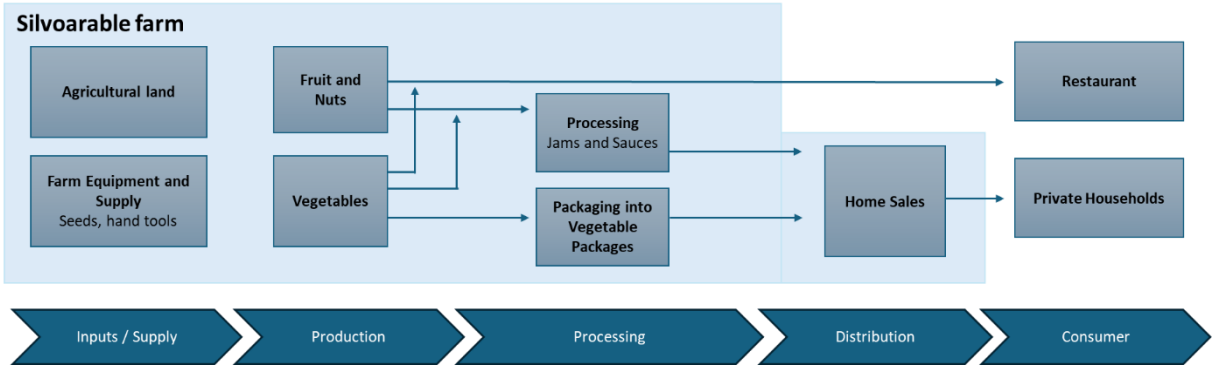

Figure 4: Value Chain from farm FB4

Inputs/Supply

The farm is a one-person business, providing flexibility and autonomy in decision-making but posing challenges in workload management. Due to financial constraints, it is not possible to hire permanent staff at this stage. Instead, temporary workers, such as working students and flexi-jobbers, assist during peak seasons, while most tasks are handled by the owner alone. The production primarily requires certified organic seeds and planting materials, which are purchased from organic suppliers. Collaboration on tasks such as contract work and pruning is conducted with individuals who share the same vision. Soil preparation is outsourced, and tree pruning is performed with the assistance of an external contractor. The farm uses minimal material, relying mostly on hand tools rather than large machines. Looking ahead, even when fruits and nuts need to be harvested, no additional machinery will be used, as everything will be harvested and processed manually.

The farm organises its land, labour, and equipment, focusing on minimal machinery use. Larger tasks, such as spring tillage and planting of cultivation plots, are outsourced or carried out using a small horticultural tractor with specialised equipment. After these tasks, most work, such as sowing and hoeing, is done by hand or with small tools. The farm does not use a plough, and manure is applied manually. When fruit and nuts are ready for harvest, they will also be collected by hand.

The farm aims to eliminate waste entirely by repurposing all by-products. Plant waste is composted and returned to the soil as a source of nourishment, while sheep manure enriches the grasslands. Even nut shells are utilised as material for footpaths in the fields, ensuring a sustainable and waste-free farming system.

Production
The farm primarily produces vegetables and herbs grown in open fields. While fruit and nut trees have been planted, they are still too young to yield produce. The farm also focuses on cultivating "forgotten vegetables" and varieties that closely resemble their ancient or original forms. The annual production plan is based on a pre-established cultivation schedule that prioritises growing products the farmer finds fulfilling, rather than responding to market demand. This approach encourages the restaurant to supply the farm to operate on a seasonal basis. Any surplus produced is also directed to the restaurant. Currently, fruits and nuts are not part of the planning; however, once the trees begin to yield, the farm's workload will increase significantly.

Processing
Any surplus fruits and vegetables are processed into products like jams and sauces.

Distribution
Initially, a few goals were set, and there was uncertainty about whether the vegetables would be sold, making the early stages challenging. However, securing a purchase agreement with the restaurant provided a sense of security. Most of the farm's fruits and vegetables are taken by the restaurant. Additionally, vegetable packages are prepared and sold through home sales. If products are processed into sauces or juices, this processing is done in-house and sold through home sales. Prices are determined based on the costs incurred and work carried out, but a reality check is conducted by comparing them with the wholesaler's prices. Social media is widely used for marketing and advertising purposes. It is done by an external person.

Consumer
The end consumers are restaurant guests and private households that purchase vegetable packages.

Additional Activities
In the long term, the farm plans to expand its offerings by collaborating with various parties to provide additional services, such as cooking workshops, ceramics, and organising a farmers' market. These activities are designed to generate additional revenue while promoting community engagement. The aim is to position the farm as a hub that goes beyond simply supplying fresh products, contributing to the creation of a sustainable and valued agricultural business.

2.5 FARM FCR1

Overview of the Farm
Farm FCR1 is a family farm with 3.5 ha of agroforestry. Within the agroforestry system, a combination of fruit trees, animals, poultry, bees, fast-growing trees, herbs, and cosmetics is cultivated, guided by natural selection and temporal possibilities.

2.5.1. Value Chain Analysis

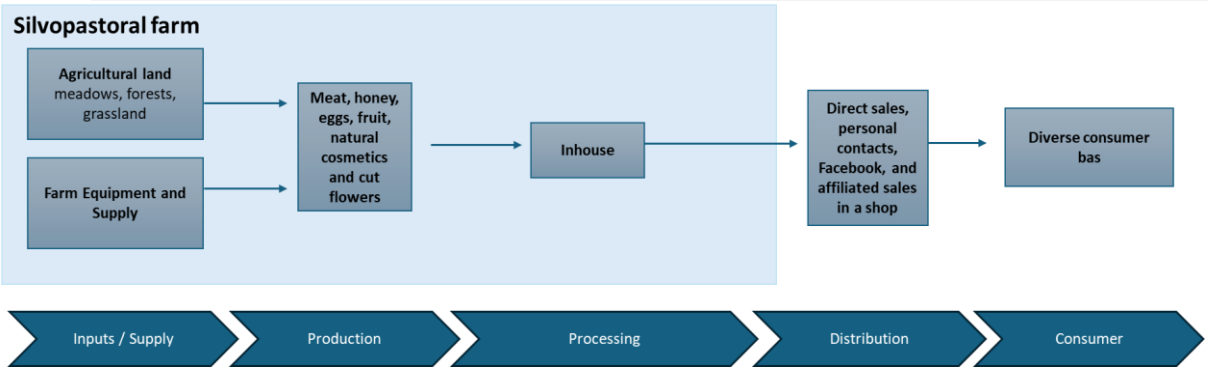

Figure 5: Value Chain from farm FCR1

Inputs/ Supply
The farm buys components for natural cosmetics from suppliers which have direct connections to producers.

Production & Processing
Everything is produced and processed at the farm.

Distribution
The distribution of the finished products is happening through direct sales, personal contacts, Facebook, and affiliated sales in a shop in the Czech Republic. The products are advertised through Facebook and face-to-face contacts. In terms of production, the market is unsaturated, but competition is emerging/growing.

Consumer
The consumer base is diverse. Consumers value the origin of the product. The farm does not follow trends; instead, it relies on buyer feedback.

Additional activities
The farm offers education options for schools and kindergartens.

2.6 FARM FCR2

Overview of the Farm
Farm FCR2 is a registered official association that covers several hectares of agricultural orchard land. The association strives to restore water management and increase biodiversity in the landscape. Therefore, it connects individual locations with local communities (volunteers, neighbours, schools, etc.). The value chain is relatively basic; local production of fruits and vegetables is coupled with education about the differences between conventional and sustainable farming practices. The foodstuff is marketed through on-site sales and self-picking.

2.6.1. Value Chain Analysis

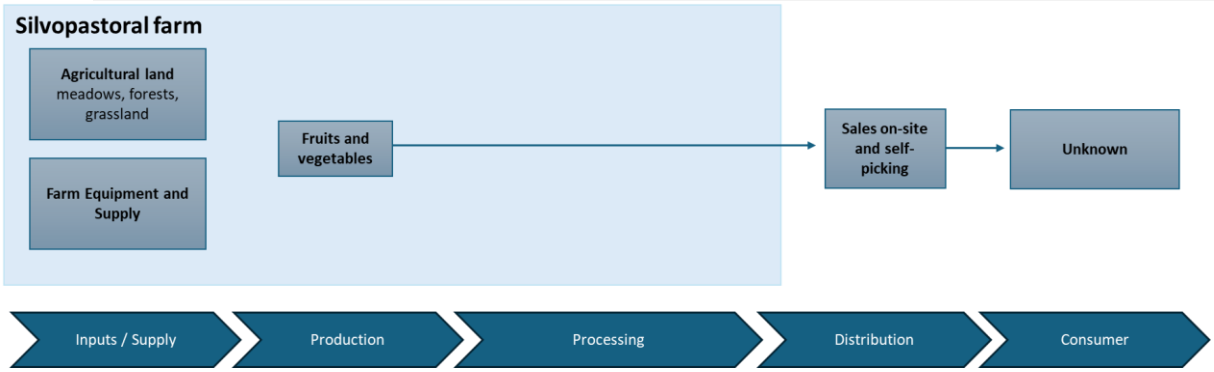

Figure 6: Value Chain from farm FCR2

2.7 FARM FCR3

Overview of the Farm

Farm FCR3 was established in 2016 and emerged through the subdivision of a larger entity. It focuses on maintaining permanent grassland and breeding cattle without market milk production, with the primary product being beef calves. Agroforestry systems have been implemented to enhance biodiversity. The farm's main product is beef calves. Everything is certified organic.

2.7.1. Value Chain Analysis

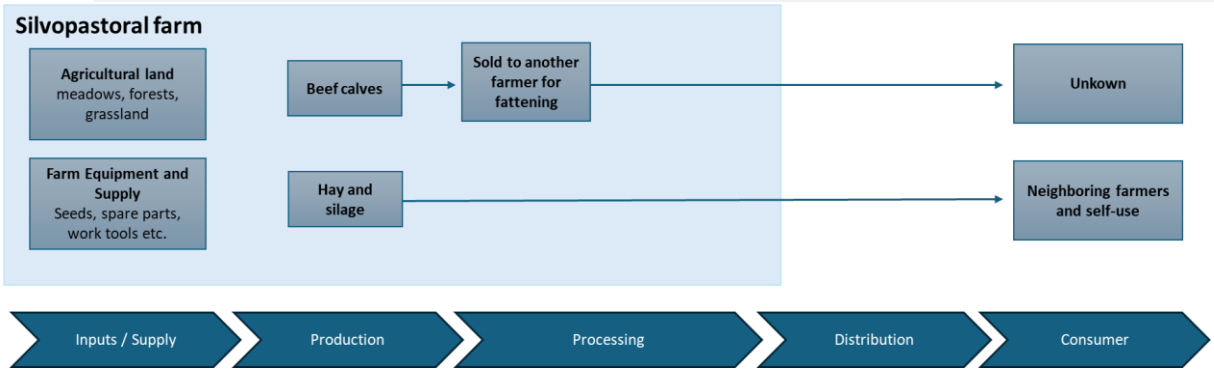

Figure 7: Value Chain from farm FCR3

Inputs/ Supply

Seeds, spare parts, work tools, suppliers - through associations, and a partnership relationship.

Production

Besides the beef calves, the farm produces hay and silage to feed the cattle and to sell to other farmers.

Distribution

The beef calves are sold to another farmer for fattening. This farmer is a long-time customer who also purchases hay and silage. Therefore, the prices are determined by mutual agreement based on common market prices.

2.8 FARM FCR4

Overview of the Farm

Farm FCR4 is a CSA. The farmer wants to farm in harmony with nature. The farm is certified organic. The farm produces fruits, vegetables and pasture-raised chickens.

2.8.1. Value Chain Analysis

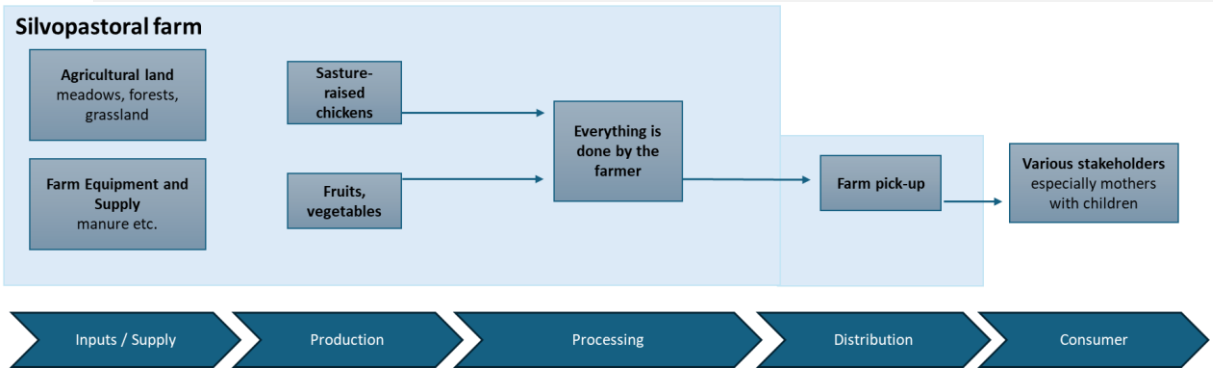

Figure 8: Value Chain from farm FCR4

Inputs/ Supply

The farm obtains manure for fertilisation and produces its compost.

Processing

The foodstuff is packaged in fabric bags, which are later returned to the farm by the customer.

Distribution

The foodstuff is sold off the farm to the end consumer and advertised on Facebook. The prices are based on standard market prices plus an organic surcharge.

Consumer

Organic vegetables are scarce in the surrounding region, making the market highly sought after. Consumers are seeking organic quality, especially mothers with children, who care about ecology and landscape preservation and appreciate the good taste of quality food.

2.9 FARM FCR5

Overview of the Farm

Farm FCR5 got mobile sheds for laying hens, cows, fruit, and vegetables. The agroforestry system aligns with the sustainability concept through its production functions and other ecosystem services. The farm practices organic and ecological farming, but is not certified organic. The farm produces eggs, honey, apple juice, fruit, pumpkins and wheat. Additionally, the farm offers a K-line plough for renting.

2.9.1. Value Chain Analysis

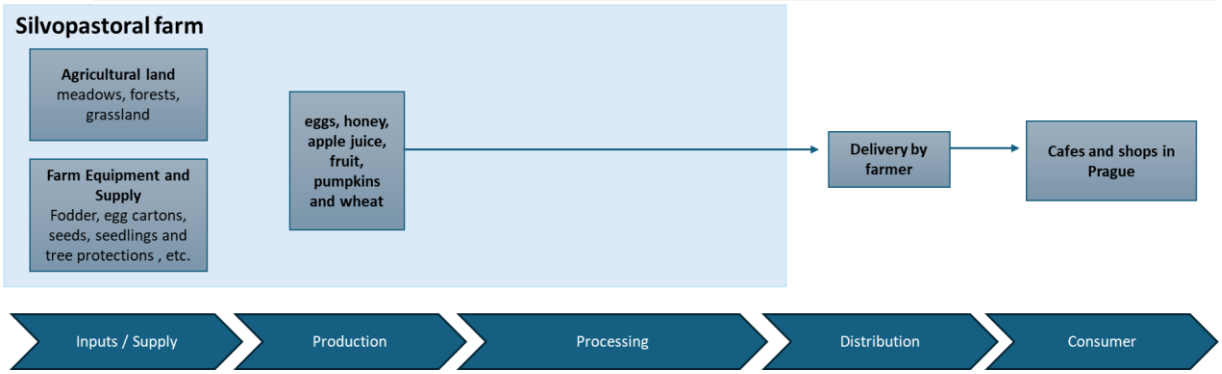

Figure 9: Value Chain from farm FCR5

Inputs/ Supply

The farm purchases feed for laying hens, egg cartons, seeds, seedlings, and tree protections from available suppliers, based on their offerings and prices.

Distribution

Once a week, delivery of the farm products to cafes and shops in Prague. The farmer sets the prices based on costs and market conditions.

2.10 FARM FCR6

Overview of the Farm

Farm FCR6 has 3 hectares of land, which the farmer has managed for 13 years. The farm features 80 beekeeping colonies, several garden beds for vegetables located behind the house, and pastures with fruit trees, where a few sheep and a horse graze. Honey and other bee products, wax, pollen, and propolis are the farm's main produce. Surplus vegetables like root and leafy vegetables, potatoes, etc., are occasionally also for sale.

2.10.1. Value Chain Analysis

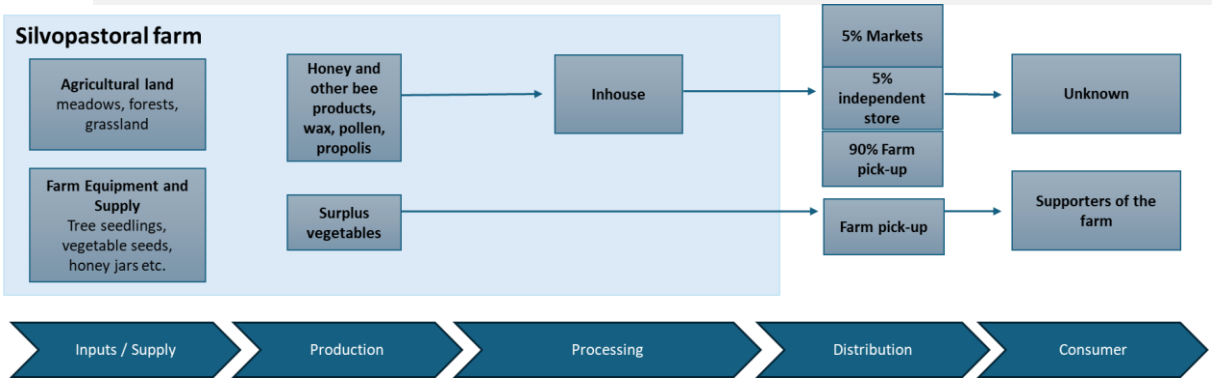

Figure 10: Value Chain from farm FCR6

Inputs/ Supply

Tree seedlings, vegetable seeds, and honey jars are purchased online and selected based on recommendations.

Processing
The honey is filled in a jar and labelled. Vegetables are sold loose without packaging.

Distribution
90% of the farm's produce is sold directly to consumers from the farm, 5% at markets, and 5% is sold to a store focusing on healthy nutrition. Vegetables are sold directly to consumers, mainly to a circle of acquaintances or supporters of the farm. Information is shared through Facebook. Through Facebook and the farm's website, the primary target is regular customers and their acquaintances. Prices follow regional prices while considering the labour-intensive practices associated with avoiding chemical protection. Honey prices are satisfactory, while vegetable prices are deemed acceptable, and overall, they are considered reasonable for consumers.

Consumer
Some customers are interested in the origin of their food and are drawn to products where the farmer personally guarantees the quality. The emphasis is on personal contact, local products, and a commitment to ensuring the quality of the product.

Additional activities
Educational visits to the farm, ecological education for children and schools, as well as therapeutic stays in the beekeeping house, such as sleeping on the beehives, are available. Meat is mainly produced for personal consumption.

