

Agroforestry Development on Dutch Animal Farms

MSc Governance of Sustainability

Name: Jasper de Groot
Student number: s2018705
Word count: 10057 (excl. annex and sum. chapters)
Date: May 28th, 2025
Thesis supervisor: Dr. A.P.E. van Oudenhoven
2nd supervisor: Dr. E.V. Bondarouk



Universiteit Leiden
The Netherlands

Abstract

This thesis investigates the development of agroforestry (AF) in the Dutch livestock industry through a three-part study of farmers' and related actors' web-content. An inventory of online farm data revealed that AF in this context is mostly applied on chicken and cow farms, with orchards and hedgerows being the preferred practices, and walnut, willow, and apple trees the most frequently planted vegetation. Next, analyses of literature on the barriers to AF adoption and Dutch animal farmers' reports of challenges revealed significant context-specific problems. Financial and institutional barriers such as high costs and restrictive regulations emerged as most persistent, with social and environmental problems playing a smaller but notable role. The comparison of in-situ farmer experiences with existing literature revealed several mismatches, notably in the ecological dimension, underscoring the importance of livestock-specific research. Lastly, analyses on the actors involved in AF development across The Netherlands showed that researchers, pioneering farmers, governments, and the Community of Practice play key roles through various knowledge-sharing, advocacy, and funding programs. The findings suggest that scaling up AF in the livestock sector requires promoting existing AF initiatives and pioneering farmers and reinforcing governance networks and policy frameworks with context-specific data and local knowledge. The thesis concludes that AF in the Dutch livestock sector is emerging, diverse, and driven by a network of engaged actors, and that widespread adoption in the future depends on supporting and scaling existing efforts.

Table of Contents

Abstract 4

List of Abbreviations 7

1. Introduction 8

1.1 Topic & societal relevance 8

1.2 Study context 9

1.3 Existing research & knowledge gaps 11

1.4 Research objective & questions 12

2. Methods 13

2.1 Inventory of AF projects on Dutch animal farms 14

2.2 Analysis of barriers and challenges 16

2.2.1 Barriers from the literature 17

2.2.2 Challenges on AF projects on Dutch animal farms 19

2.2.3 Comparison of barriers versus challenges 20

2.3 Dutch animal-AF actor analysis and influence mapping 21

3. Results 24

3.1 AF projects on Dutch animal farms 24

3.1.1 Animals, AF practices, trees and shrubs species 24

3.1.2 Individual animals, trees and shrubs, and AF practices versus combinations 26

3.1.3 Pairs of animals, trees and shrubs, and AF practices 26

3.2 Barriers and challenges 27

3.2.1 Barriers from the literature 27

3.2.2 Challenges on AF projects on Dutch animal farms 29

3.2.3 Comparison of barriers versus challenges 32

3.3 Dutch animal-AF actors and influence scores 33

4. Discussion 38

5. Conclusion 41

References 43

Web-content references 45

Annex 1: Inventory of agroforestry projects 46

1A. Louis Bolk inventory (projects on animal farms) (Prins et. al., 2021) 46

1B. Location, farm type, size, year started 47

1C. Practice, size (animals), trees and shrubs 48

Annex 2: Barriers and challenges 50

2A. Literature barriers, sources 50

2B. Animal farmer challenges, sources.....51
Annex 3: Animal farmer transcripts.....54
Annex 4: Actors' web-content sources.....71

Acknowledgements

This thesis would not have been possible without the support of some very kind and inspiring people. First and foremost, I thank my supervisors, Alexander and Elena, for their guidance and patience throughout the whole process. To my fellow Governance of Sustainability students, thank you for your companionship and for sharing a commitment to a planet-and-people friendly future. I'm also thankful to Martijn and the boulder-community in Hoofddorp for the fun and flexible job, and the moments I could clear my head when I wasn't on my laptop. To my Uncle Wim, thank you for designing the cover page. Aunt Edith, thank you for providing perspective when I needed it most. To my brother Sander, thank you for your unwavering support on the home front and, together with my friend Lisa, for helping me regain the momentum I needed to complete this project. Finally, to my parents, Robert and Tanja, thank you for supporting this (academic) journey from the start and for being the best role models (for sustainable living) anyone could have. Your knowledge of biology and permaculture, the family 'Finca' in Spain—where, among other agro-ecological activities, goats are helping to manage an overgrown and fire-prone forest, and all our travels together never stopped motivating me to pursue this master's degree and eventually also to study the wonderful topic of agroforestry in our home country of The Netherlands.

My hope for this thesis is that it inspires more people to go out and support nature-inclusive farmers—whether by buying their products, helping develop nature-based solutions on their farms, or boosting their legitimacy within local governance networks.

Jasper de Groot
May 28th, 2025

List of Abbreviations

AF	Agroforestry
AK	Agroforesty Kip (Agroforestry Chicken)
ANN	Agroforestry Netwerk Nederland
BK	Bomen voor Koeien (Trees for Cows)
BMN	Boeren met Natuur (Farmers with Nature)
BN	BoerenNatuur
CoP	Community of Practice
EU	European Union
GKN	Groen Kennis Net (Green Knowledge Net)
LTO	Land- en Tuinbouw Organisatie
LNV	Ministerie van Landbouw, Natuur, en Voedselkwaliteit (Ministry of Agriculture Nature, and Food Quality)
NMV	Nederlandse Melkveehouders Vakbond
NVP	Nederlandse Vereniging van Pluimveehouders
PB	PluimveebedrijfNL
RVO	Rijksdienst voor Ondernemend Nederland (Netherlands Enterprise Agency)
SD	Standard deviation
WUR	Wageningen University & Research

1. Introduction

1.1 Topic & societal relevance

Over the past few decades, the industrialization of agriculture has significantly increased the global per capita supply of calories. However, it has also given rise to numerous socio-environmental problems. Modern industrial farming methods have been linked to declines in biodiversity, reduced landscape diversity, degradation of air and soil quality, and diminished welfare for both farmers and animals (Van Zanten et al., 2018). Alongside the global challenges of climate change, food insecurity, and the depletion of natural resources, these problems are prompting a growing number of farmers to adopt practices that promote long-term economic viability, social well-being, and environmental sustainability. Agroforestry (AF) is a widely supported land management approach among both farmers and policymakers to address multiple problems simultaneously. The EU-funded AGFORWARD project defines AF as "the deliberate integration of woody vegetation, such as trees or shrubs, within crop and/or livestock production systems to leverage both ecological and economic interactions" (den Herder et. al., 2017).