2.11 FARM FD1

Overview of the Farm
The farm is an agroforestry research site at a university. It was initiated in the 1990s with the primary objectives of establishing a multifunctional cropping system, implementing organic management, integrating the production of food, energy, and ecosystem services, and achieving a fossil energy-neutral agro-ecosystem. The area coverage is 11.1 hectares, 10.1 hectares of food/fodder, 1 hectare of biomass/biofuel belts. The system delivers three different outputs: food (wheat/barley/oat), fodder (clover with rye grass), and trees (willow/alder/hazel nut). The plots between the biomass belts have different lengths: 200m, 150m, 100m and 50m. This is to research the influence of the biomass belt on the plot, like the shadow influence on the crops and water consumption by the roots. The entire system is run for research purposes, so there is no need for it to be economically profitable.

2.11.1. Value Chain Analysis

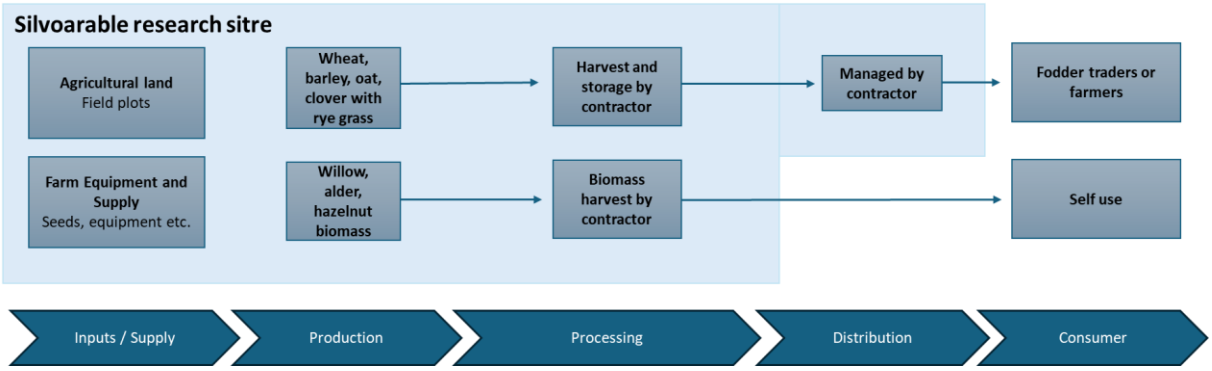

Figure 11: Value Chain from farm FD1

Inputs/Supply

The seeds for the plots are purchased from a supplier in large quantities every year, and there are both organic and conventional seeds. Consequently, in some years, conventional seeds are used on the plots, while in other years, organic seeds are used.

Production

Agricultural work is performed by university personnel, with the exception of the harvest, which is outsourced. Four people work on all the university plots, but only one person is needed to run the agroforestry system. The production is organic, but it is not certified as such and is not labelled as such. The same crop rotation has been employed for the past decade on all plots. The staff is putting in minimal effort in the plots, just to maintain the status quo. On the plots, crop rotation is practised yearly, and clover with ryegrass are used as the natural fertiliser. The trees grow quite fast after the biomass harvest. The tree breeds are specially chosen due to their rapid growth capabilities.

Processing and Distribution

A contractor visits the site every year to harvest the crops; they combine the harvest from the agroforestry site with the harvest from the other university plots. The contractor stores the harvested crops until the university gets a good price, and then the contractor sells them to a fodder trader or farmers. All crops harvested on university plots are mixed up and used for fodder. The biomass belt is harvested by a contractor every 5 years, last time in 2021 during winter. The idea of the biomass belt was to sell the harvested wood chips to a heating company. Currently, the university biomass belt harvest has not been sold for at least the last 5 to 10 years, due to its small volume and associated price difficulties. The university found other ways to utilise the wood chips within parts of the university for its own purposes, for example, in the university orchard as a heat cover for the trees and plants in winter, and as a natural fertiliser due to the high carbon content in the woodchips. Perhaps a heating company purchased it a few times initially when the system was established, but not currently.

2.12 FARM FE1

Overview of the Farm

Farm FE1 is an 800-hectare organic farm located in the southwest of England, near Swindon. The farm is the founding supplier of its own organic brand, which also sells products from other organic farms. The farm produces milk for Arla Foods. Besides the dairy, the farm produces beef and rose veal as secondary products of the dairy operation, as well as pork meat, a mix of wheat, a mix of vegetables and salads, and gin and spirits from the fruits within the agroforestry system. This foodstuff is sold within their organic brand in supermarkets, online, and farm shops. In the farm shop, products from other organic farms are also available for sale. Some products are also used in conjunction with the farm's associated agritourism operations, including a restaurant and a mini-hotel. Farm and brand succession from the current owner to her daughter and son-in-law is currently underway.

The motivations behind the farm's adoption of agroforestry are multifaceted, reflecting a blend of environmental, ethical, and economic considerations. Several key objectives are behind their engagement in agroforestry, emphasising climate change resilience as a major driving force. The uncertainty of climate change and its potential impacts prompted them to utilise trees to mitigate the risks associated with changing weather patterns. Furthermore, there is an acknowledgement of the broader benefits of agroforestry, such as increased biodiversity and improved soil health, indicating a holistic approach toward sustainable land management. Overall, their primary motivations for

practising agroforestry appear to be climate change adaptation, animal welfare improvement, and promoting ecological health on the farm. Additionally, animal welfare is a significant consideration for the farmer, aiming to provide better conditions for the livestock through shade, shelter, and improved diet. This focus on enhancing animal welfare reflects a commitment to ethical and sustainable farming practices, which goes hand in hand with the farmers long-term dedication and passion for organic farming. Another motivation is the goal to establish agroforestry systems, such as grazed woodland, alleys, shelter belts, roundel plantings, browsing blocks, and hedges, aiming to create a demonstration site for testing and learning purposes and to show other farmers how agroforestry can be done in a benefiting way.

2.12.1. Value Chain Analysis

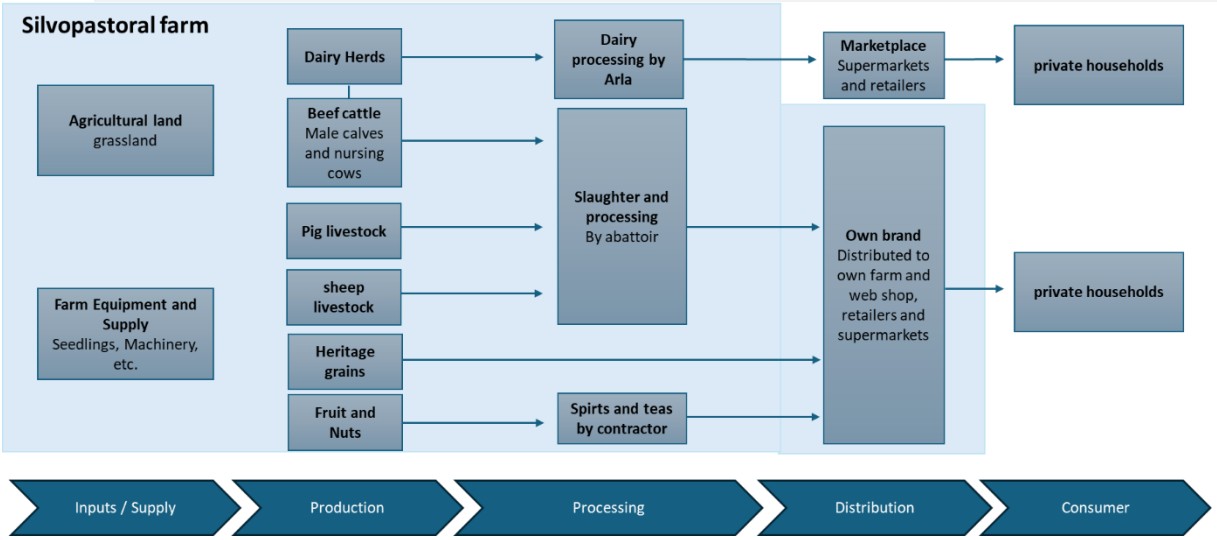

Figure 12: Value Chain from farm FE1

Inputs/Supply

The farm got a mixture of some smaller and older machinery. If expensive arable machinery is needed, they contract the machinery from elsewhere. The cattle are primarily grass-fed. The pig feed is a mix of foraged fodder at their grazing ground, cereals and organic food waste.

Production

The farm has all kinds of agroforestry systems: Grazed woodland (forest wood blocks in grazing grounds), alleys, shelterbelts, hedges, and fruit and nut orchards. The first trees were planted in 2016. The fruit and nut orchard got almonds, walnuts, pears and sea buckthorn. Tree maintenance is quite labour-intensive, especially in the first years of establishment, which poses challenges for farmers.

> *"We are definitely understaffed in terms of being able to look after the trees. And I would say that is fairly common amongst farmers. And it is often not the top priority, particularly livestock farmers."*

The timber production of the farm is small-scale, which challenges regarding the selling of the finished timber. In general, the timber production in the UK is very industrialised with big machinery with which single farm can't compete. Therefore, the farm is actively engaging in building a small-scale woodland economy in cooperation with the Soil Association. If succeeding, this should also motivate other farmers to plant more trees.

The yield of their fruit and nut trees is still quite low because of the age of the trees.

"So, for instance, our field of fruits and nuts, there's not enough of each one probably to be really profitable on its own."

The farm also grows cereals with a focus on heritage grain production of different sorts for artisan bakers.

The cattle are mainly for dairy production. The milk cows are split into two herds with 150 animals each, and no crossover between them. The dairy herds graze in two different areas of the farm with its own milking parlours, where they are milked once a day. They are also overwintered at their grazing areas. Regarding overwintering, there are also some barns for extreme weather conditions. The animals are predominantly outdoors, but the barns are for adequate protection on the grazing ground when extreme weather conditions occur. The dairy herds don't have access to the farm's agroforestry area.

The farm employs a combination of artificial insemination and natural insemination through bulls that the farm owns. Since the livestock's primary goal is to produce milk, male cattle aren't desired. Nevertheless, the farm managed to market the male cattle commercially. The male calves are fattened and reared without being confined in crates, resulting in pinker meat. When butchered, the meat of these calves can be sold as Rose Veal. Rose Veal is considered a classic beef product and thus offers farmers the opportunity to commercially utilise the unwanted male calves, which are a by-product of milk production. Rose Veal production is also linked to improved animal welfare, providing the animals with a better quality of life. Less productive dairy cows with mastitis that cannot contribute milk to the bulk tank to nurse and rear the calves, essentially repurposing these cows for this purpose. This way, these retired cows continue contributing some value by aiding in rearing the calves and enjoying additional welfare benefits. The agroforestry area is primarily grazed by calves with the nursing cows. The herd stays at the beginning of the grazing period in early spring for one month and is then moved within the same time window on a regular basis to different plots. The rotation lasts until the calves are weaned, which typically occurs after 10 months. Then all animals are turned into meat. The farm also had a small sheep.

Processing

The fruit yield is turned into spirits and teas. The farm's milk is sold to Arla as part of the general organic milk supply rather than directly under the farm's brand label. Arla produces a variety of milk products, which are supplied to various destinations, including supermarkets. The farm receives a fixed price per litre for its milk, and there may be additional bonuses based on factors such as fat content. The bonus is generally around one penny per litre. Fluctuating milk prices are a significant concern in the UK, particularly the differences between organic and conventional milk prices. Cyclical patterns are recognised by farmers, who experience periods of contentment followed by extended periods of struggle due to varying contract terms, market demand, and supply fluctuations. This inconsistency in prices creates a constant challenge for farmers in the UK.

The farm outsourced the slaughtering and processing of the livestock. After doing so, various types of meat cuts and processed products, such as sausages, are returned to their farms. The pigs of the farm are slaughtered at an abattoir in the UK. Historically, processing has been conducted in Germany due to the unavailability of suitable facilities in the UK, primarily because of a lack of the right equipment and the necessary skills to operate on the required scale. However, there's mention of a potential shift back to using a UK-based processor due to recent discussions with a

business that might accommodate their requirements, as the farm has decreased its pig operation in scale. It is also recognised that shipping the meat to Germany for processing and then back to the UK for selling is not ideal. Brexit has not helped in this regard either. The recent development regarding pork meat products is also related to Sainsbury's cancellation of the supply contract due to a shift in the supermarket's organic product preference, which no longer includes selling organic pork.

Distribution

The dairy products processed by Arla are distributed through Arla's distribution channels and can be found in supermarkets and retailers all over Europe. The farm utilises different distribution approaches. The main distribution channel is the farm's own brand. The branded products are sold in the farm shop, on its own website, and through supermarkets and retailers. The web shop accounts for 5-10% of the total sales of these products. Additionally, the farm utilises some of its products in its own gastronomy and catering operations. The farm got its own farm pub/restaurant, where all kinds of farm products are used within the kitchen and at the bar, for example, beef steaks and peri-pear gin. Guests can even bring in their own food and produce and get vouchers for the pub. The farm and web shop, as well as the pub, rely heavily on word-of-mouth and local reputation, complemented by a social media presence, primarily on Instagram and Facebook.

Consumer

The end consumer likely has an above-average income, as the products are organic and therefore more premium-priced.

Additional Activities

The farm has a hotel and a pub. In the UK, there is a shift from pubs being primarily drinking establishments to places that increasingly offer food, especially in rural areas. As a result, the pub primarily focuses on food. The farm is integrating farm-produced goods into the pub's menu. One speciality is buckthorn berry gin, which an external contractor manufactures with the farm's buckthorn berries. Moreover, there's a system where individuals can bring their produce to the farm and receive vouchers to spend at the pub and the farm shop, which is an innovative way of local sourcing and community engagement.

The farm also offers various activities, including farm safaris, farm walks, a camping site, and courses and workshops. Activities like farm safaris and farm walks are not a significant factor in increasing farm income, but they do contribute to building excitement around the farm and attracting people, thereby adding value to the pub and hotel that the farmer owns. These diverse activities collectively contribute to the farm's overall value, even if they are not highly profitable individually.

> *"They all feed into each other in a away. (…) They are a way of building excitement around the farm and bringing people in and of adding value to the pub and to the hotel."*

2.13 FARM FE2

Overview of the Farm

Farm FE2 is situated in the Lake District of Cumbria and is classified as an upland farm. Its main product is beef. The farm is in organic conversion. The farm was bought by the farmer's grandfather in 1979 and farmed by him until the late 90s. After this, the farm was under annual grazing licences until 2017. In 2017, the farmers assumed management of the farm. The farm is predominantly a livestock farm. The farm is approximately 280 acres in size, of which an 80-acre block comprises heather moorland. The farm also consists of a mixture of meadows, a big block of historically wooded pasture and some pastures. The meadows are currently in a restoration process to become species-rich meadows. The

wood pasture block is used for what the farmer calls rough grazing, because the trees have gradually started to disappear over the last centuries in this area. The farm is making efforts to restore the wood pasture. The pauses are plantations on ancient woodland sites. The biggest pasture contains mostly oak but also other species such as conifers and larch. There is one big block of conifer spruce, which is planted in felling rows. This block is managed by the farmer's parents, who have their own business. The farm also contains some smaller pockets of other, more native deciduous woodlands, which are also classified as pasture. One of them is a historically coppiced woodland that is mostly overgrown. The farmer wants to clear it out and restore it to its original state as coppice woodland.

2.13.1. Value Chain Analysis

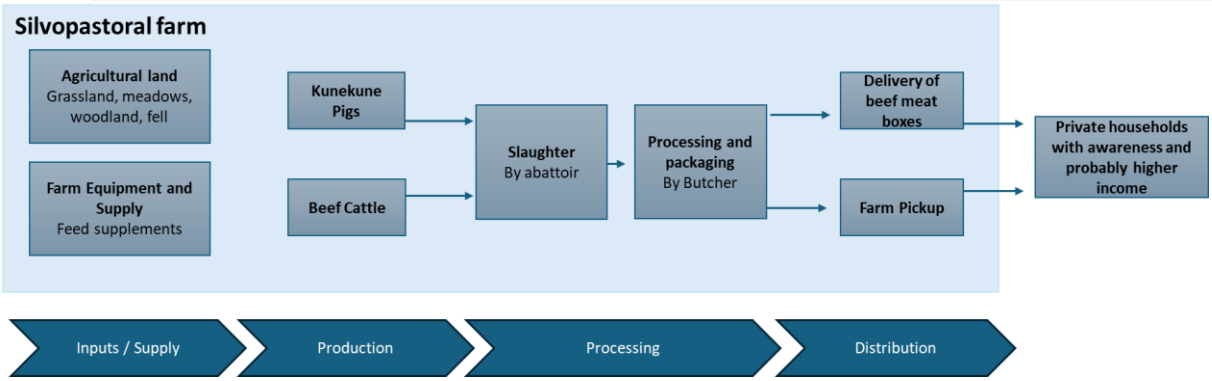

Figure 13: Value Chain from farm FE2

Inputs/Supply

The farmer shared information on the feed inputs for their cattle, emphasising their practice of mainly relying on their land for feed, with the only additional input being seaweed in the past. She explains that they were concerned about potential mineral deficiencies due to the relative rarity of achieving a 100% grass-fed diet for cows in upland areas. Consequently, they conducted blood tests on their cows and discovered low levels of iodine, among other minerals. To address this deficiency, they introduced seaweed into the cattle's diet, as it contains the minerals they were lacking, especially iodine. However, the farmer notes the costliness of feeding seaweed and expresses uncertainty about its continued use in the future. Despite addressing the mineral deficiency, they hadn't encountered any visible health issues typically associated with low iodine levels in cattle. Therefore, the decision to continue feeding seaweed remains uncertain, as it was initially introduced to address a known mineral deficiency but hadn't yet resulted in observable issues related to iodine deficiency in their cows. This highlights the challenges of maintaining a 100% grass-fed diet for cattle in upland areas and the specific measures taken, such as incorporating seaweed to address mineral deficiencies, while also considering the cost-benefit aspect of this supplementary feed.

The farmer mentions that they aim to minimise tractor use as much as possible. A tractor is primarily employed for haymaking. It's one of the few tasks where tractor usage is necessary. Instead, they rely heavily on a quad bike, considering it their farm's most valuable piece of machinery. The quad bike is used for tasks such as setting up and collecting electric fencing.

Production

The farm's livestock splits into a herd of short-horn cattle and a very small number of kunekune pigs. The farm had sheep as their main livestock breed for a long time. Sometime after the farm takeover by the farmers, they realised that the sheep were not profitable, they could not pay their labour costs, and their costs on inputs like feed and fertilisers were too high. At the same time, they had a small herd of cattle and thought they preferred cattle over sheep, so they got rid of the sheep and moved fully into cattle.

The cattle herd consists of 63 animals. In 2023, the farm calved 16 breeding cows to grow the herd. Currently, there are 30 breeding cows that they wish to pair with the bull. The herd comprises a steady mix of suckler and beef cows, primarily intended for meat production. The pigs' livestock consists of two sows, three 18-month-old pigs, and a litter of piglets, which are sold off gradually.