By integrating trees and shrubs with crop or livestock production, AF systems can improve soil health & water quality, enhance biodiversity, sequester carbon, reduce plant pests and animal diseases, improve animal and farmer wellbeing, and maintain a farm's economic viability (Castle et al., 2022). Today, common types of AF in Europe are silvoarable systems (where trees or shrubs are planted in between annual or perennial crops), forest farming (where trees, shrubs, and crops are planted closely together in multiple layers to recreate natural forest conditions), riparian buffers (i.e., strips of perennial vegetation between cropslands or pastures and water sources such as streams or lakes), improved fallows (where fast growing, preferably leguminous woody species are planted during the fallow phase of shifting cultivation), multipurpose trees (where productive trees are randomly or systematically planted in cropland or pasture, and silvopasture (where trees or shrubs are planted on pastures in combination with animal farming) (Mosquerda-Losada et al., 2009).

1.2 Study context

The Netherlands is arguably well-positioned for AF development due to its agricultural expertise, favourable soil and climatic conditions, and growing regional demand for forest and timber products (ANN, 2023; Rijksoverheid, 2020). However, AF adoption rates in the country are among the lowest in Europe (den Herder et al., 2017; Rijksoverheid, 2020). In 2020, a group of stakeholders therefore announced the target of establishing at least 25,000 hectares of AF in The Netherlands by 2030 (Luske et al., 2020). AF development in the country's livestock industry is crucial to reaching this target. Firstly, because the land currently used for grazing livestock and growing animal feed takes up a significant portion of the country's landmass, and alternative space is scarce. Secondly, because the current state and trajectory of the industry both provide ample opportunities for farmers to transition to AF.

In 2019, the Dutch livestock industry contributed to almost 40% of production stemming from the country's 29-billion-euro agricultural sector (Central Bureau for Statistics, 2024). In 2022, animal agriculture used up to 1.2 million hectares, or 65% of the country's total agricultural surface area (Central Bureau for Statistics, 2022). Despite a drastic decrease in the number of animal farms over the past decades (from 250.000 in 1950 to 50.000 in 2019), they remain among the main drivers of the country's environmental degradation (Van Zanten et al., 2018). Agricultural and ecological experts agree that 'systemic change' is needed to "reduce nitrogen emissions while addressing the financial and livelihood concerns of animals and farmers" (ANN, 2023).

Furthermore, the Dutch government recently published legislation with the aim of reducing harmful emissions from agricultural and land-use sectors drastically by 2030, including the aim to cut nitrogen emissions in half (Rijksoverheid, 2020). This policy is expected to render obsolete the most industrial forms of animal farming, forcing many farmers to either adopt sustainable practices or quit the business entirely in the coming years. For farmers who choose the latter, the government has provided buyouts with sums reaching up to 120% of their farm's current value (ANN, 2023). For those who choose the former, AF can serve as a practical blueprint. The strategy's aims for circularity, ecological diversity, and long-term

resilience aligns closely with current policy targets and thus offers a more promising way forward.

Compared to its application on crop or arable farms, AF can provide additional (synergistic) benefits on animal farms. The intensive use of land, water, and other resources needed for livestock production is linked to numerous environmental impacts such as soil degradation, water pollution, and greenhouse gas emissions (Hilborn et al., 2018). AF practices can help mitigate these impacts by regenerating the soil, reducing erosion and nutrient runoff, and sequestering carbon, respectively (Jones et al., 2022; Waldron et al., 2017; Yadav et al., 2019). Trees and shrubs also produce feed and shelter for animals, which reduces the need for external inputs and contributes to higher levels of animal welfare (Yadav et al., 2019). Finally, an AF system can provide additional sources of income for farmers with the addition of fruits, nuts, or timber to their product range, thereby increasing the farm's resilience against market disruptions (Castle et al., 2021). This is relevant for much of the livestock industry as the global shift towards plant-based diets and tighter governmental regulation pose a growing threat to current animal farming practices (Van Zanten et al., 2018).

1.3 Existing research & knowledge gaps

However, despite these well-documented benefits, implementing AF remains difficult for many farmers. Researchers have studied how some challenges act as barriers that discourage or prevent farmers from adopting AF. Barriers include necessary changes in fertilization, feeding, animal housing, or land allocation—interventions described as costly and time-consuming (Felton et al., 2021; Jara-Rojas et al., 2020; Louah et al., 2017). The design of an AF system is also said to require costly planning and technical expertise to ensure compatibility with existing farm infrastructure. Other barriers emerge from anticipated conflicts between farmers and their communities or neighbors, due to prevailing traditions or negative attitudes towards AF (Louah et al., 2017; Felton et al., 2021). Additionally, farmers' limited experience with forestry and restricted access to educational or financial resources can hinder AF adoption (Felton et al., 2021). Furthermore, factors such as governmental policies and regulations, are frequently cited as barriers in the literature. For instance, policymakers may underestimate the potential of AF or overinvest in other sectors, while

existing regulations and complex permitting processes can delay or block new projects (Felton et al., 2021; Jara-Rojas et al., 2020). Finally, constraints such as soil type, climate conditions, seasonal variations, plant growth, and animal behavior can limit the benefits of AF and thereby discourage uptake (Jara-Rojas et al., 2020).

To overcome the barriers to its adoption and promote AF development at scale, researchers recommend analysing existing projects and the experiences of those who developed them (Felton et al., 2021; Jara-Rojas et al., 2020; Louah et al., 2017). Local AF projects can be a valuable source of data to support farmer-to-farmer learning and help build trust between different actors (e.g., by demonstrating the strategy's feasibility in a particular region or sector). Policymakers in particular can benefit from this type of analysis. For instance, better knowledge of the different combinations of animals with trees and shrubs can help guide the development of support programs (e.g., for underused practices) and extension services such as farm workshops (e.g., on what farmers are more likely to experiment with). In addition, a better understanding of the challenges reported can help determine which measures are needed, and where. Lastly, better knowledge of the actors involved (i.e., those contributing to AF project development and policy formation) can help strengthen collaboration and advance the wider adoption of AF practices (Louah et al., 2017).

In the context of the Dutch livestock industry, however, these insights are limited. One study on Dutch dairy farms found that relatively little policy attention was given to 'pioneering' farmers who developed sustainable alternatives to mainstream farming (Hoes & Aramyan, 2022). While similar research on AF systems has been conducted for different specific sectors (e.g., on chicken or cow farms), few studies exist that capture the common characteristics of, challenges persisting, or actors involved *across* the industry. On the other hand, a country-wide inventory of all existing and aspiring AF projects was conducted by Prins et al. (2021), but much of the data pertaining to the livestock industry was incomplete. The study estimated that around 200 farmers had implemented AF to a certain extent, and almost 500 hectares had been realized in total. Furthermore, some 50 different advisors and organizations were found to be active in informing and supporting farmers in their transition towards AF systems, and farmers were found to depend heavily on regional and thematic networks and groups for practical advice and support. However, farm type data was undefined for 52 projects, the start year for 25 projects, and farm size for 9 projects out of the

108 projects identified on animal farms. Information on specific AF practices or plant species was not included, and the authors did not investigate farmers' experiences at these projects. Thus, while the literature provides helpful insights for AF development within sectors, it fails to identify overarching patterns that could inform policy and support systemic change. On the other hand, broader studies provide helpful overviews, but lack the scope and depth useful for practical implementation across the livestock industry.

1.4 Research objective & questions

Despite the potential benefits of AF systems and the current opportunities for AF development in the Dutch livestock industry, adoption rates across the country remain low. Empirical insights are also lacking, as researchers have yet to capture what AF development across the industry looks like, what kind of challenges Dutch animal farmers face on their AF projects, and which actors are in a position to help reduce those challenges. Further exploration of these aspects is needed to support governance of AF. Therefore, the main objective of this study is to analyse AF adoption and the challenges reported across the Dutch livestock industry. Besides exploring specific AF practices, tree and plant species, and average AF project sizes on animal farms, this study will examine how barriers reported in the literature compare to the real-world challenges faced by Dutch animal farmers with AF experience, and how these challenges relate to the broader governance network. The findings can help inform actors, including policymakers, on how to promote AF across the Dutch livestock industry and beyond. The main research question of this study reads:

To what extent has agroforestry been adopted across the Dutch livestock industry?

The specific research questions posed in this study are:

Q1 – What are common characteristics of AF projects on Dutch animal farms (e.g., plant species, animal integration, AF practices, and project size)?

Q2 – To what extent do the barriers to AF adoption identified in the literature align with or differ from the challenges reported by Dutch animal farmers with AF experience?

Q3 – Which actors play or could play a key role in influencing AF development in the Dutch livestock industry, and how might they address the reported challenges?

2. Methods

This study consisted of three main research steps, represented by the 'Topics' shown in Figure 1 and described in detail in the following chapter.

Topic	*Method*	*Data*	*Outcome*
1. Inventory of AF projects on Dutch animal farms	Descriptive quantitative analysis	- Dutch animal-AF farmer web content (e.g., websites, blogs, and related grey literature)	Overview of common and rare AF features across Dutch livestock industry
2. Content analyses on perceived barriers to AF and challenges on Dutch animal farms	Qualitative thematic coding and comparative analysis	- Peer-reviewed literature on farmer attitudes toward AF systems - Dutch animal-AF farmer web content	Overview and comparison of literature-derived barriers and Dutch animal farmer-reported challenges
3. Content analyses on actors' involvement in AF development in the Netherlands	Qualitative thematic coding and influence mapping	- Dutch animal-AF farmer web content - Other actors' web content	Categorization of actors according to their role and mapping of linkages with problem dimensions

Figure 1. Research flow

2.1 Inventory of AF projects on Dutch animal farms

The first aim of this study was to reveal what the key characteristics are of AF projects across the country's livestock industry, particularly in terms of tree and shrub genera, animal integration, AF practices, and project sizes (Sub-Q1). An inventory of AF projects on Dutch animal farms, inspired by the Prins et. al. (2021) study, was conducted to reveal relative frequencies of practices and combinations of animals and plants, as well as the average sizes of projects. While the inventory is not exhaustive, it can highlight emerging trends and reveal where policy and research attention may currently be concentrated or lacking. Prins et. al.

(2021) was used only as a reference for structuring the inventory and not as database, although some overlap of projects may exist.

Data collection

A Google search was employed between April and June 2023 to identify AF projects on Dutch animal farms and collect data. A diverse range of projects was targeted using the following keywords in English and Dutch: "agroforestry", "silvopasture", "trees", "shrubs", "animal", "farm", "beef", "dairy", "poultry", "eggs", "leather", "wool", "cows", "horses", "pigs", "goats", "sheep", "chickens", and "turkeys". Table 1 presents the variables identified in the search. These included the farm's name, the year the project was established, its size in hectares, and the types of animals found on the project – as per the Prins et. al. (2021) study. Three additional variables were deemed to be of practical importance for AF system management, including the tree or shrub genera, specific AF practices, and number of animals found on the project.

Table 1. Variables included in the inventory of AF projects on Dutch animal farms

Variables	*Description*	*Examples / Range*
Farm	Name of the farm or AF project	"Chicken Forest"
Location (Province)	Name of the province the farm is located	North Holland
Animals	Name of the animals that were combined with trees or shrubs on the farm	Cows, Pigs, Goats, Sheep, Turkeys, Chickens
AF practices	How trees or shrubs were integrated with animals on the farm (or vice versa)	Solitary Tree(s), Hedge(row), Thicket, Riparian Strip, Orchard, Food Forest
Trees or shrubs (Genus)	Genus of the trees or shrubs that have been planted on the farm	Willow, Oak, Walnut, Hawthorn, Apple, Pear, …
Size (Area)	Size of the AF area (in hectares)	0,1-35
Size (Animals)	Number of animals being farmed	8-80,000
Start year (AF)	Year AF area was first established	2005-2021

Projects were selected if there was sufficient data (two or more variables) available on them, and verified by checking their location, size, or year of planting with multiple sources. Projects where animals grazed extensive areas of natural forests and meadows (e.g., deer or bison) were excluded as they fell outside the scope of this study and the previous inventory. In total, 41 projects were identified and listed in Annex Sections 1A-C. Missing data mostly concerned the year the AF project started, the size of the project in terms of animal numbers, and the project size in hectares, respectively. The remaining variables were identified for all 41 projects.