Additionally, the farm also acquired four fell ponies, which are not considered part of the farm's livestock, as they are not the property of the farm, but may become part of it in the future. The ponies are the property of the lady who is running the Fell Pony Heritage Trust, who aims to highlight the decline in their numbers, especially those breeding on the fell. Maintaining their presence on the field is crucial for preserving their hardiness and resilience. The farm is supporting this effort as a way of demonstrating the value of fell ponies in regenerative farming practices. The farmer expresses a long-term intention to potentially collaborate with the lady owning the ponies, given her extensive experience and the mutual relationship. Additionally, she mentions the potential financial value of the ponies, particularly the prospect of selling foals. At the moment, two ponies are expecting foals. Fell ponies are a native breed at risk. The farm receives environmental payments for both the cattle and the ponies, as well as specifically for the fell ponies being located on the fell. The farmer stated that they are very friendly animals, but she doesn’t trust them for riding purposes because she thinks they underestimate their own strength.

The farmer describes their farming approach as a hybrid between rewilding and regenerative farming. The handling routine for the cattle is primarily rotational grazing on the meadows from spring to autumn; in winter, the cattle graze inside the woodlands and wood pasture areas. Being able to overwinter the cattle inside these areas has a high value for the farm, as it negates the need to feed hay or provide housing. The decision to overwinter cattle within the agroforestry system is closely linked to the farm's holistic management approach and its social, financial, and environmental aspects. Socially, the farm faced challenges, including inadequate housing for the cattle and the strain it placed on family dynamics, particularly with the farmer managing the cattle's care twice daily. Financially, the cost of housing cattle indoors was higher than that of an outdoor arrangement. Environmentally, they anticipated a more positive impact from the cattle being outside.

To manage grazing more effectively, the farm creates a grazing plan that outlines when to initiate cattle rotation on the grazing areas. The rotation occurs between the winter block and the meadows the rest of the year. A big part of it is to wean the calves onto the meadows and get them taught by the older cows how to forage in the winter block. The cows and calves enter the winter block first, so they are not losing too much of their condition during the winter. The herd is only fed during March; for this purpose, the farm utilises bale grazing. Bale grazing means unwrapping hay bales and setting them out onto the meadow. Because of this, there is only the need to make hay on one field each year. Four fields are used to make hay, resulting in a four-year rotation cycle. Bale grazing takes place on two fields that are also rotated. One of the fields has a lack of soil health and diversity. The farm tries to improve this. In its effort, the farm is part of a research project with other innovative farmers who also practice bale grazing to determine the notable effects of this approach. The grazing plan is closely linked to the herd growing plan regarding herd size versus anticipated grass growth and rest periods during the different times of the year.
The farmer explains that their farm is ring-fenced, meaning they don't use machinery like tractors to move the cattle from one plot to another. Instead, they have a routine where they move the cattle daily to new grazing areas, providing fresh grass on a daily basis. The cattle associate this movement with receiving fresh grass, particularly with the farmer who leads this daily movement, and with the

opportunity for new grazing. She further notes that the cows are accustomed to following the humans, particularly the farmer, and this behaviour extends even to the winter season. During winter, when they need to relocate the cattle from the winter block, all they have to do is stand at the gate and call, and the cattle will follow the call willingly. This highlights the farm's management style, emphasising a hands-on approach to moving the cattle without relying on machinery. It also underscores the trained behaviour of the cattle, associating specific individuals with the opportunity for fresh grazing, leading to their ease in following humans during movements from one area to another, even in different seasons.

Like already mentioned, the farm also has four fell ponies. This type of pony breed doesn't graze well with cattle, so this also has to be considered in the grazing plan. In the winter block of wood pasture, the grazing of both animals works well. The rest of the year, from March to October, the ponies are on the fell. Their purpose is solely for grazing because they eat rougher grasses than the cattle, like thistles and tufted hairgrass. They keep the rougher grasses from becoming too dominant in the grazing areas. The fell ponies have a relatively low water requirement compared to the cattle, making them an ideal animal for the fell, where the farm is struggling to establish a good water supply.

The farm is in the process of increasing its livestock numbers. The farmer stated that approximately 10 animals were slaughtered in 2022, including a few cull cows. She explained that, due to their focus on growing the herd and retaining most young heifers for breeding, they have not yet reached peak production. Therefore, they anticipate a similar or slightly increased number of slaughters in 2023, possibly around 10 or slightly more. In 2023, the farm had 16 breeding cows calve. She then outlines their future plans, envisioning that when they reach a stable herd size of around 30 breeding cows, they might slaughter around 20 animals annually. Additionally, they consider the possibility of selling breeding heifers in the future, possibly even within the current year, as local farms have shown interest.

The farm acquired kunekune pigs for breeding, including three 18-month-old females and a litter of piglets. The female kunekune piglets, suitable for breeding purposes, are sold to other farmers. The farm keeps the male piglets for fattening. The fattening process takes 18 months, which is a relatively long time for fattening, whereas the typical fattening period for pigs is much shorter. The process takes this long because the farm is not using any extra feed; the pigs only eat what the ground offers. The only expectation is for the mothers when they struggle to keep their condition, as they are feeding a large number of piglets. One of the main food sources for the pigs is acorns. The kunekune pigs on the farm have to have two acorn harvests before they will be sent to the abattoir.

Agroforestry System

As the farm is a livestock operation, all agroforestry areas are used for grazing. The agroforestry system is undergoing a partial restoration process. Historically, the area being restored is a wood pasture that hadn't been managed properly, and the trees started to disappear gradually, making it more of a rough grazing ground. Thus, the farmers began to restore it to a wood pasture status, aligning it more closely with their ideas. The farmer characterises the rest of the agroforestry system as fields lined with hedges or woodland on one side, so that the livestock has access to trees at any time.

The agroforestry system is mostly a mix of sycamore, birch and alder. Young trees must be shielded from potential damage by the cattle, so proactive measures are taken by replanting in enclosures. These enclosures serve the dual purpose of adhering to the Forestry Commission's guidelines regarding tree density while ensuring that livestock can roam within the broader area without compromising the

growth of the young trees. This strategy displays the farmer's commitment to meeting the Forestry Commission's stipulations while actively integrating livestock into the woodland environment. It emphasises a balance between preserving the trees' development and allowing the coexistence of livestock within the woodland space. The farm is collaborating with the Woodland Trust and Cumbria Woodlands, which are assisting in the management of some of the woodlands. Woodland Trust applied for a government grant, called the Green Recovery Fund, and is administering how the money is spent. The Woodland Trust is funding Cumbria Woodlands with this money to install some of these enclosures on the farm. Additionally, the setup of the enclosures is part of a research experiment aimed at determining what happens when livestock, such as cattle, are placed in established woodland for short periods, particularly the effects on the woodland floor. The farm is the perfect research object, as it offers areas where deer, cattle, and pigs are grazing, and areas where all livestock is excluded.

The farm utilises an agroforestry system to overwinter livestock without the need for sheds, resulting in financial savings. The livestock also benefits from the agroforestry system, which saves money.

Processing

The cattle, as well as the kunekune pigs, are slaughtered by an abattoir in South Cumbria, which then sends the meat to a butcher in Kendal, South Cumbria. The kunekune pig is a very fatty but also quite small pig breed; because of this, the whole meat is processed into sausages. The butcher processes and packs the packaging.

Distribution

The farm collects packaged products from the butcher. The product is then sold in two ways. The main selling channel is beef boxes. These boxes contain a full range of beef cuts from nose to tail, which the farmers pack; nothing is wasted. A mailing list manages the box sales, so customers receive an email when beef is available, and then they can reply with an order. The boxes are then dropped off at the courier and delivered to the customers within a day. The boxes are well-packaged to keep the meat fresh. The excess meat and the kunekune pig sausages are stored in the farm freezer and can be purchased and picked up at the farm.

Consumer

The farmer stated that some customers seek out their meat because of their Pasture for Life certification, as they are the only farm in the Lake District with this certification. A rarity in the region, and there are only a few in Cumbria, which gives a clear competitive advantage over other competitors. The farmer explained their pricing strategy, which involves setting their beef prices after comparing them to supermarket prices, particularly the higher-end supermarket ranges. She emphasises that while their product is considered premium due to its quality and certification, they aim to keep their pricing competitive by directly selling to customers without a middleman. This approach enables them to capture more value from their product.

> *"It's a premium product and but no more premium than the supermarkets kind of premium price."*

The Pasture for Life certification serves as a significant differentiator for their meat, attracting customers who value such certifications and allowing the farm to justify its pricing strategy based on quality and market positioning, despite being in the premium price range comparable to supermarkets.

2.14 FARM FE3

Overview of the Farm

The Farmer owns a regenerative farming and circular infrastructure Company. It is also a community interest non-profit company. The company is working and cooperating with other food companies in the UK. The goal is to encourage other food companies to invest in more adaptive, resilient, and ecologically rich landscapes or farms, and to develop a circular, regenerative sector in the UK. Four basic requirements are particularly important for the company before interacting with any landscape or farm in this context: 1. It has to have an intelligent water design and infrastructure; 2. It has to produce food that fits the local climate. It has to put as much carbon in the soil as possible. 4. There must be a willingness to develop biologically rich, complex, diverse and dense ecosystems. Food companies that wish to collaborate with the company must share an interest in these four fundamental principles. The farm FE3 is the company's first regenerative and circular project. The farm is considered a demonstration site, to demonstrate to food companies what a good regenerative and circular platform looks like and how they can adapt to scale up their production system and their processes in a regenerative and sustainable way. The farmer states that many food companies in the UK want to do the right thing and make their business more regenerative and sustainable.

> *"We have to understand that food companies are not ecosystem designers and they are not farmers and farmers are not ecosystem designers."*

Therefore, in his opinion, the farming approach for the future should blend traditional farming activities with ecosystem design, regardless of whether it is arable, pasture, tropical, or temperate. The company is enticing food companies to join the project, supporting the regenerative and sustainable transition in agriculture and developing regenerative landscapes. This initiative aims to address the huge challenges associated with this topic and invest in the UK to drive change. The farm's goal is to demonstrate how it is done, allowing companies to experience it in person and ask questions on-site. When the companies understand the transition and want to scale up their production systems, the company assists them in developing more commercial systems.

The farm is located in the uplands of Yorkshire. In this area, pasture farming is the predominant farming method. Yorkshire Water owns the land on which the farm is situated. Yorkshire Water is one of the largest landowners in Yorkshire. Approximately 100 tenant farmers are engaged in various forms of farming on Yorkshire Water land. The farmer notes the difficulty water companies face in achieving their net-zero targets and improving water design infrastructure. Yorkshire Water recognised the link between water purity and land use in the areas where water is sourced. Therefore, Yorkshire Water acknowledged the importance of regenerative land use approaches and sought projects that aligned with regenerative agriculture. The farmer was already acquainted with Yorkshire Water and identified their possible interest in a demonstration site for regenerative agriculture. He proposed that Yorkshire Water raise capital and develop a demonstration site in exchange for a long-term, rent-free land contract from Yorkshire Water.

The motivation element for Yorkshire Water is the local water situation. Yorkshire Water spends one million pounds a year on cleaning the water before pumping it into the reservoir due to poor land management. This sum could be reduced by developing good ecosystems in the area, as this lowers toxic runoff. In the UK, there is an increase in heavy rainfall, which can cause floods that can then pollute the water reservoirs. One reason for these floods is the deforestation of the land. Deforestation could be solved by better ecosystem design with integrated agroforestry systems. Trees and plants can hold water, weakening or preventing floods. Another problem associated with deforestation is an

increase in water evaporation, which negatively impacts water reservoirs. The Yorkshire area is experiencing a decline in groundwater levels. Agroforestry systems can reduce water evaporation and mitigate the effects of heavy rain events, thereby improving water management in the fields. The groundwater level can regenerate, and in return, the soil will be moist, and crops can grow even better.

> *"The best reservoirs in the world are soiled."*

Methods for improved water management, such as ponds, swales, and berms, can be integrated into an agroforestry system and positively impact the water management situation. Good water management decisions can mitigate certain effects of climate change and prevent desertification. In addition to the support from Yorkshire Water, the farmer relied on the intersection of farming and the food industry. Regarding this, he highlights the challenge of landowners lacking funds but having land, while food companies have capital but lack land. During this time, the farmer was freelancing for Levy UK, a food company. Levy UK was also interested in a regenerative approach, so the farmer could mobilise this contact to fund his project. Yorkshire Water offered him four locations. One was the farm, managed in the third generation by a farmer. After visiting all farms, the farmer was hooked on the farm because of the current farmer's mindset.

> *"He's 78 years old, been farming that land since nine years old with his parents. Never been married. Never been away from Yorkshire, never had a passport, just lived on that farm and nothing else. And that's very traditional in them areas. It's not a profession, it's a way of life."*
> *"Even though he's 78, his eyes are wide open really wants to change his farming which is amazing at 78 years old when he's only done one kind of farming. I think that was a really important milestone for me to meet Derek and Derek saying look I can't do it but I know that this isn't working you know and I want something better".*

Another major reason for the farmer choosing the farm is the landscape. The farmer describes the land as really difficult because it has a big height difference; the highest part lies around 250 meters above sea level, and the lowest is 175 meters. The farmer says that most farmers would not want to farm on such ground, but for him, this elevation offers some real advantages for the water design. In a well-designed water system, you aim to retain as much water as possible on top and then distribute it evenly throughout the year. The farmer thought that, because of the difficulties in the landscape, the farm would be the perfect demonstration site, because if he could pull it off in this environment, any farmer could do it in the UK. Another reason for him was the livestock on the farm, which is sheep. Sheep is the main livestock in the Yorkshire area, so it would be even better to show that the approach works with the common livestock used by the local farmers. The land the farmer got from Yorkshire Water on the farm is 37 hectares. The farm comprises additional land owned by the original farmer and spans approximately 300 hectares. The farmers plan to commercialise the farm to create an organic, certified ecosystem, which will generate biodiversity gains. They aim to capitalise on these gains by selling the carbon and biodiversity credits to businesses. The farm is in organic conversion. Currently, the primary product is sheep meat. Another product is processed from fruits and berries of trees and shrubs in the agroforestry system, such as fermented elderberries and pear products, or dehydrated and cold-pressed products.

The original farmer has no children who can continue his farming legacy, so he would be very happy if he could pass on his work. Currently, both are assisting each other with the farm project. The farmer stated that he would be happy if the original farmer came up to him someday and offered to buy or rent his land. The farmer said he made it very clear to the original farmer that this is an option for him, so the possibility of this kind of farm legacy succession is open for the original farmer, if he wants to take this option.

2.14.1. Value Chain Analysis

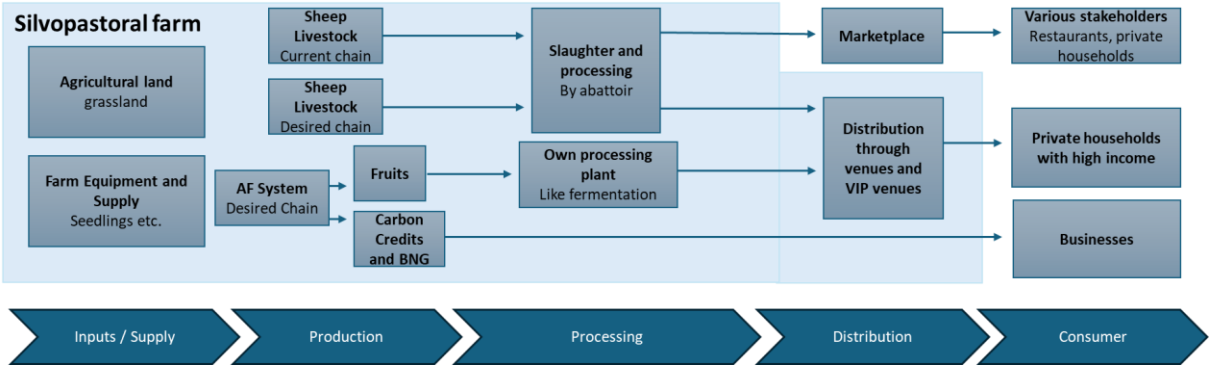

Figure 14: Value Chain from farm FE3

Production

Currently, the farm has approximately 130 sheep, which are managed within the agroforestry system within the farm project area. The original farmer has the grazing licence for grazing the sheep at the farm project area. The farmer devised a grazing plan based on the agroforestry system. The original farmer is 78 years old, and because of this, the farmer is taking over the grazing and selling of the sheep step by step.

Agroforestry System

The farmer attempts to mimic nature with his agroforestry design approach because he is convinced that nature has already determined what a good ecosystem looks like, and it is this ideal that he aims to create. Therefore, the agroforestry system is a unique alley agroforestry system established in 2022. Due to its specialised planning and structure, it is worth describing this system in detail. The agroforestry area covers 12 ha and is integrated within the livestock grazing ground. It is split into eight 1,5 ha blocks with a similar pattern design. Each block has 8 alleys. The alleys are 100 to 115 metres long and 1.5 to 2.5 metres wide. The distance between each tree is 2 metres, and between each alley 15 metres. Each alley is divided into 16 blocks, each with a particular plant configuration. Each of these 16 blocks features 3 keystone species of trees and an understory comprising 6 to 8 shrubs. Which has again two understories; the first with 2 to 3 leafy crops and the last with cistern plants. The system is designed to be resilient against sun, wind and frost. Therefore, large fruit trees are used to protect the smaller plants and the alleys. The alleys are oriented in such a way that they support this goal by offering shade, windbreak, and frost resilience. As one keystone species, the farmer uses apples. Other than that, pears, damsons, etc. are also used. Shrubs are juneberry, elderberry, blackberries and blackcurrants. Cistern plants are lungwort, comfrey and broom. This design results in approximately 64 different species in each alley. For the entire system, this translates to approximately 1,000 new productive trees and shrubs per hectare. Between the alleys, 57 cover crops are spread. These cover crops include pulses, cabbages, cereals, grasses, wild flowers and herbs. The cover crops are only kept for two years; their primary purpose is to add biomass to the ground. To further support the soil health and loosen it up, 30 kilos of lobe worms are added to each alley, as well as mycorrhizal fungi spores and oyster mushroom spores. After two years of soil enhancement, the farmer aims to cultivate arable crops and root crops, while also allowing livestock to graze periodically within the agroforestry system. The primary goal and motivation for the agroforestry system on the farm is to integrate biological functionality and economic outputs, and serve as a demonstration site to show others how agroforestry can be implemented. The farmer is convinced that a farm can become economically viable by stacking individual farm activities. Therefore, the main goal can be divided into 7 essential elements,

which all reflect the key motivations for this agroforestry approach:
The first element is to improve the carbon input into the soil and to commercialise it. The second element is creating biodiversity gains, which are also commercialisable in the UK. Therefore, the economic output goal is to create an ecosystem and offer businesses carbon and biodiversity gains generated in this ecosystem as credits.

The third element is the animal livestock, specifically sheep. The chosen agroforestry system design shall provide a better nutritional fodder basis for the sheep, thereby increasing the quality of their meat to a point where it can be considered regenerative meat. However, this process, until the meat and all other products of the farm are truly regenerative, still takes about three more years because the system is relatively newly implemented. Considering the increasing demand for biological materials and new fabrics in the UK, as well as the need for countries to become more circular and develop sustainable industries, a possibility is being explored to market sheep wool more effectively. As mentioned, around 500.000 sheep are clustered in various farms. The farm project aims to find marketing solutions that are also adoptable by the other farmers and are not only working for their own 130 sheep. The background to the matter of new marketing opportunities for wool is that, at the moment, a farmer only earns around 50 pence for a coat from a sheep and, in return, has to pay 1 pound to get it shaved by a specialised contractor. This paradox lies between a valuable resource and a lack of economic benefit.