Analysis

A dataset was created in Microsoft Excel that listed all the reported variables per AF project. Each project was treated as a separate entry (row), and variables were categorized along the columns. Descriptive statistics were used to offer insights on the project starting years, and average project sizes (based on area in hectares and animal numbers). Frequency counts and percentages were presented to reveal how AF is implemented across the livestock industry in The Netherlands. Specifically, it was shown how often plants, practices, and animals were reported in the inventory, which of the variables appeared most often in isolation (*individual*), and what *combinations* versus *pairs* of variables were common. Here, *combinations* refer to multiples of the same variables (e.g., where two types of animals were found), and *pairs* refer to the co-occurrence of two different variables (e.g., animal and AF practice). This differentiation aimed to provide a nuanced picture of how AF is implemented in practice; from how many different components are used, to how they are functionally connected.

2.2 Analysis of barriers and challenges

The next aims of this study were to reveal *barriers* to AF adoption perceived by farmers as reported in previous studies and assess how they relate to the *challenges* experienced by Dutch animal farmers with AF experience (Sub-Q2). Two sources of data were established: 1) a literature-derived dataset of 25 barriers to AF adoption extracted from six international peer-reviewed studies, and 2) a dataset of 21 challenges extracted from web content on 20 unique AF projects on Dutch animal farms.

The two datasets were analyzed using a grounded typology of the four *dimensions* of problems that all farming systems face: *financial, social, environmental,* and *institutional*.

These *dimensions* were adapted from a study on the challenges to farming systems by Meeuwissen et al. (2019) and presented in Table 2 below. A comparison of the frequency and topics of the *barriers* and *challenges* was made to highlight patterns and divergences and reveal where gaps may exist between farmer's expectations and in-situ realities. The following describes the research phases in detail.

Table 2. Types of challenges to farming systems (from Meeuwissen et. al. (2019))

Category	*Description*	*Example*
Financial	Economic challenges or costs associated with implementing farming system.	Investment / Cost, Production / Market loss; Maintenance; Labor; Time (related to the return on investment, or time spent in terms of labor)
Social	Negative perceptions, attitudes, or subjective concerns regarding farming system.	System not attractive to (older) farmers, neighbors, or community; Conflicting beliefs
Environmental	Harmful or undesired impacts of farming system on the natural environment or animal welfare or vice versa.	Natural (native) habitat, Animal welfare, Plant health, Time (related to plant or animal growth)
Institutional	Regulations, policies, measures, or administrative obstacles hindering farming system.	Legal restrictions, Lack of support, Unclear or conflicting policies

2.2.1 Barriers from the literature

Data collection

A Google Scholar search was used to find studies on farmer's attitudes towards AF systems. Neither the scope in terms of region nor the chosen research method was restricted as this allowed for more *barriers* to be extracted than from European or Dutch literature only. Since AF adoption can be influenced by a wide variety of factors, restricting the scope to specific regions or contexts could lead to an incomplete overview. By targeting a random sample of studies from different parts of the world, a broad spectrum of challenges could be captured, increasing the applicability of the typology and the comparison with the Dutch livestock industry. Keywords for the search included: "farmer", "perspectives", "agroforestry", "adoption", "animal farms", "silvopasture". Selection required that the studies were

peer-reviewed, indexed in online journals, and written in English between 2015 and 2025. Table 3 presents the six studies included in the final sample.

Analysis

A systematic reading of each study was conducted, during which statements describing constraints, difficulties, or limiting factors related to AF adoption were noted as potential *barriers*. Where multiple studies referred to the same or very similar problems, they were merged, resulting in a final list of 25 generalized *barriers* to AF adoption.

Each barrier was then labeled with one or more of the four *dimensions* defined above, based on whether it matched with the description provided in Table 2. In cases where a *barrier* clearly intersected more than one *dimension* (e.g., when a lack of subsidies (*financial*) was linked to unclear policy (*institutional*)), it was assigned to multiple *dimensions*. This ensured that the interconnected nature of *barriers* could be captured, allowing for a more nuanced analysis. References were listed in Annex Section 2A.

Table 3. Studies on farmers attitudes towards AF systems

Author(s), Year	Source Title	Region	Data Collection Method(s)	Data Analysis Method(s)	Journal (Publisher)	Type
1. Louah et al., 2017	Barriers to the development of temperate agroforestry as an example of agroecological innovation: Mainly a matter of cognitive lock-in?	Belgium	Interviews	Q-Method Discourse Analysis	Land Use Policy (Elsevier)	Qualitative
2. Jara-Rojas et al., 2020	Factors affecting the adoption of agroforestry practices: Insights from silvopastoral systems of Colombia	Colombia	Survey	Inferential Statistics	Forests (MDPI)	Quantitative
3. Felton et al., 2021	Farmers' attitudes towards, and intentions to adopt, agroforestry on farms in lowland South-East and East England	England	Survey	Descriptive Statistics	AGRIxiv (MDPI)	Quantitative
4. Hoes & Aramyan, 2022	Blind spot for pioneering farmers? Reflections on Dutch dairy sustainability transition	The Netherlands	Literature Review, Interviews, Workshops	Content Analysis	Sustainability (MDPI)	Qualitative
5. Tega & Bojago, 2023	Farmer's Perceptions of Agroforestry Practices, Contributions to Rural Household Farm Income, and Their Determinants in Sodo Zuria District, Southern Ethiopia	Ethiopia	Surveys, Interviews, Field Observation	Descriptive & Inferential Statistics	International Journal of Forestry Research	Mixed
6. Telwala, 2023	Unlocking the potential of agroforestry as a nature-based solution for localizing sustainable development goals: A case study from a drought-prone region in rural India	India	Interviews	Content Analysis	Nature Based Solutions (Elsevier)	Qualitative

2.2.2 Challenges on AF projects on Dutch animal farms

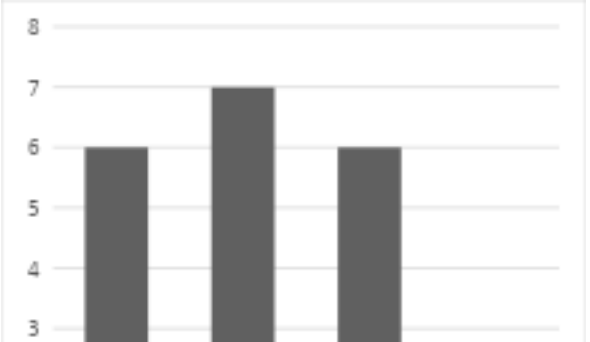
Next, secondary data on Dutch animal farmers' experiences with AF was analyzed to reveal *challenges* in the livestock industry.

Data collection

Data was gathered from online reports made by farmers or researchers at the projects identified during the inventory in the previous step. Reports were defined as "text on farmers' websites or case studies published online referring to an AF project where trees and/or shrubs were integrated with animals". To find these reports, a Google search was employed using the farm's name, location, and the following keywords in English and Dutch: "agroforestry", "silvopasture", "tree(s)", "hedge(row)", "thicket(s)", "riparian strip(s)", "orchard(s)", "grazing", "food forest(s)", "shrub(s)", "animal(s)", "farm(s)", "beef", "dairy", "poultry", "egg(s)", "leather", "wool", "cow(s)", "horse(s)", "pig(s)", "goat(s)", "sheep", "chicken(s)", and "turkey(s)". Selection criteria required that the reports mentioned at least one *challenge* experienced on the farm relating to the AF project. The search resulted in 20 reports from 20 of the AF projects from the inventory. Transcripts were included in Annex Section 3.

Sample statistics

The 20 projects together represented at least 85,35ha of land where at least 219780 animals were farmed in combination with trees and/or shrubs in The Netherlands. The average size of these projects was 4,27ha and the average number of animals being farmed was 12928. The mean starting year was 2015. The sample consisted mostly of projects where only chickens were farmed (n=11) and projects where various fruit trees or willows were planted (both n=6), as shown in Figures 2 and 3. Several *pairs* of variables appeared more frequently than others in the sample. The most common *pairs* of animals with tree or shrub genera were chickens and walnuts (n=9) and chickens and apples (n=8), found on 45% and 40% of the sampled projects, respectively. A common animal and AF practice *pair* was chickens and orchard (n=13), found on 65% of the projects. Common *pairs* of tree or shrub genera with AF practices were walnuts and orchard (n=10 or 50%), and apples or willows and orchard (each n=8 or 40% of the projects).



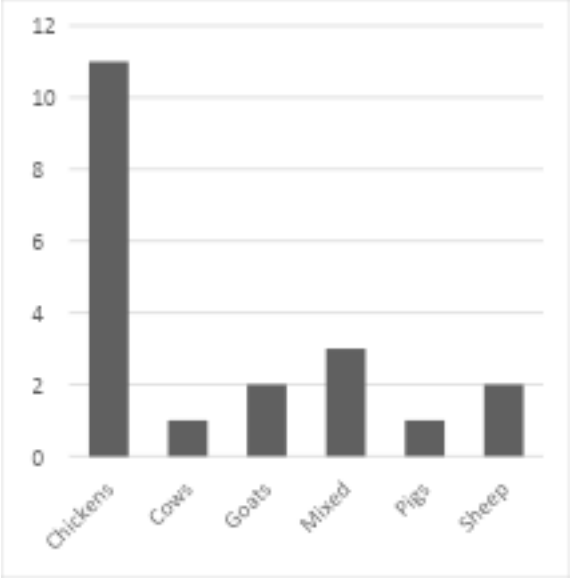


Figure 2. Type of farm (sampled projects)

Figure 3. Trees and shrubs (sampled projects)

Analysis

To identify experienced *challenges*, reports were systematically reviewed and any negative statement concerning the AF system, during or after implementation was extracted and noted. This involved difficulties, limitations, or setbacks described by the farmers themselves or by researchers summarizing their experiences. Where multiple reports mentioned the same or very similar problems, the statements were merged into a single, generalized *challenge*. This resulted in a list of 21 unique *challenges*, each of which was then labeled with one or more of the four *dimensions* of barriers defined earlier. Sources of each challenge were listed in Annex Section 2B. In cases where a *challenge* clearly overlapped multiple *dimensions*—for instance, when an administrative burden (*financial*) was linked to a governmental regulation (*institutional*)—it was assigned to more than one *dimension*. This approach aimed to capture a nuanced image of the interconnected problems farmers face in practice.

2.2.3 Comparison of barriers versus challenges

Lastly, a comparison of the frequency and contents of the *barriers* versus the *challenges* was made. For each of the four *problem dimensions*, it was assessed which *barriers* appeared in the field data (i.e., confirmed problems), which *barriers* did not align with field data (i.e., irrelevant problems in the context of the Dutch livestock industry), and which of the *challenges* reported were not addressed in the literature (i.e., novel problems).

2.3 Dutch animal-AF actor analysis and influence mapping

The next aims of this study were to reveal which actors influence AF development in the Dutch livestock industry and to what extent they are related to the problems associated with AF systems (Sub-Q3). A web content-based method of thematic coding, following Raum & Rawlings-Sanaei (2022), was used to identify actors and assess their capacity to adress particular problems. Specifically, these two levels of analysis involved: 1) identifying actors and clustering them into *actor types*, and 2) assessing to what extent each *actor type* is related to the *problem dimensions* defined in the previous research stages. The following describes the steps taken in detail.