The fourth element is the fruit trees and the berries. To utilise these, the project relies on fermentation. According to the farmer, simply selling apples is not profitable, so the farm is trying to improve the value by adding value through fermentation. Possible products are fermented elderberries and pear products, for example. Other possible processing methods include dehydration and cold pressing, which are more economical. The fifth element is not yet developed, but there is the possibility of using wildlife on farmland, such as deer, rabbits, and hares. These animal populations need to be managed by the farmer as directed by the UK Forestry Commission. Because these animals also provide high-quality meat, they can be used for economic gains.

The sixth element is to provide a location for workshops, leadership days, and other events on the farm and utilise this as an additional income source. The last element is to prepare the farm to receive governmental payments, such as for integrated ponds and meadows, tree planting, and various other ecosystem services activities. Receipt of these payments in the UK will be possible starting in 2028.

Processing
When the original farmer sells the sheep directly to an abattoir, the abattoir then sells the meat nationally. After the full takeover of the sheep operation, the farmer plans to stop selling the meat through an abattoir in the future, as he believes this approach is not regenerative enough. He wants to sell the meat directly from the farm to local people, as well as to local and high-end restaurants, and offer them the opportunity to visit the farm and see the product. Overall, the farmer is trying to produce high-priced, premium products, which he calls “VIP products”.

The agroforestry at the farm is still relatively newly implemented. Therefore, the outputs are small, except for the produced meat. The farm began experimenting with fruit processing, including fermentation, in autumn and winter 2023/2024 to further expand its product range. The fruit procession experimentation is done in cooperation with Levy UK, which is already engaged with the farmer and the project. Levy UK provides food service to venues such as football stadiums, jockey stadiums, and horse racing stadiums, and is also an investor in these projects. Levy UK provides the

infrastructure to experiment with the planned processes used for processing crops, including fermentation, dehydration, and cold pressing. This collaboration should also provide Levy UK with new products to enter their various venues, as the products produced within the cooperation are expected to mark the start of a supplier relationship between the farmer and Levy UK. The possible venues offer the opportunity to sell basic products, such as street food, and VIP products. The farmer mostly aims for the VIP area in venues like Wimbledon. Wimbledon for example is renowned for strawberry eating, the farmer suggests that it could be one possibility to produce a very good product like a compote or a fermented berry mix out of classic English berries like white berries, blackberries and juneberries harvested within the agroforestry system of the farm, that head chefs and executive chefs can use in their menus at such venues or in their restaurants. He thinks that processing and marketing the crops in this way could yield a profitable economic return. The farmer hopes for a successful test run with the processed products, so that Levy UK is willing to invest around £ 30,000 to £ 50,000 in a small processing lab, allowing the project to scale up the process.

Distribution
The abattoir distributes the processed sheep meat into the food distribution chain.

Consumer
The farmer's hopes for increased income are tied to stronger households, while the meat can currently be found in the conventional meat market.

Additional Activities
The farm is considered a demonstration site to show food companies what a good regenerative and circular platform looks like and how they can adapt their production systems and processes to scale up in a regenerative and sustainable way. The company entices food companies to join the project, supporting the regenerative and sustainable transition in agriculture, developing regenerative landscapes, understanding the significant challenges associated with this topic, and investing in the UK. Working with food companies offers access to customers, suppliers, and staff, providing the opportunity to organise events at the project site, such as leadership and workshop days. The demonstration platform is designed to show companies how it is done, provide an up-close experience, and allow them to ask questions in person.
Providing an event location is also one of the farm's main goals, as hosting events like workshops and leadership days on the farm offers, besides the educational perspective, the possibility of generating an additional income source.

2.15 FARM FE4

Overview of the Farm
Farm FE4 is located in Suffolk. The farm is entirely organic, spanning 137 owned hectares, with a focus on arable farming, poultry, and vegetable cultivation. The farm produces eggs, flour, over 40 different types of vegetables, and honey. The operation also includes a farm shop where the farm's products and those of other farmers, which are not produced on the farm, such as cheese, are sold.

2.15.1. Value Chain Analysis

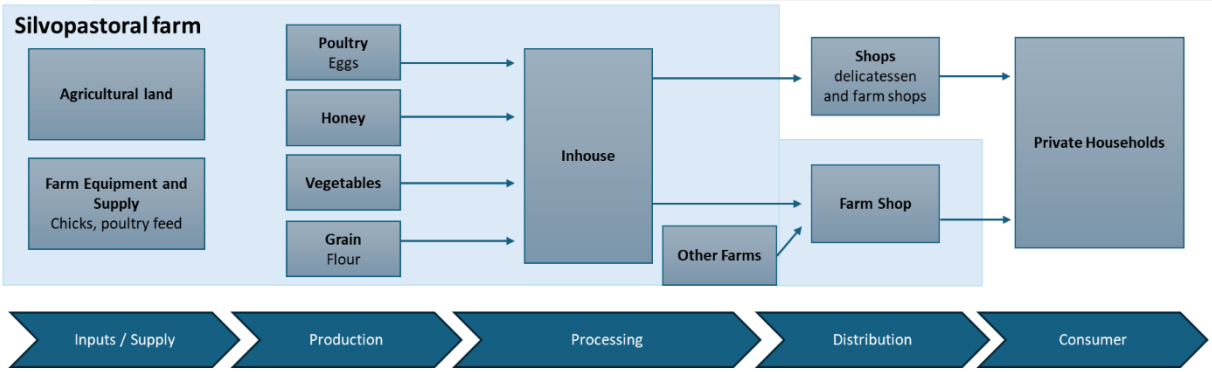

Figure 15: Value Chain from farm FE4

Inputs/Supply

The farm buys day-old chicks and raises them. The farm acquires the chicks from a distributor who imports them from hatcheries in France on a monthly basis into the UK.

The poultry's feed is supplemented, besides the grazing, by offering them complex poultry feed that includes several proteins and oils, which is purchased from external sources. The farm got a mill, from which by-products such as middlings and bran from the flour production can be fed to the poultry. The farmer stated that this is one of the reasons why the farm has poultry. Using what would be considered waste as a fodder source.

Production

The farm isn't focused on its livestock operation; its focus is split between arable farming, poultry, and vegetable cultivation. The farm has 1.800 hens. These are split into six flocks of 300 birds. The farm uses mobile units as sheds for poultry. During summer, the sheds are moved from one field to another, but in the wetter months (November, December, and January), they are left in one place to minimise damage and resume moving them once the ground has dried up.

Some fields have agroforestry systems on them, so the poultry have access to these systems. The farmer stated that all the eggs are laid in the mobile units. He attributes this to their practice of constantly relocating the sheds, which prevents the chickens from settling in one place and forming a habit. Additionally, he notes that the trees are smaller, allowing more light to reach the ground, which makes the area less attractive for egg-laying. Therefore, the darkest place for the poultry is the shed, which further reduces the likelihood of egg-laying within the tree rows. The agroforestry system is designed to allow the fields to be used for running poultry or for arable purposes as needed. There is no fixation on one approach.

When poultry reaches an advanced age and egg productivity begins to decline, it is rehomed. The birds are given to private individuals who might still get eggs from them, and they become pets in the garden. The farmer mentions that since they use coloured birds (black, grey, white), it is relatively easy to find people interested in taking them for their gardens. The farm has 1.800 hens running in six flocks of 300. At any given time, maybe 300 hens are retiring, but it is spread throughout the year to avoid dealing with a large number. When this comes up, the farm announces that birds need a retirement on their website, social media and email list. Interested individuals can then contact the farm via phone calls or email. Farmer adds that there is usually a small fee involved in the rehoming process. Nevertheless, this approach enables the animals to live a little longer, thereby improving animal welfare.

Sometimes, flying flocks of sheep come in from a grazier and are placed in the field during the green manure phase when cover crops are being planted. The sheep are not allowed to roam freely in the agroforestry area until the trees are old enough. This cautious approach ensures that the trees can withstand browsing and other impacts from livestock. Across the farm area, beehives are spread and used to produce honey. The farm produces over 40 different vegetables. It also produces grains for flour production.

Agroforestry System

The agroforestry planting started in 2014. The planting process continued for about 8 years and was then paused. The farmer explains that the planting was stopped because the size of the agroforestry system was at a point where they felt they had reached the farm's capacity. The expenses for managing the agroforestry system were increasing. He acknowledges making errors during the planting process, particularly in getting trees to grow well. Therefore, the farm team need to spend time addressing existing gaps, catching up, and ensuring that existing plantations are functioning properly. The pause allowed them to address and rectify these issues while keeping the expenses for managing at a sustainable level.

Most of the farm fields meet the requirements for agroforestry. They offer the right shape for rows running from north to south. The farm's agroforestry system currently spans 40 hectares, comprising seven fields. Every field is treated the same, with row centres set at 30 meters between the rows, and each field has two rows. The strip of land between the rows is 24 meters wide. This is a standardised approach across all agroforestry fields. The fields are designed in such a way that the poultry, when grazing, can access the trees and browse within the rows. The trees used are predominantly native English trees. The rows in some fields are dedicated more to biomass production, including hazel and poplar, while others have a higher concentration of fruit trees, such as apple and pear. Currently, the trees are not producing enough because they are still immature and small; however, the farm plans to utilise them commercially within the farm shop.

The farm incorporated fruit trees into its agroforestry system in an orchard. The trees planted there are spaced at a large distance.

Processing

The farm uses a combination of manual and machine processes to process the eggs. A grader is used for sorting and labelling the eggs. The final step of placing the eggs into packaging is still done manually.

Distribution

The farm produce is sold using a direct marketing approach in the farm shop. The products are priced higher than the average supermarket because they are of high quality and organic. Besides the farm shop, the eggs are sold in other local shops ranging from Norfolk, 30-40 miles north of them, to London, 60 miles south of them. These shops are mostly delicatessens and farm shops. The farm does not use any intermediaries to sell its products. This indicates a direct-to-consumer approach without involving middlemen or intermediaries.

Consumer

The consumer base is likely more aware and higher-income, as the products are organic and premium-priced.

Additional Activities

The farm offers locals the opportunity to contribute to the agroforestry system and, in doing so, experience the benefits of agroforestry. Visitors can help plant new trees within the agroforestry system on the farm.

2.16 FARM FE5

Overview of the Farm

The farm FE5 is located in the very north of England, at the English-Scottish border, in the northwest corner of the Cheviot Hills in Northumberland. The ground in the area varies greatly and is described by the farmer as probably more beautiful ground but less productive. The farm was bought by the farmer's father in 1955. The farmer took over the farm in the mid-90s from his father and describes the handover as “an evolutionary handover rather than a revolutionary handover”. Because of other obligations, the farmer handed over the day-to-day management to a neighbouring farmer. In 2019, he regained overall management of the farm. The farm area comprises 1,150 acres of half-hill ground, all of which is owned by the farmer. The farm area is divided into one permanent pasture, one rotational pasture, and one arable field. About 12% of the farm area is covered with woodland in shelterbelts, most of which were planted between 1955 and 1980, after the farmer’s father took over the farm. In 2019, when the farmer took the farm management back into his own hands, he decided to go into organic conversion. Today, the farm is certified for organic use. The farm produces beef, fat lambs, and cereals.

2.16.1. Value Chain Analysis

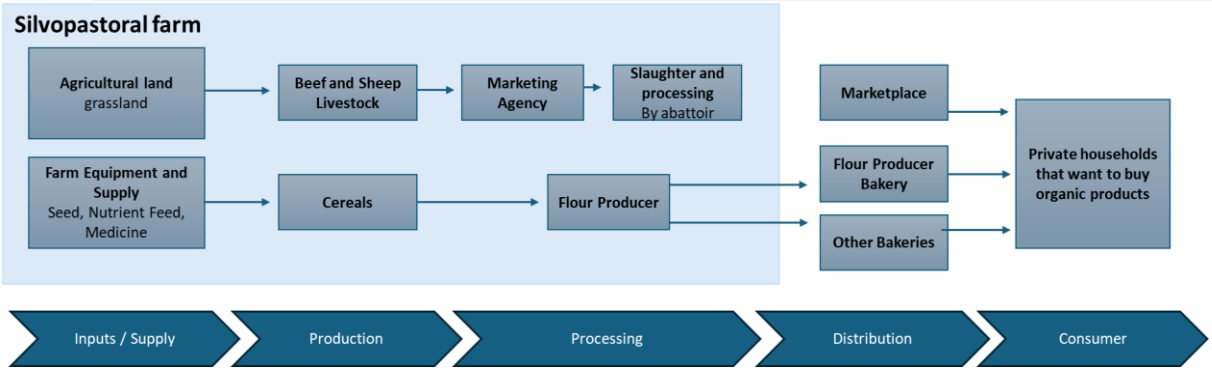

Figure 16: Value Chain from farm FE5

Inputs/Supply

Almost all inputs are produced by the farm. The farm produces its own cereal seeds. The nutrient density and protein levels of the cereals are improving compared to conventional methods. While they mostly use homegrown seeds, they occasionally purchase seeds they don’t already have, such as herb seeds, or when they experience a seed shortage. Organic seeds are sourced from a limited number of suppliers. Occasionally, medicine or nutrient feed is bought for the livestock if needed. Silage is produced to supplement livestock diets as needed.

Production

The farm has around 1.000 breeding sheep for fat lamb production and 90 beef cattle. The farmer has transitioned to a closed flock for sheep and a closed herd for cattle, meaning they no longer buy in female replacements but instead breed their own. They only purchase sires (males) occasionally. This approach allows them to raise livestock better suited to their land through epigenetics—essentially selecting for traits that thrive in their specific environment. A key shift in their strategy is keeping the

fastest-growing females for breeding rather than selling them early, which helps improve overall herd and flock performance over time. Previously, they struggled to find organic replacements that fit their farming system, so producing their own has been a better solution.
After birth, the calves stay with the mother cows until they are six to eight months old. During this time, the calves are fattening, and to feed the calves, an arable hillcrop silage is used. This silage consists of diverse cereals grown on the farm's grass fields and provides a high amount of protein and carbohydrates to support initial growth. After this period, the cattle are allowed to graze on the farm's fields. The sheep are also grazing. The farm employs one shepherd and one cattleman to herd the animals. The farm has around 1.000 breeding sheep, which lamb at about 195%, so one sheep generates around two lambs a year. The farm also has 90 breeding cows. One cow will typically have only one calf per year. The farm is currently rebuilding its cattle numbers to 100 animals after a reduction due to the conversion from conventional to organic farming. The calving of the cows will begin in the third week of March, and the calves will be born around mid-September. The calves will stay with the cows until they are about six to eight months old. During this time, the calves are fattening, and to feed the calves, an arable hillcrop silage is used. This silage consists of diverse cereals grown on the farm's grass fields and provides a high amount of protein and carbohydrates to support initial growth. The farm produces organic cereals.

Agroforestry System

The farm agroforestry system relies on shelterbelts with hedges. Most of the trees were planted and integrated into small blocks with the primary objective of serving as shelter belts, as the area was quite exposed and windy. The trees are mostly local species, such as willow. Some of the hedges have been grown deliberately into veteran tree lines, which also suits the diversity and the ground. The hedges and tree lines also work as natural field boundaries. The farmer performs all agroforestry-related work alone because finding contractors who specialise in this type of work is quite difficult in his area. He planted around 14.000 trees in the winters of 2021 and 2022. To create a hedge, the trees are cut and bent horizontally when they reach a certain size and then spiked vertically to make the hedge thicker. The farmer also plans to plant some wood meadows. By placing trees in the centre of a grazing field, he aims to improve the field's browsing and nutrient density.
Practising agroforestry means making a long-term commitment for a farmer, because you are managing trees that may outlive you, depending on which trees you are using. This can lead to you planting trees that, in the future, someone else will have to manage. This scales a business plan significantly. The business plan for the farm effectively demonstrates this. According to the farmer's father, most of the trees were planted and integrated into small blocks with the primary objective of serving as shelter belts, as the area was quite exposed and quite windy. The business plan for these shelterbelts suggested that the trees be thinned every 10 years, and the sale of the thinnings will pay for itself. At the end of the business plan, after 70 years, a good crop of standing timber is achieved. In the meantime, the situation changed, and after 20 to 30 years, the farmer wasn’t interested anymore in thinning because it got too expensive, and the timber is imported cheaply from elsewhere. This is one of the main reasons why many English woodlands are undermanaged and underthinned, as they are no longer profitable. Another reason is that various compliance frameworks make it difficult to sell such low quantities of wood, as the farm produces consistently. So, the question is, what is the farmer doing in such a case? This highlights the fact that the length of time spent working in certain agroforestry systems represents a major risk. To mitigate this risk, it is essential that farmers are informed about these risks from the outset and that various options for the economic utilisation of the agroforestry system, as well as support programs, are continually developed. Farmers must also be informed about the diverse non-commercial benefits of tree planting and include these in their business plans since these should also be considered as an output target of the agroforestry system.

For the farmer, the business model had to change and adapt because the global market conditions had changed. The farmer's shelterbelts of wood went from being a valuable crop to an expensive one with no monetary value. The farmer solved this problem by chipping the thinnings into wood chips. He installed a biomass spoiler on his farm, which heats a number of houses, buildings, and offices in the farm area by burning wood chips. Additionally, if the wood chips are not suitable for burning, they are used as a compost additive to improve the fertility of the farmland, which in turn supports the livestock and cereal operations. Some of the wood chips are also returned to the hedges to support biodiversity and promote the growth of a healthy understory. For this purpose, various understory plants are also added to the hedges. The wood chips are not sold as the farmer characterised the compliance framework for selling wood chips as quite prescriptive. In the end, the farmer's shelterbelts of wood went from being a valuable crop to an expensive crop without monetary value, back to an organised asset that generates around £ 40,000 in savings on heating oil a year.

Processing

The main purpose of livestock is meat production. Most livestock is sold through a marketing agency to abattoirs, which then supply large supermarkets like M&S. Some farmers sell directly to consumers via butcher-managed box schemes, but this requires a reliable local butcher, which isn't available nearby. The farmer wants to establish a more vertically integrated system, meaning more control over processing and selling. Therefore, he is seeking a joint venture with a new entrant to establish a local box scheme for meat distribution. Animals are sent to the abattoir based on readiness, typically in small batches (2-10 at a time). If the market is good, some livestock is sold as "stores" (unfinished animals), allowing other farmers to finish them. For instance, in April 2024, 30 stores were sold due to favourable market conditions. EU regulations have forced many small, local abattoirs out of business. This has made it difficult to process livestock in the vicinity. Livestock must travel up to four hours to reach an abattoir. This extended journey causes stress for the animals, which is undesirable.

Being organic gives the farm more money for its wool, but this isn't even enough to cover the cost of shearing. On the other hand, shearing is necessary for the sheep's welfare, so it is a cost. Nevertheless, it is a structural problem that the wool sale doesn't cover the cost of the shearing process. The cereals are sold to Wild Farmed, a company specialising in regeneratively farmed flour, which uses the flour in its bakeries and sells it to other bakeries. Despite not being organic, Wild Farmed pays a premium for environmentally sensitive production. In 2024, the farm received £430 per tonne for its organic cereals, significantly higher than the £180 per tonne conventional price, with lower input costs. However, due to shifting market conditions, the organic premiums for 2025 are uncertain.

Distribution

Like already mentioned, most livestock is sold through a marketing agency to abattoirs, which then supply supermarkets like M&S. The flour produced by Wild Farmed is distributed to their bakeries and other bakeries.

Consumer

Regarding the UK organic market, the speaker notes that while supermarkets such as M&S and Waitrose carry organic products, demand remains limited, as many consumers are unwilling to pay a premium. Being organic, the finished products can be found in supermarkets and bakeries.

Additional Activities

The farm offers a variety of holiday cottages in the farm area. In England, it was common for farm staff to live with their families in cottages on the farm land. On the 1150 acres of the farm are 14 cottages.

Today, one-third of these are used as holiday cottages, offering an additional income source for the farmer.

The farm participates in school visits as part of the STEM project, a science, technology, engineering, and maths educational initiative in the UK. The project's goal is to encourage children to pursue science, technology, engineering, and mathematics subjects and to overall capture their interest in these topics. As part of this, the farmer hopes to encourage some children to get involved in farming. Another positive effect of creating a contact point between children and farming activities is to generate awareness regarding the environment and food, which can positively influence their lifestyle.

2.17 FARM FE6

Overview of the Farm

The farmer is the owner of an egg packaging company. The operation is located in the Lake District and is partially organic certified. The farmer elaborates that the land consists mainly of improved grassland and grazing areas. The terrain isn't suitable for arable farming due to the prevalence of rock and hard ground, making it better suited for grazing. The farmer´s family farm was a traditional small farm of 50 hectares sustained by government and EU funding, primarily focused on beef and sheep. The farmer diverged from this conventional farming path by joining the Air Force for ten years before returning to the family farm. The farmer and his wife ventured into free-range poultry production during its early stages, when the market was expanding rapidly in the UK. This was because there was a need to intensify farming activities upon his return to the farm. The operation has grown significantly over the last 25 years, expanding from 50 hectares to a substantial operation with 150,000 free-range birds and 30,000 organic ones, covering approximately 200 hectares, all of which are owned by the company. The company is collaborating with 80 other farms to supply eggs to its egg packing operation, which serves retailers. The main product of the operation is free-range eggs, which are branded in four types of differentiation: conventional, organic, "laid with love" and niche eggs. The differentiation lies in the feed quality, housing conditions, and additional nutritional benefits for "laid with love" eggs. In contrast, organic eggs are produced to higher standards, utilising organic feed and maintaining reduced stocking density. The decision to produce niche products offers the opportunity to cater to specific consumer preferences. The operation also includes a pullet rearing company that is not primarily driven by profit, but focuses on producing high-quality birds that lay eggs of the same standard. The primary goal is to support their farm and their partner laying farms to produce a quality product and reduce the external inputs needed.

2.17.1. Value Chain Analysis

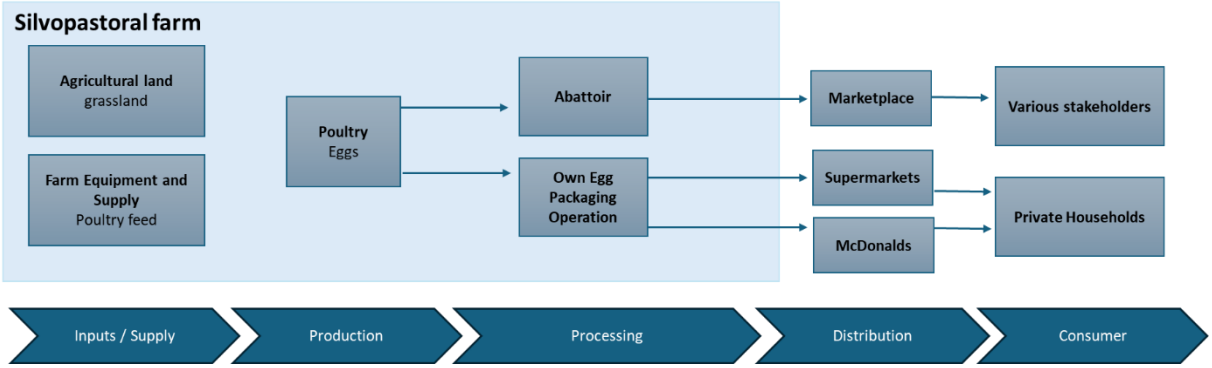

Figure 17: Value Chain from farm FE6

Inputs/Supply

The egg packaging company includes an additional operation that rears day-old chicks into pullets, which are then sold to farmers supplying eggs or used in their egg production operation. The farmer expresses concerns about the European approach, particularly in Germany, regarding handling day-old chicks, deeming it problematic. He mentioned the practice of sexing chicks before hatching to separate males from females, which, he claims, leads to inaccuracies and potential welfare issues. He mentions a situation with a breed of chickens where genetic errors led to challenges in sexing chicks accurately, resulting in morally questionable scenarios where unwanted males had to be culled as teenagers. He views the inaccuracy of sexing as a welfare problem and questions the ethics of such practices. He points out that the dead male chicks could be used in raptor feeding and the snake industry. He argues that if these male chicks were macerated after sexing while in incubation, this would be a waste, because there would still be the need to produce fodder for the mentioned industries, and this would possibly happen in worse condition, welfare-wise, than gassing two-day-old chicks for fodder production. He highlights the need for ethical consideration in handling these chicks and emphasises the importance of using them as a food source rather than waste. The egg packaging company has its hatchery, which follows strict protocols in handling these matters, indicating a different perspective compared to common industry practices. The farmer's stance suggests a critical evaluation of the industry norms regarding treating male chicks in the egg production.
The biggest single input of the operation is feed, because everything needs to be bought. The farmland is only usable for grazing and not for arable fodder production.

Production

In the 1970s, the farmer's family farm initially had dairy cows when the average dairy herd size in the UK was around 40-45 cows. However, due to limitations in farm size and the changing landscape of dairy farming, advances in techniques such as silage, as well as the need for larger operations, they transitioned away from dairy farming. At that time, government funding, from the UK or the EU, incentivised farms to exit dairy production. The farm utilised this grant funding to transition into beef and sheep production, primarily breeding sheep for fattened lambs and beef cows for breeding single-suckler calves. However, the farmer notes that even with this shift, the farm's beef and sheep aspects were subsidised and didn't yield much profit. He mentions that, historically, many upland farms in the UK have been financially reliant on government subsidies, with their actual business income being significantly lower than the subsidies received. As a result, upon returning from his service in the Air Force, the farmer and his wife sought a more commercially sustainable approach. They wanted their farm to operate independently without heavy reliance on government support, recognising the unpredictability of continued funding. Thus, they decided to move away from beef cows and eventually from sheep due to the financial challenges and lack of profitability in those sectors and get into poultry. This development highlights the economic challenges faced by small farms, their dependence on government subsidies for viability, and the farmer's drive to make the farm commercially sustainable without relying heavily on external funding.

The farm was growing significantly over the last 25 years to a livestock size of 150,000 conventional free-range birds and 30,000 organic free-range birds. The egg packaging company has pioneered free-range poultry with tree planting for chicken welfare in the UK. The farmer mentions that their practices have become the standard in various official codes of practice by organisations like the RSPCA, Woodland Trust, and Environment Agency. Regarding the farm layout, the farmer describes a typical setup: a chicken shed, followed by a small area, approximately five to six meters wide, of rough stone or a similar material to keep the immediate vicinity clear. Then, about 10 meters of open space, often soiled beneath the shed. Beyond that, within 15 to 20 meters from the shed's exterior, trees are planted, which might extend between 50 to 100 meters, with hedge rows beyond that, encouraging

birds to explore further. The trees are systematically planted in rows, approximately four meters between rows and two meters between individual trees within a row. The farmer emphasises that this planting pattern has become a standard practice across the UK for chicken farming, aimed at promoting the birds' welfare while encouraging their natural behaviour and movement within the agroforestry system.

When the poultry goes out into the tree area, it will eventually return to lay eggs inside the sheds. To guarantee this, it is important to manage the three areas to prevent the establishment of dark corners, where poultry might lay eggs. This management strategy of keeping the tree branches at least 1.3 meters above the ground helps prevent issues with eggs being laid in undesirable locations, ensuring that they are laid inside the sheds.

Extreme weather conditions pose a high risk to free-range poultry. The farmer acknowledges the effectiveness of woodland areas in breaking up snow, preventing the animals from being buried and potentially dying due to extreme weather conditions. The farmer explains that they allow their chickens to freely graze outdoors yearly. However, he notes the poultry's natural instincts, causing them to stay indoors during harsh weather conditions, they won't venture out into open grassland covered in snow, as an example. The farmer highlights the benefits of trees in moderating temperatures and breaking the wind, which encourages the poultry to venture out into wooded areas even during winter. While fewer animals may go out during winter compared to summer, the presence of trees provides a more favourable environment that encourages their outdoor activity even during colder seasons.

Because the farms are split into conventional free-range, organic and some specialised egg products, the feed and housing can be different:

-Conventional free-range poultry:

Feed: Standard EU feed with soy, bean, a little maize, and mainly wheat.

Housing: Stocked at 9 birds per square meter in the shed, complying with EU regulations.

Characteristics: No special additives in the feed, resulting in a standard yolk colour.

-"Laid with Love" poultry:

Feed: Similar to conventional, but with an additional ingredient - marigold extract containing lutein.

Housing: Same density as conventional (9 birds per square meter).

Characteristics: The marigold extract enhances the nutritional content, promoting benefits for human health, particularly in the areas of eyesight and heart health. The yolk is noticeably yellower.

-Organic poultry:

Feed: Organic feed.

Housing: Reduced stocking density to six birds per square meter.

Characteristics: Adherence to organic standards in both feed and housing, offering a premium product.

-Niche Products:

Other specialised products, like blue eggs with dark brown shells, are created from their breeds.

The farmer points out that organic production is significantly more labour-intensive than free-range production. He compares the average flock size for each type: 16,000 birds for free-range and 3,000 for organic. The difference in flock size contributes to the increased labour intensity in organic production. The organic production involves smaller flock sizes, which require more attention and care per bird. The farmer mentions the possibility of combining multiple 3,000-bird units to scale up organic production to 12,000 birds. This implies a potential strategy to increase efficiency while maintaining organic practices.

Agroforestry System

The egg packaging company produces free-range eggs within an agroforestry system. The farmer explains that his farm and company have been pioneers in free-range poultry with agroforestry for

chicken welfare in the UK. He mentions that their practices have become the standard in various official codes of practice by organisations such as the Royal Society for the Prevention of Cruelty to Animals (RSPCA), the Woodland Trust, and the Environment Agency. Regarding the layout of the agroforestry system, the typical setup is a chicken shed, followed by a small area, approximately five to six meters wide, of rough stone or a similar material to keep the immediate vicinity clear. Then, about 10 meters of open space, often soiled beneath the shed. Beyond that, within 15 to 20 meters from the shed's exterior, trees are planted, which might extend between 50 to 100 meters, with hedge rows beyond that, encouraging birds to explore further. The trees are systematically planted in rows, approximately four meters between rows and two meters between individual trees within a row. The strategy behind this pattern involves creating woodland edges within the planting of tree rows to facilitate biodiversity within the range, acknowledging the importance of the first meters of woodland edge for biodiversity. The farmer expresses the importance of managing the tree areas to prevent birds from laying eggs outside the sheds. It is essential to ensure that the tree branches are at least 1.2 to 1.3 meters above the ground to prevent creating dark corners where birds might lay eggs. This management strategy helps prevent issues with eggs being laid in undesirable locations, ensuring they are laid inside the sheds.

The farmer emphasises that this agroforestry design has become a standard practice across the UK for free-range chicken farming. It aims to promote biodiversity and the welfare of birds while encouraging their natural behaviour and movement within the agroforestry system. This pattern is also a requirement for farmers who want to supply eggs to the farmers' packaging operation. A minimum of 20% of the grazing range's area must be planted with trees for farmers to be eligible to supply eggs. Thus, all 80 supplying farms have established an agroforestry system.

The farmer is pleased that he began practising agroforestry in 1997. Because of this, the farm had a head start regarding this practice, which became increasingly popular. The trees are now 40 to 50 feet high and mature. The farmer stated that the amount of work the trees require is decreasing over time; during the first few years, it is higher, and after the trees are mature, they look after themselves, requiring only thinning if necessary. The farmer explains that across their own and all their associated farms, the selection of trees is primarily focused on benefiting the chickens and enhancing biodiversity rather than aiming for timber yield. The egg packaging company collaborates with a local consultant, Paul Arkell from the Cumbrian Farm Environmental Partnership, who has been involved with their tree planting initiatives for 25 years. The trees selected are native to the region and are chosen based on what naturally grows in the area around the farm. Many tree species are used, including ash, oak, silver birch, hazel, blackthorn, hawthorn, fir, sessile oak, English oak, elm, crabapple, willow, and hazel. First, the Norwegian pine is usually a requirement in the agroforestry systems used and makes up 15% of all trees used in a system, because of its abilities in ammonia absorption. Some trees, like crabapple and willow, are included to extend the pollinator season, benefiting bees and enhancing biodiversity. The farmer emphasises the adaptability of tree selection in response to specific environmental conditions. For instance, more pine trees are planted in sandy coastal areas to align with the local biodiversity. He notes that while they got a partner farm that plants apple trees, it's not a practice they engage in across all their farms. Overall, the tree selection process is driven by enhancing biodiversity, promoting the welfare of the chickens, and aligning with what naturally thrives in the respective environments across their farms. Farmers are given flexibility in choosing tree types for their agroforestry, with guidance to avoid trees that might taint the eggs. Native species are generally recommended, and the farmer assists in creating planting plans customised for each farm. When a new farmer without trees approaches the egg packaging company, they offer support by providing a planting plan agreed upon by the farmer, Mr Arkell and the farmer. The farmer is responsible for fencing the range and planting

the trees. At the same time, the egg packaging company purchases the trees, fostering a collaborative effort to establish a successful system and partnership. The farmer emphasises their support in buying trees, recognising that farmers may lack expertise in forestry. He shares a past incident where a farmer, unfamiliar with tree management, mistakenly removed valuable trees, such as oaks, while sparing fast-growing species like poplars and willows, which impacted the biodiversity plans. To prevent such occurrences, the farmer provides guidance and marks trees for removal when he visits the farms during the year to maintain a balanced and sustainable ecosystem at each farm. This conversation highlights the company's commitment to agroforestry while emphasising the need for proper guidance and education for farmers entering into tree planting initiatives to ensure the long-term sustainability and effectiveness of the practice.

The beginning of tree planting on the farm in 1997 was initially prompted by the farmer's observations of chickens seeking shade. In 2007, the operation was the UK's biggest specialist free-range egg supplier. Recognising the potential benefits of incorporating trees into the farm's operations, the farmer sought to integrate them as a marketing measure to enhance customer appeal. He collaborated with prominent partners, including McDonald's, Sainsbury's, and the Farm Animal Initiative in Oxford, to substantiate this approach with scientific evidence. The research aimed to demonstrate the positive impact of trees on the welfare of laying birds and, subsequently, on egg production. The research proved the effectiveness of their approach and underscored the marketing plan with scientific facts. As part of their marketing strategy, every farmer supplying eggs to the egg packaging operation is required to have at least 20% of their range planted with trees in an agroforestry system, highlighting the emphasis on improving bird welfare to enhance productivity, as mistreating chickens in any way immediately impacts egg production because chickens are not as robust and hardy as other livestock.

The research findings revealed that trees encouraged more birds to venture outside, improving welfare and increasing egg production. According to their findings, the cost of planting trees was recouped within six months due to the enhanced egg production resulting from improved bird welfare. The farmer emphasises the benefits of the trees by absorbing ammonia in the chicken dung; therefore, the trees must be dense in the area around the shed and then extend further out, around 100 meters, with a mixture of trees and open grassland. This planting plan is supported by research activities, indicating that after 20 years, 40% of the ammonia is absorbed. Agroforestry also helps improve drainage, percolation rate, and disease resistance in hens, and provides shelter and shade. Moreover, agroforestry contributes to carbon dioxide absorption and generates savings by using thinnings as biomass for heating, showcasing its multifaceted benefits.

When the trees are mature, the financial aspect of tree planting becomes nearly insignificant. The farmer states that the required work for the trees decreases over time. During the first few years, it is higher, and after the trees mature, they can look after themselves and be thinned when needed or desired by the farmer. The trees on the egg packaging company farm are thinned and chipped into G50 wood chips. These can be used either for bedding in the sheds for the chickens to scratch and improve their welfare/or be burned for heating. The farm generates up to 60.000 pounds of savings a year in biomass value used for heating in this way.

Processing

Hens that can no longer maintain a certain amount of egg productivity are ready to be slaughtered. Therefore, an RSPCA-approved contractor team catches the hens and transports them to an RSPCA-approved abattoir. The farmer emphasises their commitment to using gas stunning rather than electrical stunning in the slaughter process, believing that electrical stunning is barbaric. The egg

packaging company's main product is packaged eggs. The egg packaging company's own farm is producing only a portion of the overall packaged eggs. Additionally, the egg packaging company's packaging operation is supplied by 80 farmers. The relationship with these suppliers follows a standard commercial arrangement in the UK. The egg packaging company issues contracts to farmers interested in supplying eggs. These farmers are responsible for providing the necessary infrastructure, such as buildings, maintaining the chickens, and supplying feed. In return, the farmer's company guarantees that these farmers will purchase the eggs. He clarifies that their company operates independently and markets the eggs. Their own farming operation is just one of the suppliers contributing eggs to the packaging plant. The arrangement essentially involves the company acting as a centralised marketing and distribution point for eggs supplied by various farmers contracted to provide eggs within their commercial setup. The egg packing operation is the largest business within the overall structure, with a dedicated management team including a financial director and a managing director/CEO. The packaging operation has a turnover of 70 million, while the pullet rearing and farm each have around 6 million. The primary goal of the egg packaging company's in-house farming operation is to generate long-term profits, with an expected payback period of 10-15 years. The farmer indicated that economic return might not be the primary consideration for all investments. Instead, investments align with the business's overall strategy, contributing to research (both scientific and marketing), knowledge, and long-term security. The farm positions itself as a leader in innovation, especially in processing, research, and farm development. While this may not yield the best short-term returns, it enhances the farm's longer-term security and reputation. Investments are viewed as contributing to the development of research facilities and the advancement of knowledge. This knowledge is then disseminated to other suppliers through the agriculture team, emphasising an integrated knowledge-sharing approach.

The egg packaging company's business began in 1997 with a modest operation, run by the farmer's wife at the kitchen table using a small machine that processed 300 eggs per day. The packaging business experienced rapid growth alongside the increasing demand for free-range eggs in the UK market. So, they set up their first factory. The first factory was outgrown in 2010, leading to the need for a new, more advanced facility. The decision to build the new factory on a greenfield site allowed for greater flexibility and adherence to high-welfare, tree-planting, biodiversity, and sustainability practices. The new facility, operational since 2011, incorporates leading-edge automation, including robots for placing eggs into boxes. The facility is designed to prioritise environmental sustainability, featuring features such as greywater usage for wagon washing and toilets. The facility achieved Scope 1 and Scope 2 carbon neutrality in 2016, a significant environmental accomplishment for an egg factory in the UK. The company is heavily focused on Scope 3 neutrality and has already reduced its Scope 3 emissions by approximately 60%. There has also been no waste to landfill since moving into the new facility, showcasing a commitment to responsible waste management. The facility packs over half a billion eggs per year. The facility's design and operations reflect a commitment to environmental consciousness and responsibility.