Data collection

An internet search with the keywords: *"agroforestry", "livestock", "animal farms",* and *"The Netherlands"* in English and Dutch was used to find actors and their web content. Actors were defined as "any organization, group, or individual that plays a role in the creation and implementation of AF policy in The Netherlands", including those that "influence this policy through research, advocacy, or industry participation". Given the focus on animal agriculture, the three largest Dutch animal farmer associations were also included, despite them not (fully) matching the above definition. Targeted web content was any 'Home', 'About Us', 'Welcome', 'Mission', 'Vision', or AF-related web page or report (e.g., case study, blog, announcement, opinion paper) published online by the actor in the past 2 years.

Specifically, the collection was done through an iterative "snowball-sampling" process of reviewing web content from previously identified actors and listing any new actors mentioned there that met the target definition. To begin this process, Raum & Rawlings-Sanaei (2022) suggest choosing authoritative actors as a starting point, and since the WUR and Louis Bolk research institutes both repeatedly work on the subject, on their own and together with various other actors, it was decided to start with them. Additional actors were listed and verified to be operational by checking if they had published AF-related content or participated in AF-related initiatives within the past year. This process was repeated until no additional *actor types* emerged, indicating data saturation had been reached.

Analysis

After an actor was identified, they were assigned to an *actor type* according to their role. Roles were defined as "the actor's objectives and activities vis-à-vis AF in the Dutch livestock industry". To gain these insights, searches were carried out on each actor's web content using the following keywords in English and Dutch: *"agroforestry", "trees/shrubs on farms", "silvopasture", "livestock farming", "animal agriculture", "pasture management", "animal feed", "manure management", "grazing systems", "objective", "activities", "agricultural policy", "climate resilience", "nature-inclusive farming", "circular farming", "ecosystem services", "farmer networks", "knowledge exchange", "advocacy", "community of practice", "agricultural innovation"*. The same keyword searches were carried out on web content from other actors, in combination with the previous actors' names, to ensure roles were cross-referenced across multiple sources and avoid relying on a single actor's self-reported information.

Finally, actors' web content was reviewed to determine to what extent *problem dimensions* were adressed by asking the questions in Table 4 based on Raum & Rawlings-Sanaei (2022)'s qualitative indicators. The indicators serve as proxies for actor engagement and influence, as: more nuanced discussions suggest greater expertise; frequent mentions indicate sustained attention to the issue; high relevance reflects practical and contextual involvement; and cross-referencing implies alignment between the problem and the actor's mandate according to the broader governance network.

Indicator	***Question***
Depth	Did actors provide general mentions of the problem, or did they offer specific strategies or solutions to overcome it?
Cross-referencing	Were actors from one type cited by others in discussions related to the barrier?
Frequency	How often did actors mention problems in this dimensions?

Relevance (Livestock-component)	Did actors address problems and solutions to AF in general or specifically one or more of the challenges reported by animal farmers?

Table 4. Qualitative indicators and corresponding questions (from Raum & Rawlings-Sanaei (2022))

Based on the answers to these questions, influence scores were assigned to each *actor type* for each *problem dimension*. A strong influence score (3) was given if the *actor type* played a central role in addressing the problem dimension, with most actors mentioning one or more related challenge(s) reported by animal farmers and frequently proposing concrete solutions. A moderate score (2) was given if several actors from the *actor type* acknowledged the problem dimension but with little emphasis or detail, or without addressing the challenges reported by farmers. A weak score (1) was given if most actors from the *actor type* rarely addressed or were not directly involved in discussions about the problem dimension. Finally, the findings were visualized in a heatmap, where the influence scores of each *actor types* were plotted in relation to the four *problem dimensions*.

3. Results

3.1 AF projects on Dutch animal farms

In total, 41 different projects were identified – together representing at least 141.55 ha of land where at least 394208 animals were farmed in combination with trees and/or shrubs in The Netherlands. The full inventory is shown in Annex Sections 1A-C. Table 5 presents some descriptive statistics on the inventory. The data on the timing of project establishment indicates a recent increase in implementation. Data on the size of projects, both in terms of hectares and animal numbers, suggest that most farms are experimenting with AF on a relatively small scale, although the numbers are skewed due to a few large-scale projects.

Table 5. Descriptive statistics for inventory variables (N = 41)

Variable	*Range*	*Mean*	*Median*	*Mode*	*Standard Deviation*
Start year (n = 31)	2005–2021	2016	2017	2019	±4.4
Project size (no. of animals) (n = 36)	8-80,000	11,263	850	25,000	±18,589
Project size (ha) (n = 40)	0.10-35	3.54	2	1	±6.07

Although less comprehensive in total area (141.55 ha vs. 281.75 ha) compared to the previous inventory by Prins et al. (2021), the findings provide valuable insights into the diversity of AF practices currently in place across the livestock industry. Notably, they suggest that vegetation and practice selection favors economic functions (e.g., fruit or timber production in orchards).

3.1.1 Animals, AF practices, trees and shrubs species

Tables 6-8 show how often types of animals, AF practices, and trees and/or shrubs were reported in the inventory. Chickens were the most frequently observed animals in AF systems, followed by cows, sheep, and pigs. Orchards were the most common AF practice

observed, followed by hedgerows, solitary trees, and thickets. In terms of vegetation, the genera Juglans (walnut) was the most common, followed by Salix (willow), Malus (apple), Prunus (plum), and Corylus (hazel).

Table 6. Animals on AF projects on Dutch animal farms (ordered by frequency)

#	*Type of animals*	*Frequency (counts and % of all projects)*
1	Chickens	24 (58.5%)
2	Cows	15 (36.6%)
3	Sheep	5 (12.2%)
4	Goats	3 (7.3%)
5	Pigs	3 (7.3%)
6	Turkeys	1 (2.4%)

Table 7. AF practices on AF projects on Dutch animal farms (ordered by frequency)

#	*AF practice*	*Frequency (counts and % of all projects)*
1	Orchard	28 (68.3%)
2	Hedgerow	15 (36.6%)
3	Solitary tree	13 (31.3%)
4	Thicket	12 (29.3%)
5	Riparian strip	5 (12.2%)
6	Food forest	3 (7.3%)

Table 8. Trees and shrubs on AF projects on Dutch animal farms (ordered by frequency)