Distribution

The chicken meat processed by the abattoir is not branded under the egg packaging company brand and is sold generically. The farmer mentions that different parts of the chicken, such as the feet and wings, are exported to different countries like Thailand and China, and some of the breast meat may be used for chicken soup production. This highlights the process of handling non-productive hens, focusing on the humane treatment of the animals during slaughter and the subsequent use of different parts of the chicken in various food products, including chicken soup. This process can also involve exporting different parts to different countries, thereby integrating them into the global food

production system. The packaged eggs are branded into four types of differentiation: conventional, organic, "laid with love," and niche eggs. The eggs are sold in various channels. The fast-food chain McDonald's sources its eggs from conventional and free-range farms. The four major British supermarket chains, Tesco, Sainsbury's, Asda, and Morrisons, offer a range of eggs, including conventional free-range eggs, organic eggs, and “Laid with Love” eggs. Additionally, local shops are supplied with eggs.

The branded product “Laid with Love” comes in a pink box associated with cancer research in the UK. A portion of the sales (2p per dozen) is donated to cancer research in the UK, with a particular focus on breast cancer research. This initiative has resulted in significant donations, totalling a few hundred thousand pounds. Customers and staff can be involved in the donation process; occasionally, they can vote on which individual cancer charities the donations go to for a year. This adds a community-driven aspect to the charitable contributions. The pink egg box and its association with cancer research serve as a branding strategy that potentially appeals to consumers who want to support charitable causes (Branding). The company's involvement in cancer research demonstrates a commitment to social responsibility, adding a meaningful aspect to the brand beyond the product itself (Social). The mention of the pink box and the charitable contributions suggests a conscious marketing approach to differentiate the brand and create a positive image (Marketing).

Consumer
The consumer can find different egg brands in supermarkets or at McDonald's.

2.18 FARM FE7

Overview of the Farm
Farm FE7 is certified organic. The farm was historically part of a larger estate formed around 700 to 1.000 years ago. Historically, the land was not very fertile, with acidic soil, and was mainly used for poor grazing, characterised by thorns, gorse, and heather. In the 19th century, lime was introduced to the land to improve soil productivity, leading to the division of land into smaller fields and the start of drainage in wet areas. Trees were also planted, comprising around 15 acres of farm area today. The farm area today comprises 70 hectares of family-owned land, dating back to 1960. Under the farmer's leadership, the farm transitioned from a mixed farm with both grass and crops for animal fodder to one that primarily grew grass to feed its own livestock. The farmer expresses the intention to reduce his livestock and grass area as he gets older, now 64 years old, and is contemplating the introduction of market gardening, micro-dairy, or similar ventures. He is also open to partnering up with an organisation or a younger person to improve this progress. This indicates a forward-looking approach to sustainable and diversified farming. The overall farming operation, besides the livestock, features a hostel on the farm.

2.18.1. Value Chain Analysis

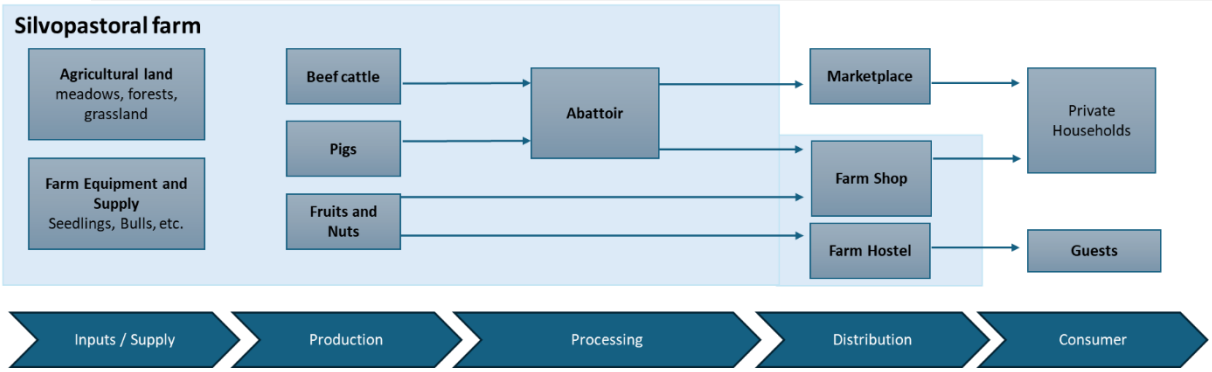

Figure 18: Value Chain from farm FE7

Inputs/Supply

The farm has four tractors, three of them being around 60 to 70 years old. The farmer mentions that the old tractors are almost just for entertainment, but they are still used for real jobs, such as making hay. The farmer emphasises the positive aspects of the old tractors, stating that they are very well-made, have paid back their carbon debt, and are strong enough for various tasks. He also highlights the simplicity of the old tractors, making them easy for him to fix if something goes wrong.

Production

The farmer's father had milk cows. The farmer stated that he decided to go into beef farming after taking over the family farm. The decision to focus on beef was personal for the farmer, driven by his desire to avoid the demanding schedule associated with dairy farming. The Farm is primarily focused on beef cattle, but also maintains a small herd of pigs, which are used mainly for self-consumption within the connected operations. The beef cattle herd consists of 42 animals. The farmer plans to grow the herd to approximately 45 to 50 animals by the end of 2024. The cattle are mainly used for meat production.

The farm's approach to grass-fed beef cattle, despite lower production, offers the ability to keep the cost of production exceptionally low by avoiding the purchase of feed, not using drugs, and refraining from soil fertilisation. The cattle are grazed outside all year round, but if a sturdier shelter is needed, the farm still has some sheds available. The farmer mentions an exception to this; at the time of the interview, there were five cattle indoors. Including the bull, which shouldn't be with the cows at this time of year, and four animals nearly ready for sale. The farmer notes that Cornwall, where the farm is located, is the warmest part of England. Despite occasional cold weather, the cattle manage to live outside the whole year. The farmer attributes this to the relatively mild climate compared to the rest of England.

The farm makes hay in the summer, mainly as a precautionary measure to have a winter reserve in case of any issues. The farmer expresses a desire to transition to a completely grazing system without resorting to hay. The motivation behind this aspiration is not only for the cattle's diet but also to eliminate the need for tractors.

The grazing areas for the beef have all been converted to agroforestry. Additionally, the cattle are now allowed to graze in the nut orchard because the trees are large enough to withstand damage from grazing. The pigs are also grazed outside in small areas of 0.2 hectares. They destroy the land they are on, but by doing so, they cultivate the soil in an environmentally sustainable and cost-effective way. After "destroying" a 0.2-hectare area, they are moved to the next area.

The farm operates with very low input and relatively low output. However, the farmer mentions that the output is expected to increase as the farm builds up its livestock numbers, with plans to stop at

around 30 or 40 female animals and to reach a total size of around 45 to 50 animals by the end of 2024. The farm got one bull for breeding purposes. The male calves are all being raised for beef production. The farm got 22 cows in the herd of 42 animals.
The amount of fruits and nuts produced is quite small.

Agroforestry System

The agroforestry design featured at the farm is a nut orchard with some other instances of tree planting, around six hectares. All agroforestry areas are used as grazing ground for livestock. The orchard was planted in 2010 and is six acres in size. 2010 marks the first step into a dedicated effort towards agroforestry for the farmer, although the other instances of tree planting on the farm had already taken place before that. The trees featured in the nut orchard are hazel and chestnut trees. The trees are not mature and therefore don't yield as much as the farmer would hope for, but the chestnut trees are beginning to yield more. All nuts are available for everybody to pick.
Currently, a new area is being planted, featuring a diverse mix of pine trees, apple trees, fruit trees, and willow trees. The farmer outlines the multifunctional roles of the different trees in the new area. Willow trees are intended for animal health, providing nutrition, shade and shelter. Pine trees are designated for timber. The farmer also intends to plant some blueberries, blackberries, and blackcurrants amongst the trees. He imagines it like a permaculture strip when everything is planted and mature. This demonstrates a commitment to diversity in the planted species, each serving a specific purpose, such as consideration for the well-being of the farm's animals, ecological considerations, and economic aspects.
The trees in the agroforestry system can be used for timber production, with the exception of the nut and fruit trees, thus providing the farm with another source of income. Some of the trees, such as willow trees, can be used to produce wood chips as bedding for animals kept indoors, thereby eliminating the need to purchase bedding material. The farmer outlines a closed-loop system where the wood chip, mixed with animal waste, becomes a valuable fertiliser. This demonstrates a sustainable and integrated approach to farming practices. This highlights that agroforestry can serve multiple purposes and create a more sustainable and self-sufficient farming system.
The fruit trees provide fruits that the farm can sell, or the fruit trees could be lent to an individual or group; either ways provide an additional income source for the farm.
The farm features a hostel where agroforestry products from the farm, such as meat and fruits, are used to cater to the guests. By using food produced on the farm to cater to the guests, the need to buy food from outside is minimised, which keeps the cost internal and supports the business. The agroforestry system also offers the possibility of extending educational workshops and activities, which guests can book. This increases the hostel's attractiveness as an excursion destination for school classes or team-building events, thereby supporting the entire operation.

Processing

The cattle are mostly sold to a small abattoir, which processes the meat.

Distribution

The processed meat goes mainly from the abattoir to supermarkets. Around 20% of the meat is sold in a direct market approach in the farm shop. Customers can sign up for an email list and get notifications when beef is available. The availability of beef is also advertised through the farm's social media channels. The beef is sold in various ways, offering flexibility based on customer preferences, whether it's selling parts separately or in specific quantities, such as 20-kilo vacuum bags, as long as it remains economical. To determine a price for the direct sales of beef, the farmer does a price benchmark at the supermarkets and with similar farms. He can sell his beef at the same price as

supermarkets while offering much better quality in terms of being organic, pasture-fed, and providing good values in terms of climate change and environmental impact. However, he faces challenges because most people don't have deep freezers. Chris notes the difficulty in competing with the convenience of fast food, despite offering better-quality beef. The amount of fruits and nuts produced is quite small. Therefore, it is sold in the farm shop or used in other farm operations.

Consumer

Being an organic beef producer with a premium price, the consumer base is probably more aware and/or has a stronger income.

Additional Activities

One part of the Farm operation is the hostel, which was converted out of farm barns. The hostel is able to host 46 people; the room size ranges from 2 beds to 14 beds. Thus, it is ideal for groups of school and university classes. The hostel is offering meals to the guests. These meals consist mostly of self-produced farm products; for example, most of the pork meat produced by the farm is used in this manner. This approach allows guests to have quality food without the farm having to purchase it externally. Educational workshops and activities can be booked, with the opportunity for teachers to bring their own work or participate in farm-related tasks with their groups. The flexibility in activities is highlighted by the farmer, as each group may have different preferences. Agroforestry plays a role in every workshop since agroforestry is a big part of the overall farm.

2.19 FARM FP1

Overview of the Farm

The family farm FP1 was taken over by the farmer in 2009 from his parents. The farm consists of 5.5 ha: 0.5 ha of forest, 4 ha of arable land, 0.5 ha of meadows and orchards and about 0.5 ha is covered with buildings. Some areas of the farm could be classed as agroforestry, but are not recognised as such by the farmer, nor does the farmer have any desire to do agroforestry. Agricultural production is minimal and mainly for the farmer's own needs, eggs are sold. The farmer has another full-time job so the farm is more of a hobby. Farming and subsidies are just an addition, and sometimes just an expense. The farmer stated that he is too old to modernise and thus just trying to sustain the farm. A common approach in the area. The farmer sometimes performs services by repairing other farmers' machinery, combining grain, pressing straw and hay, planting potatoes with a planter and the like.

2.19.1. Value Chain Analysis

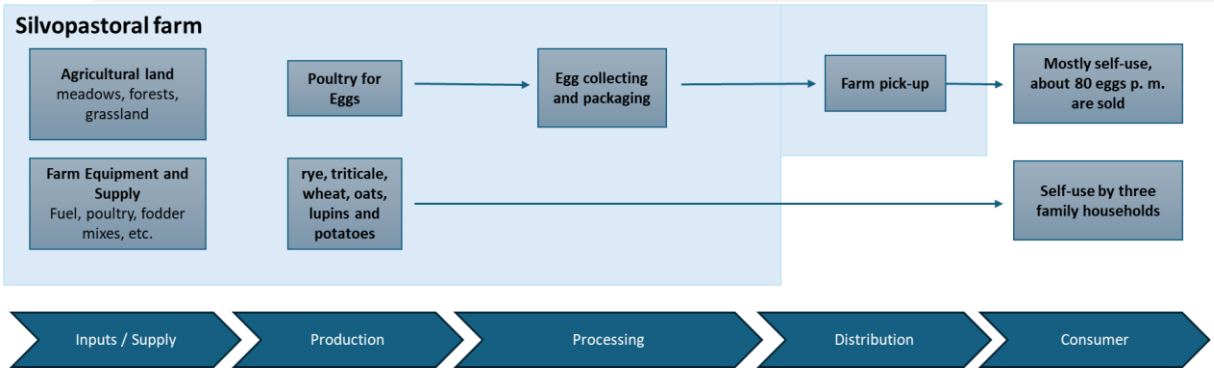

Figure 19: Value Chain from farm FP1

Inputs/ Supply

Inputs utilised at the farm are bought locally or produced by the farmer. Fuel is bought at the nearest petrol station. Fertiliser is bought from the nearest depot, but it is expensive, and thus the amount bought is decreased more and more. The poultry is bought from a trader. Fodder mixes, such as pesticides and other small things, are mainly bought for the hens from the nearby farm shop. Once every few years, certified wheat seed and potato tubers are bought from the seed centre or from traders. Besides grown cereals and bought fodder mixes kitchen/food waste is used to feed the hens. Grass from the yard and meadow goes into the compost. Manure is used as fertiliser. The farm has a lot of agricultural equipment, but it is outdated and often breaks down. The farm got a well.

Production

The arable land is cultivated with rye, triticale, wheat, oats, lupins and potatoes. The most important goal is to produce wheat for the hens. The soils are very poor and often affected by drought. Therefore, only a small amount of wheat can be harvested. Rye, triticale and oats are not a good fodder source for the hens. The hens only eat them when they germinate in the yard. These other cereals are mostly fodder for rabbits, geese and pigeons. The potatoes are grown with the aspiration to provide enough for the family for the whole year. The hens consume the excess. Since it is unprofitable for the farmer to sell grain and potatoes, these are better used for animal feed.

The main commercial product produced at the farm is chicken eggs. Therefore, the farm had enough hens to provide enough eggs for the family and sell the rest to interested customers. The farmer stated that the rearing is easy. In terms of quality, the hens are free-range, fed naturally and have grass cut from the meadow. Fodder mixes are only added to the chicken's diet in order to prevent any nutrient deficiency. For the farmers' own needs, the farm produces meat from poultry and rabbits as well as vegetables and fruit. Therefore, the farm has two poly tunnels, and every free space is dedicated to a vegetable garden.

Processing

The produced eggs are packed in standard cardboard boxes, which customers then return on their next purchase. Fruits and vegetables are processed in jars, but are used only for personal consumption.

Distribution

Most of the eggs are sold directly at the farm, and customers just come by and buy. Some egg boxes are taken to town by the daughters and sold to their friends. The volume of sales is small, about 80 eggs per month (approximately €20-25). Opposing to this is the foodstuff produced for self-use, which saves about 300-400 zł a month (€80). If the farm would be able to sell grain, it could generate more income, but since the price has been below the cost of production for the last 2 years this is not an option for the farm. The farmer stated: "Wheat is at 800 zloty a tone (175 euro), oats and rye at 700 (155 euro). It is more profitable just to buy it than to grow."

Consumer

Only trusted customers buy from the farm.

The foodstuff for self-use is distributed between three families, the farmers household and the households of the farmers two daughters.

2.20 FARM FP2

Overview of the Farm

Farm FP2 is a multi-generational family farm. The farm gives the farmer financial stability by combining fruit production and beef cattle breeding within an agroforestry system. The farm is certified organic .

> "Organic farming - it is consistent with my world view. Higher returns from ecology combined with agroforestry are certainly also a motivation. Moreover, I believe this type of production has a future in my region of Beskid Sądecki."
> "Diversification and intensification of production. Two different products provide some income stability."

2.20.1. Value Chain Analysis

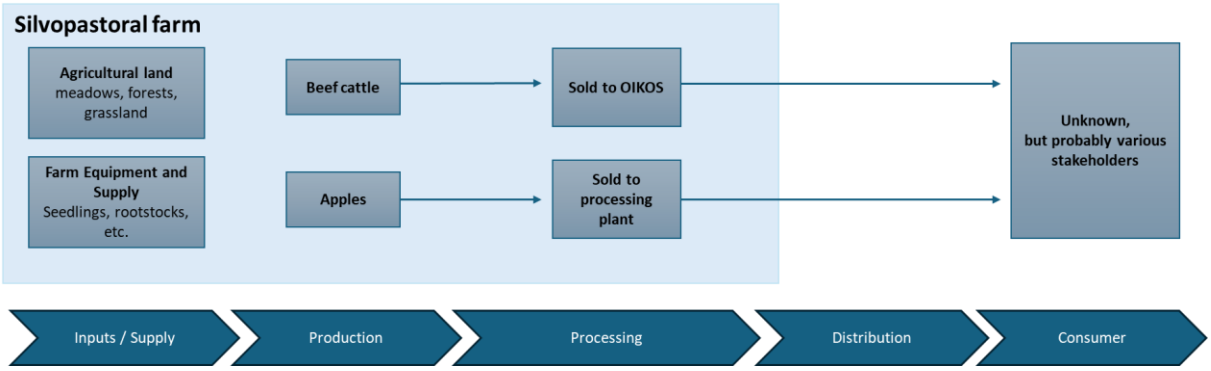

Figure 20: Value Chain from farm FP2

Inputs/ Supply

The farm utilises local supply sources. The farm obtains apple cuttings from an old orchard planted by the farmer's grandfather, which a local gardener then grafts onto fast-growing rootstocks. The farm purchases the highest-quality, certified organic seeds for sowing meadows. Other means of production (fuel, silage film, etc.) are sourced locally. The farmer chooses suppliers based on three criteria: quality, price, and distance to the store. The relationships are more business-like. The farmer artificially inseminates cattle. The young heifers are used for herd renovation and expansion.

Production

The living cattle are sold to OIKOS, which cooperates with small producers.
Apples are sold to an organic processing plant.

Distribution

The farm does not sell beef due to the complexity and work involved. Overall, direct sales require a significant amount of work time and infrastructure, which is unprofitable for this farm. Therefore, the farmer has no further participation in the processing and distribution of the farm produce after selling it. Recipients and the market situation largely determine prices. However, the price of organic livestock is relatively constant, unlike the prices of conventional livestock. This situation results not from a market trend but from a specific recipient. The prices of organic apples have fallen by more than half in the last 10 years. This is a problem for the farmer. At the same time, the prices of products and fruit on the retail market increased significantly. A solution might be to go into direct sales.