#	*Tree or shrub name - Example species*	*Frequency (counts and % of all projects)*
1	Walnut - *Juglans regia (Common Walnut)*	19 (46.3%)
2	Willow - *Salix alba (White Willow)*	18 (43.9%)
3	Apple - *Malus domestica (Common Apple)*	12 (29.3%)
4	Plum - *Prunus domestica (Common Plum)* *Prunus cerasifera (Cherry Plum)* *Prunus armeniaca (Apricot)* *Prunus persica (Peach)* *Prunus avium (Cherry)*	*Sum: 11 (26.8%) | 3 (7.3%)* *2 (4.9%)* *1 (2.4%)* *2 (4.9%)* *3 (7.3%)*
5	Hazel - *Corylus avellana (Common Hazel)*	10 (24.4%)
6	Hawthorn - *Crataegus Monogyna (Common Hawthorn)*	9 (22.0%)
7	Chestnut - *Castanea sativa (Sweet Chestnut)*	8 (19.5%)
8	Alder - *Alnus glutinosa (Black Alder)*	7 (17.1%)
9	Oak - *Quercus robur (English Oak)*	7 (17.1%)

10	Pear - *Pyrus communis (European Pear)*	7 (17.1%)
11	Currant - *Ribes rubrum (Red Currant)*	4 (9.8%)
12	Reed - *Phragmites australis (Common Reed)*	3 (7.3%)
13	Ash - *Fraxinus excelsior (European Ash)*	3 (7.3%)
14	Silverberry - *Elaeagnus angustifolia (Russian Olive)*	2 (4.9%)
15	Brambles - *Rubus fruticosus (Blackberry)*	2 (4.9%)
16	Holly - *Ilex aquifolium (European Holly)*	2 (4.9%)
17	Buckthorn - *Hippophae rhamnoides (Sea Buckthorn)*	2 (4.9%)
18	Elderberry - *Sambucus nigra (Black Elder)*	2 (4.9%)
19	Maple - *Acer platanoides (Norway Maple)*	2 (4.9%)
20	Boxwood - *Buxus sempervirens (Common Box)*	1 (2.4%)
21	Quince - *Chaenomeles japonica (Japanese Quince)*	1 (2.4%)
22	Mulberry - *Morus nigra (Black Mulberry)*	1 (2.4%)
23	Grape - *Vitis vinifera (Common Grape Vine)*	1 (2.4%)
24	Medlar - *Mespilus germanica (Common Medlar)*	1 (2.4%)
25	Beech - *Fagus sylvatica (European Beech)*	1 (2.4%)
26	Spruce - *Picea abies (Norway Spruce)*	1 (2.4%)
27	Ginkgo - *Ginkgo biloba (Maidenhair Tree)*	1 (2.4%)

3.1.2 Individual animals, trees and shrubs, and AF practices versus combinations

A distinction can be made between projects where a single animal type was kept (*individual)* versus those that combined multiple types of animals (*combinations*). Similarly, some farms applied only one AF practice or tree genus, while others combined multiple.

Chickens (n=19, 46.3%) and cows (n=9, 22.0%) were the most common *individual* animals. The most common *individual* practices were orchards (n=15, 36.6%), hedgerows (n=3, 7.3%), and riparian strips (n=3, 7.3%). Willows and walnuts (n=5 each, 12.2%) were the most common *individual* tree genera. Among the projects with multiple animals, chickens and cows were most often *combined* (n=4, 9.8%). Common practice *combinations* included solitary tree with thicket (n=8, 19.5%) and hedgerow with thicket (n=8, 19.5%). Orchards were also frequently *combined* with either a hedgerow or a solitary tree (both n=6, 14.6%). Common tree genus *combinations* included walnut with plum and walnut with apple (n=8 each, 19.5%), followed by apple with pear and willow with alder (n=6 each, 14.6%).

3.1.3 Pairs of animals, trees and shrubs, and AF practices

Several *pairs* of variables appeared more frequently than others in the inventory. These *pairs* illustrate both the multifunctional use of land and the diversity of plant-animal-practice relationships that constitute AF. Chickens and walnut (n=14, 34.1%) and chickens and apple (n=11, 26.8%) were the most common animal-tree *pairs*. Other frequent *pairs* included

chickens and willow (n=10, 24.4%), cows and walnut (n=8, 19.5%), cows and willow (n=5, 12.2%), and cows and apple (n=4, 9.8%).

Next, chickens and orchard (n=20, 48.8%) was the most common animal-practice *pair*. Other frequent *pairs* included cows and hedgerow (n=10, 24.4%), cows and solitary tree(s) (n=8, 19.5%), cows and orchard (n=7, 17.1%), chickens and solitary tree(s) (n=7, 17.1%), and chickens and hedgerow (n=6, 14.6%). Finally, orchard and walnut (n=17, 41.5%) was the most common tree-practice *pair*. Orchard and willow (n=10, 24.4%) and orchard and apple (n=10, 24.4%) were also frequent. Other observed *pairs* included hedgerow and willow (n=8, 19.5%), hedgerow and walnut (n=6, 14.6%), and hedgerow and apple (n=4, 9.8%).

3.2 Barriers and challenges

The following section presents the results of the analyses of perceived *barriers* to AF adoption reported in the literature and *challenges* reported on Dutch animal-AF projects, and the comparison made between the two.

3.2.1 Barriers from the literature

A total of 25 *barriers* were extracted from literature on farmers attitudes towards AF and categorized in Table 9.