2.21 FARM FP3

Overview of the Farm

Farm FB3 is located within the low Beskids mountain range in Poland and is managed by two brothers and their father. The farm area is split into three parts, each owned by one of the family members. Despite the farmland having three owners, the production is managed and taken care of by one of the brothers and two labourers whom he employs. This farmer manages his farm in Poland and another farm located in Tenerife. As he spends most of his time at the farm in Tenerife, the two labourers in Poland manage the majority of the work, receiving regular updates and instructions via telephone.

Figure 21: Overview of the farm

The production at the farm in Poland adheres to organic standards, a form of production that is not widely practised in Poland. The area spans a total of 274 hectares. Seventy-two of them are covered with trees. The rest is covered in grasslands, meadows and pastures. The farm utilises various agroforestry practices and is open to new models and alterations within the current system. The farm's primary focus is on the silvopastoral system, which combines forestry and livestock farming. Beef cattle are held in combination with a variety of trees and bushes. In total, 147 different plant species contribute to the great biodiversity in the farm area. The agroforestry model offers a variety of benefits for nature and production. Some examples are protection from the sun for the cattle, protection from parasites, wind blockage, soil conservation, and an increase in biodiversity. Various insects and birds can live within this agroforestry ecosystem.

The farmers did not use a blueprint for silvopastoral production or any existing information on agroforestry to design their area and production during the development of the farm. One farmer aimed to plant trees and various bushes in an attempt to help the animals and nature, and was subsequently informed that his production met agroforestry standards. Following this discovery, the farmer broadened his knowledge of silvopastoral production and planned on disseminating his knowledge across the country. He is now teaching about it at a university and has also led online courses with up to 200 participants. He believes that topics such as organic farming, sustainability, climate change, and agroforestry are not being discussed enough in Poland. Thus, he aims to raise awareness and potentially influence consumer behaviour and the way farmers produce food.

Furthermore, he wishes to restructure the economy by dismantling international value chains and concentrating on integrating value chains into a local system that prioritises sustainability and collaboration over profitability and growth. This would boost the local economy, help preserve nature, and ensure fair prices for local goods.

The farmer does not value major profit or the endless expansion of his farm. Instead, he wishes to offer a sustainable production that includes a great array of biodiversity, which produces and processes products following organic standards and with zero or negative carbon sequestration.
The farm produces a variety of outputs sold to the open market and its collaborative partners. The forest area from the farm is utilised for products such as fruits, birch sap, and firewood. Some of these products are even utilized circularly, offering a supplementary diet for the cattle. When the cattle held in the meadows are ready, they are slaughtered, and the meat is sold to various stakeholders. This offers the producers a variety of produce that they can either utilise themselves or sell on the open market.

2.21.1. Value Chain Analysis

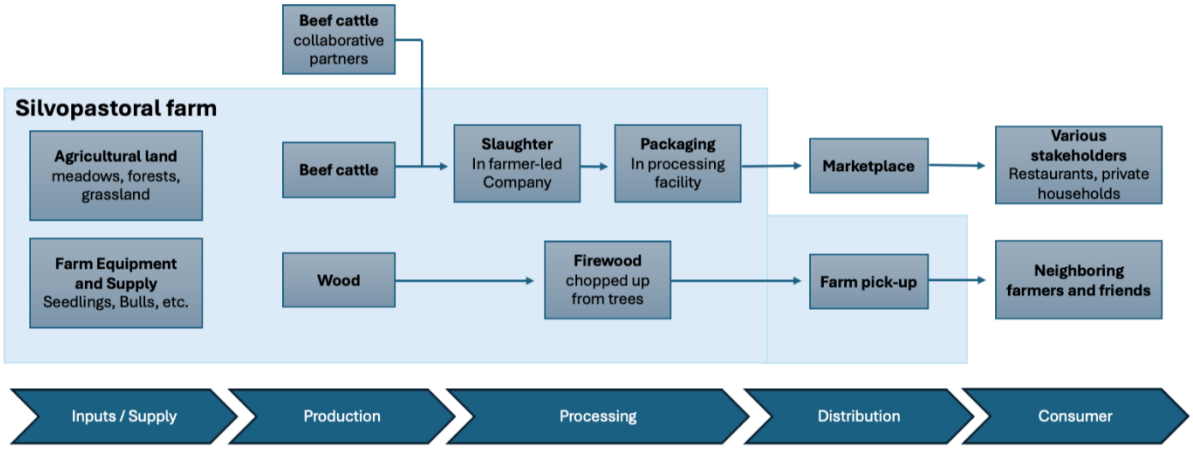

Figure 22: Value Chain from farm FP3

Inputs/ Supply
Inputs utilised at the farm are either bought locally or produced by the farmers through circular economy methods. Certain products, such as fodder for the cattle and seedlings, are occasionally bought locally. However, the farm also produces and utilises these products within the agroforestry system. Fruits and herbs that are grown within the forestry parts of the area serve as fodder, and seeds are extracted from the already present trees. Occasionally, bulls are purchased from a nearby farm if the in-farm supply becomes too limited. The farmer requires the bulls that he buys to be organic and grass-fed. The purchase of certain inputs is facilitated by government subsidies, enabling the farm to increase production at a lower cost.

The farm is currently planning to increase biodiversity by adding further crops, such as apple trees. The seedlings for these planned crops would need to be purchased from local farmers or other stakeholders. The farmer stresses that all inputs would be collected from the near vicinity in order to shorten value chains and preserve the environment.

The assortment offered by this farm is a combination of their own production and a collaboration with other farmers who operate within a 40-50 km radius of the farm. These partners work in close collaboration and pursue the collective goal of offering sustainable, organic foods for consumers. In

theory, this farmer has the most power within this value chain. He makes all the decisions on his own farm and distributes the goods from other farms. However, since this farm is based on ethical and sustainable decision-making instead of economic growth, the farmer does not exploit this power for personal gain. Instead, he opts for joint decision-making and stable, close relationships with his partners to achieve a system that is fair towards society and nature.

Production

The main product produced at this farm is meat from beef cattle, which accounts for around 95% of the total production. Overall, the farm currently has about 160 animals, including cattle, of which 90 are cows. The rest are bulls and calves. The cattle from the farmers' own production all originated from the Polish countryside. They are raised following organic standards, enabling the official organic labelling of the products. The cattle have an area of over 200 ha on which they can graze and move freely. On hot summer days, they can protect themselves from the sun by seeking shade between trees and enjoy the cool air.

Figure 23: Silvopastoral farming

The remaining 5% of production is based on products derived from the forest areas. Most of the produce here is firewood, which is gained from chopping down trees. The farmer only chops down trees that are unhealthy or appear to be on the verge of death in the near future. The plants are either arranged randomly or form strategically placed hedgerows, providing protection for the surroundings. These hedgerows and plants comprise a total of 146 different plant species. Currently, only wood from trees is being sold. The farmer also has some additional production, which is currently used exclusively for personal use, such as various herbs and fruits. Apart from the cattle, the farm is also home to four horses and twenty goats.

A major challenge the farmer faces with his animals is the threat of wolf attacks. The farm animals have attracted a pack of wolves, which regularly kill some of the animals. In the last six months, wolves

have killed three cows and three goats. He is currently seeking a solution to prevent this from happening in the future. In the future, the farmer plans to offer a variety of products for sale in the open market. One example is honey, which can be derived from bees that build their colonies in certain trees. Furthermore, various additional herbs and fruits, such as apples, are meant to be planted and sold. Additional produce is gathered from other farmers who operate within the close vicinity of the farm. These also produce the following organic standards and sell their cattle to the farmers. In addition to the cattle from his farm, he also raises cattle from other countries, such as Aberdeen Angus.

Processing

When the cattle are ripe for slaughter, they are processed in a butchery, for which the farmer has introduced a new company. In a processing room, the farmer's cattle and those obtained through his collaboration are slaughtered according to organic standards. The farmer was able to obtain governmental funding, which paid 70% of the costs for a processing facility. However, receiving this funding was not an easy feat, and it took years to obtain. The receipt of various funding opportunities is highly valued by the farmer. Especially since the war between Ukraine and Russia, it has become significantly more expensive to run his farm, presenting a substantial barrier to its development.

Following the slaughter, the parts of the cattle are packaged into various portion sizes, ranging from 0.2 kg to 1 kg. Depending on their age, the animals are slaughtered at different ages. Cows are generally slaughtered at an age between 8 and 12 months. Bulls are slaughtered at a higher age, averaging 1.5 - 3 years. These are then packaged and labelled with information on the organic production and the origin of the cow. The cattle are processed in their entirety. Not just steak and filet are packaged, but also liver, stomach, bones, etc. The processing facility also features a cooling room, where vacuum-packed produce is stored until it is distributed to consumers.

Currently, the farm only processes the wood from the trees into firewood, which is later distributed. However, the farmer plans to integrate more processing steps to offer a broader assortment and increase the value of his farm's produce. He plans on adding sawmill wood, wooden chips, and biochar to his assortment. Creating a Biochar stove has been underway for the last three years and is nearing completion. Next to firewood, ash is also processed and collected through the burning of logs. However, this is used exclusively for private purposes and not for distribution on the market. This also applies to the goats and horses at the farm, which are used exclusively for the farm's needs. What function exactly they fulfil was not specified. However, the farmer stated that he plans on changing this in the future. He wishes to expand his goat herd and integrate goat products into his assortment.

Distribution

The produce from the cattle is transported to a market at regular intervals via a truck or other vehicle. Here, the produce from the farm and the collaborating partners are deposited at a stand with large coolers and sold to various stakeholders. In this market, it is possible to sell products in a certain quantity. Selling the cattle from his own farm would not be enough to enter the market. This is one of the reasons why the collaboration was created, enabling the collective sale of the meat. The firewood from the farm is not sold at a large market. This is distributed among friends and farmers who live in the immediate vicinity, forming deals based on friendship and trust. However, the farmer plans to expand this by increasing wood production, processing, and selling the wood to the open market. This market holds great potential, as demand for wood is high and prices have increased over the last couple of years. Currently, this farm creates most of its production value in the processing and distribution of meat products. However, the future of increased processing diversification of wood will enhance value creation and potentially increase farm profits.

Consumer

Consumers receive the produce from the farm through the market or private interactions with the farmer, in cases where they are one of his neighbouring farmers. The consumers who purchase meat products are usually middle- to upper-class individuals who reside in cities. The farmer believes that this has to do with city people being more educated and caring more about sustainability than people from rural areas. Furthermore, they have higher incomes and can thus afford organic meat, which appears to be relatively expensive compared to produce from conventional farms. High prices for organic products and a lack of education on the topic appear to be significant barriers to the market's expansion. Large institutions, for example, restaurants, hardly buy from farmers, since they are only interested in steak and filet. Rather, the farmer wishes to sell his produce to other stakeholders who are interested in all parts of the beef.

Organic production is not very popular in Poland. It is one of the few countries where the amount of organic production is decreasing. Although this might be considered a barrier to market development, the farmer of this farm considers it an enabler for his particular farm. Since there are still some customers interested in organic products and he is one of the few people selling them, he does not have a difficult time finding customers for his meat products.

Regarding the firewood, only nearby farmers and friends are recipients of the produce. However, the farmer plans to expand upon this and open the wood market to further customers.

2.22 FARM FP4

Overview of the Farm

FP4 initially functioned as a horticultural farm focused on vegetable production during the 1990s, then in 2000 it transformed into a cut flower farm. In 2010, due to the lack of profitability of flower production, the farm converted to a poultry farm. The main motivation of the change was to earn a living and to be able to exploit the potential of the greenhouses by converting them into poultry houses. Today, the farm's income sources are the organic poultry operation and an elderberry plantation. The total farm area is 2.45 ha. The poultry sheds cover an area of 1575 m^2. The elderberry plantation currently stands at 1.4 ha.

2.22.1. Value Chain Analysis

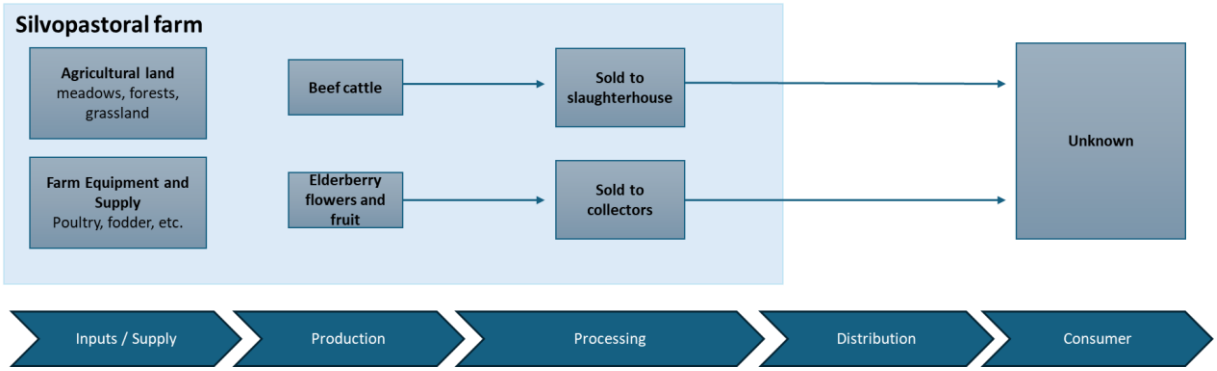

Figure 24: Value Chain from farm FP4

Inputs/ Supply

Inputs utilised for the poultry operation are chicks, feed and vitamins. These are supplied by the company that collects the poultry when it is ripe. The overall annual planning for the poultry operation is done in consultation with the same company. Important factors are profitability (production costs and selling price) and continuity of production between the poultry harvest (with the required 14-day break). Neighbouring farmers provide straw as bedding material in the sheds. In return, they receive

the manure. The farm's workforce consists of family members. External contractors are hired for poultry loading, cleaning and disinfection of the poultry house.

Production

The production at the farm is separated into two operations:
1. Organic poultry free-range rearing is the most profitable part of the farm. The main goal is to achieve the desired weight of the poultry. Therefore, personal monitoring of the facilities' performance is essential. The poultry are regularly examined by veterinary staff. The sanitary and production requirements of the free-range and organic poultry rearing system are followed.
2. Elderberry flowers and fruit, which are hand-picked by family members.

Processing

The poultry is sold directly to the slaughterhouse and thus the farmers don't know the further processing and distribution route of the product.
The selling price is fixed per bird in advance at the time of contract conclusion. The projected production costs (e.g. electricity, gas and feed) are considered. The farmer is not aware of the pricing methods in the downstream sales channels.
In previous years, younger members of the family were involved in trying to produce and sell elderberry juice. Interest in the product and demand was insignificant. Thus, they stopped doing so.

Distribution

Elderflowers/fruits are sold to nearby collectors.

2.23 FARM FS1

Overview of the Farm

Farm FS1 is a pasture-based farm, Can Genover, in the Alt Empordà region. The farm extends over approximately 370 hectares of mostly rugged terrain in the foothills of the Pre-Pyrenees. The land consists of a mosaic of Mediterranean forests, shrubland, and pastures, where a herd of 180 Aubrac mother cows roams freely throughout the year. Olive groves dominated the landscape until 1956 when a severe winter frost killed most of the trees. Since then, the landscape has naturally regenerated into a dense Mediterranean mixed forest, consisting of holm oaks (Quercus ilex), Scots pines (Pinus sylvestris), olive trees (Olea europaea), and other tree and shrub species. Meanwhile, some arable land across the farm continued to be used for growing grains and oilseeds. The current owner took over the land from her father in 2004. In the first few years, she experimented with various annual crops, only to realize that the soil was too compacted and generally too infertile to sustain substantial agricultural yields, let alone improve the ecosystem's productivity. As a result, she initiated an ambitious plan to place free-ranging cattle at the centre of the farm's agricultural and landscape management strategy. The farmer a studied Allan Savory's principles of Holistic Management and developed the pastureland by sowing perennial grasses, mainly legumes such as alfalfa (Medicago sativa), while completely eliminating the use of pesticides. Since then, the cows have grazed exclusively on the farm's grassland vegetation and are supplemented with alfalfa hay.

2.23.1. Value Chain Analysis

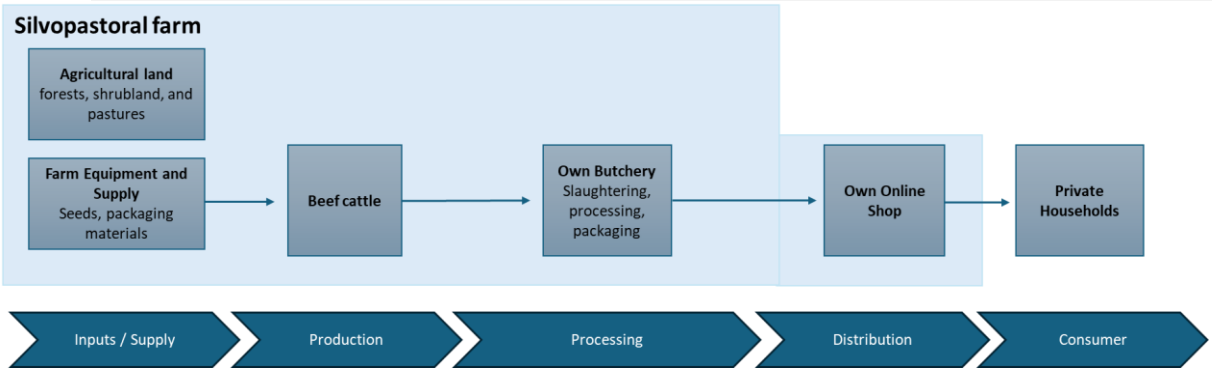

Figure 25: Value Chain from farm FS1

Inputs/Supply

Before 2014, the farmland was used to produce cereals and soybeans. Since 2014, no pesticides have been used, and arable production has stopped. Simultaneously, the Aubrac cattle livestock was introduced. To support the livestock feed, which is primarily grass-fed, the farm produces some hay from Ecologico for which it buys alfalfa seeds. The plan is to create a good ground cover, so that the seeds only need to be bought occasionally. Packaging for the meat distribution is bought.

Production

The farm got 180 Aubrac mother cows for beef production, which roam freely around the farm area and are managed by a cowboy.

Agroforestry System

More recently, the farmer has undertaken significant efforts, inspired by the ancient agroforestry traditions of the southwestern Iberian Peninsula, to thin out some of the densest forests, allowing the cattle to access and move through these areas. This practice is considered beneficial in the Iberian Peninsula and the Mediterranean region, where biomass accumulation in shrublands and forests poses a potential fire risk. In these drought-prone regions, the likelihood of uncontrollable fire spread is higher, and the severity of wildfires increases, particularly in hilly areas where firefighting operations are complicated or sometimes even impossible. By grazing in the forests, the cows benefit from aromatic plants, twigs, and leaves as part of their diet while simultaneously compacting the soil and preventing the unwanted regrowth of underbrush. The herd moves weekly across a pasture network divided by electric fences. Rotational grazing promotes the regrowth of pasture species and enables vegetation regeneration.

Processing

The farm got its own butchery on the farm with electricity from solar panels and water from the farm's water pump. Therefore, the input costs for the butchery are, besides staff costs, very low. The butchery was built to cut the killing and processing costs. The meat can mature for 14 days and stay in the refrigerator for one month. After that, it is vacuum packaged. The fridge is always stocked with meat, but not with every meat cut. Only certain meat cuts or minced meat is available depending on the state of the animal and already sold parts, since finished cattle is only killed if the meat of the previously killed cattle is sold completely. The farmer notes that many Spanish consumers are not common with vacuum packaged meat, therefore some consumers tend to misinterpret the visual look of the meat and consider it gone off. Therefore, the consumer base needs to be informed.

Distribution
The finished meat product is sold via the farm's online shop.

Consumer
The consumer base is very aware of the grass feed production and its health benefits, and is therefore more willing to pay a premium price. Some consumers are located in Ibiza.

Additional Activities
The farm got some holiday apartments built into old farm houses on the farm property.

2.24 FARM FH1

Overview of the Farm
Farm FH1 was established in 2006. Agroforestry was an integral part of the farm since the beginning. The main aspects were: impoundment from neighbours who used conventional cultivation, multiple benefits, and increased biodiversity. The farm area is 12 ha. The area has 5 ha of orchards, 2 ha of wild fruit, 3.5 ha of pasture/meadow, 0.5 ha of pinewood, 0.5 ha of vegetable garden and 0.5 ha of Mediterranean orchard. The planting was done based on permaculture principles, with a diverse distribution and planted with traditional species and varieties. The farm is certified organic.

2.24.1. Value Chain Analysis

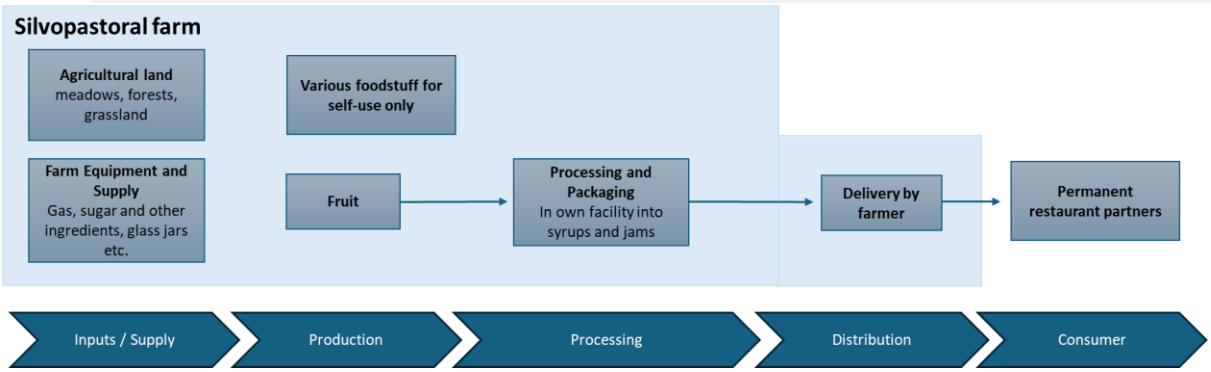

Figure 26: Value Chain from farm FH1

Inputs/ Supply
The farm needs different supplies for its processing operation. Therefore, crystal sugar and lemon concentrate are bought from external sources as well as glass bottles, which are bought from a permanent partner for years.
The factory currently operates with propane gas heating devices. The farmer and his wife work full-time at the farm. His wife mainly does product processing while he is doing maintenance work on the farm, the repair of machines, and sales. Two seasonal workers help out on the farm.

Production
For self-consumption, the farm produces vegetables, fruit, corn, honey, eggs, meat, milk, fish, and firewood to the greatest extent possible. For sale, the farm produces processed fruit products like syrup and jam.

Processing

The farmer's wife does the whole process of processing. One of the farms' helpers takes part in the preparation. The products are made only from natural raw materials and don't contain any additives, flavours or preservatives. Cultivated wild fruits are used to enhance the taste of traditional fruits. Since these have a very distinctive taste, they make the final result very special. According to the „Hungarian Food Codex", their quality belongs to the „Handmade Product category".

The processing technology is constructed to minimise waste and by-products. The products are filled in glass bottles so that the farm can collect and reuse as many bottles as possible. By-products are fed to the livestock, and the rest is composted.

Distribution

The products are primarily sold to permanent restaurant partners. By doing so, the farm can precisely plan for its customers' needs. The farm knows which of its syrups are the backbone of turnover, and we try to produce as much of them every year. The other products are prepared depending on the season. The farmer carries out the delivery with collective transport. The prices are determined by considering the competition and raw material prices. Since it is a short supply chain, the farmer is able keep the prices lower than average. There are relatively few competitors in this product category and in this quality, but they are generally stronger and bigger than the farm. The farm's competitive advantage lies in exceptionally high quality.

Other activities

The farm is an official depot of MAPER (Hungarian Permaculture Association). Within the framework of the Association, the farm performs education and training, such as permaculture training and farmer workshops. Occasionally, group garden visits are organised on different topics.

3. DISCUSSION

The empirical material presented in this report provides one of the most comprehensive qualitative assessments of agroforestry value chains currently available in Europe. It demonstrates that the socio-economic viability of agroforestry depends not only on biophysical performance but also on the organisation of value creation, governance arrangements, and cultural meanings attached to land use. Across all 24 case studies, farmers have combined ecological motivations with pragmatic business considerations, revealing agroforestry as a *hybrid practice* that bridges production, environmental stewardship, and community development.

Agroforestry and the multifunctional transition of European agriculture

Agroforestry systems in the ReForest Living Lab network reflect a broader European transition toward multifunctional agriculture (Wilson, 2007), in which farms are expected to deliver not only commodities but also public goods such as biodiversity, landscape quality, and climate regulation. This multifunctionality underpins both the European Green Deal and the CAP 2023–2027 reform, which emphasise "eco-schemes" and *result-based payments for ecosystem services* (European Commission, 2021). Many ReForest farms exemplify this approach: for instance, FE1's integration of grazed woodland and energy diversification, or FB1's combination of carbon farming and local food processing. These findings align with studies demonstrating that agroforestry can enhance the supply of ecosystem services while maintaining or increasing profitability when integrated into diversified business models (Kay et al., 2019; Rigueiro-Rodríguez et al., 2009; Edris et al., 2025).

Nevertheless, the case studies also confirm the observation that agroforestry remains under-recognised in mainstream agricultural policy (Rigueiro-Rodríguez et al., 2018; den Herder et al., 2017). Many farmers still face administrative barriers to CAP eligibility, limited technical advice, and uncertain market access for non-standard products. These findings reinforce recent calls for a dedicated European **Agroforestry Strategy** and for integrating tree-based systems into carbon accounting frameworks (EURAF, 2023).

Value creation through diversification and resilience

Economic diversification emerges as a central driver of agroforestry adoption across the Living Labs. Nearly all farms use trees to open new income streams—fruit, nuts, honey, timber, carbon credits, tourism, or education—while buffering against volatile markets. This corresponds to the literature identifying diversification as a resilience mechanism within agroecological systems (Lin, 2011; Mendez et al, 2012). The combination of spatially and temporally complementary products reduces dependency on single commodities and enhances the farm's adaptive capacity to climate or price shocks (van Zonneveld et al., 2020).

Several case studies illustrate these dynamics. FE3 in Yorkshire transforms agroforestry outputs into high-value fermented and dehydrated products for the hospitality sector, linking ecological design to circular bioeconomy models. FE5 converts shelterbelt thinnings into biomass fuel, saving £40,000 annually in heating costs—demonstrating *internal substitution* rather than market sales. Such examples confirm that agroforestry profits often arise from avoided costs, internal synergies, and the monetisation of ecosystem services, rather than from direct product markets alone (Graves et al., 2017).

Yet profitability remains fragile, depending on access to capital and skilled labour. This corroborates broader findings that small diversified farms tend to face higher transaction costs and limited economies of scale (Knickel et al., 2018). Consequently, institutional innovations—cooperatives, shared processing facilities, or digital marketplaces—are critical to realise the latent economic value of agroforestry products (Murdoch, 2006).

Short food supply chains as socio-economic infrastructure

A consistent theme is the predominance of short food supply chains (SFSCs), confirming agroforestry's natural compatibility with localised food systems. Most ReForest farms operate *face-to-face* or *proximate* SFSCs (Renting et al., 2003), relying on direct sales, subscription models, or community partnerships. These networks enhance transparency, allowing producers to communicate their ecological and ethical values directly to consumers, thereby creating *relational value* beyond price. Empirical evidence from FB3 (Belgium) and FE2 (UK) indicates that consumer willingness to pay for local, traceable products offsets higher production costs. This supports findings from the EU Parliament (2016) and Goodman et al. (2014) that embedded markets can transform farming from a volume-based to a value-based activity. Moreover, SFSCs often act as *learning platforms* where farmers and consumers co-produce knowledge about sustainable food (Sage, 2014).

However, the case studies also reveal capacity bottlenecks typical of SFSCs: limited labour for marketing, seasonality of supply, and dependence on personal relationships. Research on rural entrepreneurship highlights that such micro-scale enterprises require intermediary organisations—such as cooperatives, food hubs, or territorial labels—to achieve continuity and trust at larger scales (Tregear & Cooper, 2016). The experience of FE4 and FH1, which combine on-farm processing with

permanent restaurant partnerships, indicates that long-term contractual relations can balance autonomy with stability.

Social innovation, knowledge exchange, and the Living Lab approach

The human and institutional dimensions of agroforestry are as decisive as its biophysical performance. Farmers frequently described their engagement in agroforestry as a social innovation process involving experimentation, cooperation, and a change in identity. This mirrors findings from the AGFORWARD and ALL-Ready projects, which documented how *Living Labs* accelerate learning and innovation through participatory methods (Berthet et al., 2016; Alblas et al., 2023).

Several ReForest sites—particularly FE3 (UK), FH1 (Hungary), and FCR2 (Czech Republic)—function as demonstration and education centres, engaging schools and local communities. These activities align with the growing body of research on "learning landscapes" (Chakraborty et al., 2022), which positions agroforestry as a medium for public engagement in sustainability transitions. The cases also highlight the value of peer-to-peer networks, which provide experiential knowledge that formal advisory systems rarely offer (Fagerholm et al., 2021). Nevertheless, a shortage of specialised advisory services and vocational training for tree-crop integration remains. The limited availability of skilled labour and the physical demands of tree management were cited as major constraints—issues also identified in recent EU evaluations of the Farm Advisory System (Labarthe and Beck, 2022). Building capacity therefore requires integrating agroforestry modules into agricultural colleges, extension services, and digital knowledge platforms such as the forthcoming EU *Agricultural Knowledge and Innovation System* (AKIS).

Environmental and ethical co-benefits

Beyond economics, the case studies reaffirm agroforestry's contributions to climate change mitigation, soil health, and animal welfare. Systems such as silvopasture (FE1, FE2, FS1) provide shade and shelter, reduce heat stress, and improve animal welfare—co-benefits widely recognised in the literature (Place et al., 2016; Bradley et al., 2008). Trees also enhance soil structure, water retention, and nutrient cycling (Udawatta & Jose, 2011), leading to indirect yield stability. These findings support global meta-analyses, which show that agroforestry can sequester 1–5 t CO_2 ha^{-1} yr^{-1} while sustaining or increasing productivity (Zomer et al., 2016). Social and ethical dimensions were equally evident. Farms such as FE6 and FE7 integrate welfare standards, ethical marketing, and charitable initiatives ("Laid with Love"), illustrating how corporate social responsibility principles can be embedded at the farm scale. The growing consumer demand for traceable and ethically produced food creates opportunities for branding agroforestry as a *climate-positive and socially responsible* practice (Padel et al., 2008).

Policy integration and governance gaps

Despite growing evidence, policy support remains fragmented. Many farmers expressed frustration with complex administrative procedures, inflexible CAP rules, and insufficient compensation for ecosystem services. Similar conclusions were reached by Smith et al. (2017) and Preitinger et al. (2020), who note that policy incoherence between agricultural and forestry domains discourages adoption. Current eco-schemes often reward individual practices (e.g., tree planting) rather than system-level performance.

To overcome these barriers, scholars and policy fora increasingly advocate hybrid governance models that blend public payments with private certification, carbon markets, and community finance (Böhringer et al., 2021; Wegner, 2016). The experiences of FB1's participation in carbon-credit trading and FE3's corporate partnerships exemplify early steps toward such blended finance. Moreover,

integrating agroforestry into national climate strategies—under the *LULUCF Regulation* and *Carbon Farming Initiative*—could provide long-term market recognition of its mitigation value.

Toward territorial and circular value chains

A final insight from the ReForest network is the emergence of territorial agroforestry systems that integrate production, processing, and ecosystem management within a defined landscape. This territorial perspective parallels the concept of *Territorial Agro-Food Systems (TAFS)* (Berti et al., 2023) and *circular bioeconomy clusters* (D'Amato et al., 2020). Farms such as FE3 (UK) and FS1 (Spain) demonstrate circularity by using waste biomass for energy, integrating livestock into forest management, and supplying local tourism. These examples show that agroforestry can anchor regional circular economies, reducing external inputs and strengthening rural employment.

From a governance standpoint, territorial value chains require coordination among municipalities, cooperatives, and private actors to align landscape restoration with local economic development. Multi-actor partnerships, as promoted in ReForest and DigitAF, thus represent a model for scaling impact beyond individual farms.

Research and policy outlook

The ReForest findings highlight several priorities for future research and policy:

- Quantifying multifunctionality – Develop integrated indicators linking ecological metrics (carbon, biodiversity) with economic and social outcomes (income stability, employment).
- Comparative longitudinal analysis – Monitor farm trajectories over time to understand profitability and resilience dynamics across systems.
- Governance innovation – Test payment-for-ecosystem-services schemes and hybrid finance instruments that reward multifunctionality.
- Consumer and market research – Explore labelling, storytelling, and certification that communicate agroforestry's added value.
- Education and capacity building – Embed agroforestry in curricula, advisory systems, and Living Lab networks to mainstream practice.

The starting points for this research could be the barriers and opportunities listed in the following two tables:

Barriers	Specification	Description
Climate conditions	Weather phenomena	Extreme weather in form of frost, precipitation, heat and wind affects livestock and crops.
	Pests	The increase in pesticides due to weather conditions is affecting practice.
Resources	Credit & Finance	Governmental subsidies, trust from banks
	Labour	Workload management, acquisition of working force, "hard physical work", prospects, profitability , etc., complicate the organisation of work
	Land	Land access is expensive (purchase or tenancy), scarce, and not always flexible in terms of time and therefore limits innovation potential.
	Skills & Knowledge	Retaining knowledge and skills is a challenge, particularly for young talent, changing climatic conditions, demographic shifts, and a shrinking workforce.

Processing	Logistics	Factors such as durability, material costs, labour capacities and the spatial fragmentation of cultivated areas make logistics cost-intensive.
	Flexibility	Flexibility in the selection of crops and livestock is limited. There is a dependency on a number of intermediaries.
Marketing	Logistics	The material requirements for buying (vehicles, refrigerators, market stalls, etc.) are expensive and time-consuming. Outsourcing these tasks to intermediaries is an attractive option. Space can be limited in direct marketing (e.g. parking space).
	Seasonality	Most crops are harvested seasonally, which means that farmers must make financial reserves for the off-season.
	Coordination	Sales and marketing coordination in cooperatives can be capacity-intensive.
	Quality	The quality of products varies and must rely on customer trust, as well as cultural, ecological, and health values.
	Competition	Many customers prioritise price in their purchasing decisions. Wholesalers sometimes sell the same products as direct sellers and compete with them.

Table 3: Identified barriers within the value chains.

Opportunities	**Specification**	**Description**
SFSCs as an economic opportunity	New Business Models with more transparency of the value creation process	Farmers can achieve economic benefits while also supporting ecological and social benefits for themselves, the consumers and the region. Strong embeddedness within a region.
Funding opportunities	Grants and subsidies	Foster investment
Regionalised value creation	Production, Competition and Cooperation	Regional economic benefits, fostering innovation, forming networks
Quality	High-quality products	Benefit for consumers
Social Benefits	Common goods	Public engagement, participation in farm projects, and fostering regional and cultural identity
Ecological Benefits	Sustainable practices	less pesticides, biodiversity promotion
Climate Change Resilience	Climate Change Adaptation	Mitigate certain effects of climate change and prevent desertification.
Animal Welfare	Shade and Shelter	Less animal suffering

Table 4: Identified opportunities within the value chains.

4. CONCLUSIONS

The ReForest value-chain assessment demonstrates that agroforestry is far more than a set of technical practices; it represents a transformational approach to farming that reconnects production, environment, and society. The farm case studies analysed across Europe illustrate that when trees are integrated into agricultural systems, they generate multiple layers of value—economic, ecological, and social—that collectively enhance the resilience of rural territories.

A central insight emerging from this analysis is that economic and ecological diversification underpin resilience. Agroforestry enterprises that combine multiple outputs—such as crops, livestock, tree products, renewable energy, or tourism—are better equipped to withstand market volatility, climatic shocks, and rising input costs. Their long-term profitability, however, depends on access to local and regional markets and on financing mechanisms that acknowledge and reward the public goods they provide, including carbon sequestration, biodiversity enhancement, and landscape restoration.

Short food supply chains and community engagement also emerge as vital mechanisms for capturing value. Through direct sales, on-farm processing, and place-based branding, agroforestry farmers can retain a greater share of added value while strengthening trust and transparency between producers and consumers. These locally embedded relationships create what may be termed a relational economy—an economic model based not solely on commodity prices but on authenticity, trust, and shared environmental values.

Institutional innovation is equally critical. The most successful farms within the ReForest network benefit from strong peer networks, advisory services, and participatory governance that enable experimentation and collective learning. Yet persistent policy fragmentation, complex administrative procedures, and limited access to finance continue to constrain broader adoption. Aligning agroforestry with the Common Agricultural Policy's eco-schemes, carbon farming initiatives, biodiversity crediting mechanisms, and national Agricultural Knowledge and Innovation Systems will be decisive in scaling up impact.

The findings reaffirm that agroforestry aligns closely with the objectives of the European Green Deal, the Farm to Fork Strategy, and the EU Soil Mission, offering a tangible route toward climate-resilient and multifunctional landscapes. However, to move from pioneering examples to systemic transformation, the multifunctionality of agroforestry must be fully recognised within both economic valuation frameworks and policy instruments. Payments for ecosystem services, blended public–private finance, and territorial cooperation mechanisms are necessary to reward farms for the full range of benefits they provide to society.

From a knowledge and innovation perspective, the Living Labs supported by ReForest have proven highly effective as platforms for co-creation and social learning, linking farmers, researchers, advisors, and citizens. Extending these participatory networks and integrating digital decision-support tools will accelerate adoption, enhance monitoring of socio-economic and environmental outcomes, and strengthen the evidence base for policy reform.

Looking ahead, the ReForest consortium will continue to build on these results to quantify and monetise ecosystem-service benefits across diverse systems, to identify scalable financing and business models, and to co-design policy recommendations for embedding agroforestry within regional development strategies.

APPENDIX: REFERENCES AND RELATED DOCUMENTS

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