Table 9. Categorization of barriers from the literature on farmer's attitudes towards AF

Barrier:	***Category:*** *Financial*	*Institutional*	*Social*	*Environmental*
1. Farmers have limited experience with AF (planting trees/shrubs).			x	
2. Foresters have limited experience working with agriculture.			x	
3. Belief that AF is only feasible if many people come back to agriculture.			x	
4. Belief that woods, woodland edges, and the likes have always been the enemy of farming.			x	

5. The short-term financial return of an AF plot is low.	x			
6. To do AF, existing machinery must be replaced.	x			
7. Difficult to demonstrate the financial potential to farmers. (e.g., farmer believes AF practices are not profitable, or that AF decreases the agricultural output or the value of the land)	x		x	
8. Farm is too large to have time or space to adapt.	x			
9. Older farmers more reluctant than younger ones.			x	
10. Land ownership requirement.		x		
11. Flat land unfavorable for AF (esp. vs. intensive cropping).				x
12. Acidic soil unfavorable for AF.				x
13. Low-fertility soil unfavorable for AF.				x
14. Farmer has a too small herd.	x			
15. Land at maximum capacity (e.g., small plot, existing paddocks).	x			x
16. Too high of an investment: seeds, planting, maintenance, equipment costs.	x			
17. Loans unavailable.	x			
18. Lack of savings.	x			
19. Lack of liquidity.	x			
20. No knowledge of where advice can be obtained.			x	
21. Farmer believes community has negative attitudes towards AF.			x	
22. Lack of government support for AF “pioneers” (e.g., innovation subsidies go to high-tech solutions like low-emission stables).		x		
23. AF (pioneering or smallholder) farmers have similar administrative accounting burdens as conventional farmers.	x	x		
24. Fierce market competition for land.	x			
25. Difficult for farmers to access carbon market: technical complexities, uncertainty, high transaction costs, mobilizing substantial numbers of smallholder	x			

farmers to ensure sufficient CO2 storage, limited data availability and monitoring capacity.				

3.2.2 Challenges on AF projects on Dutch animal farms

In total, 21 different *challenges* were extracted from the sample of AF projects and categorized in Table 10.

Table 10. Categorization of challenges reported on AF projects on Dutch animal farms

Challenge:	***Project ID(s) and AF system(s):***	***Category:*** *Financial*	*Institutional*	*Social*	*Environmental*
1. Space for planting trees is scarce in the Netherlands	ID13 (chickens in fruit orchard)				x
2. Issue with KAT certification (confusion, delay)	ID13 (chickens in fruit orchard) ID32 (chickens with willows) ID03 (chickens with willows)		x		
3. Belief that the organic sector shouldn't grow too big,	ID13 (chickens in fruit orchard)			x	
4. Animals need protection from predators (e.g., foxes, hawks)	ID34 (chickens in hazel- and walnut orchard) ID13 (chickens in fruit orchard)	x			x
5. Planting costs a lot of money	ID40 (chickens in fruit orchard)	x			
6. Young trees need protection from animals	ID40 (chickens in fruit orchard) ID32 (chickens with willows) ID10 (chickens with willows) ID09 (chickens in vineyard and walnut orchard)	x			x

	ID24 (chickens and sheep in fruit and nut orchard) ID39 (cows, pigs, and chickens in fruit orchard) ID22 (goats in nut orchard with willows)				

7. Farmer primarily specialized in the animals, not trees	ID40 (chickens in fruit orchard) ID10 (chickens with willows) ID03 (chickens with willows) ID24 (chickens and sheep in fruit and nut orchard)			x	
8. Protecting young trees took longer than expected	ID32 (chickens with willows) ID37 (chickens with willows)	x			
9. Dead or damaged plantings (due to animals, disease, drought, weeds)	ID37 (chickens with willows) ID03 (chickens with willows) ID40 (chickens in fruit orchard) ID08 (chickens with willows) ID09 (chickens in vineyard and walnut orchard) ID24 (chickens and sheep in fruit and nut orchard) ID33 (cows in nut and fruit orchard) ID39 (cows, pigs, and chickens in fruit orchard) ID23 (goats with willows)				x
10. Chickens confined due to bird-flu regulation	ID29 (chickens in fruit orchard)		x		x
11. Project is too small-scale for it to be	ID08 (chickens with willows)	x			

commercially interesting	ID36 (sheep in fruit orchard)				
12. Lack of successful examples	ID24 (chickens and sheep in fruit and nut orchard)			x	
13. Regulations prohibiting planting	ID24 (chickens and sheep in fruit and nut orchard)		x		

14. AF is a long-term investment	ID24 (chickens and sheep in fruit and nut orchard) ID16 (chickens in food forest and orchard and cows with hedgerows)	x			
15. Difficult to make a distinctive product	ID33 (cows in nut and fruit orchard)	x			
16. It is a new system; complex process of experimenting, monitoring and making gradual adjustments.	ID35 (pigs with nut trees and various shrubs)	x		x	
17. Belief that it requires a lot of perseverance to be working with nature	ID30 (sheep with willows and reed)			x	
18. Strict mowing rules	ID30 (sheep with willows and reed)		x		
19. Strict fertilization/manure/nitrogen/phosphate rules	ID30 (sheep with willows and reed)		x		
20. Maintenance costs a lot of labor (mowing)	ID30 (sheep with willows and reed)	x			
21. Young trees need protection from animals	ID40 (chickens in fruit orchard) ID32 (chickens with willows)	x			x

	ID10 (chickens with willows) ID09 (chickens in vineyard and walnut orchard) ID24 (chickens and sheep in fruit and nut orchard) ID39 (cows, pigs, and chickens in fruit orchard) ID22 (goats in nut orchard with willows)				

3.2.3 Comparison of barriers versus challenges

The following presents the similarities and differences between farmers' expectations (*barriers*) and the reality of the Dutch livestock industry (*challenges*) in relation to each of the *problem dimensions*.

3.2.3.1 Financial

In the financial category, a match between the literature and field data was that AF projects were not commercially interesting or very profitable. The perceptions that the short-term return on AF investments was low tied in with farmers' reports of their projects being a long-term investment, with relatively high costs reported to purchase seedlings, plant them, and protect the plantings. Time constraints mentioned in the literature also aligned with the reported difficulties of managing complex systems. At the same time, the issue of machinery having to be replaced did not come up in farmers' reports. The notions that farms were too large to have time or space to adopt AF, or that farms were too small for AF, were also not reported by farmers. Likewise, the topics of limited savings or liquidity, competition for land, carbon markets, and the belief that AF decreases the agricultural output was not explicitely mentioned by farmers. The notion that AF farmers have similar administrative burdens as conventional farmers was not reported. On the other hand, a prevalent theme in the farmers reports but not in the literature concerned the costs incurred to protect plantings from animals and vice-versa. Additionally, making a product distinctive from conventional (non-AF) products was challenging according to one farmer, while this topic was not mentioned in the literature.

3.2.3.2 Institutional

Few explicit similarities were found between the literature and farmers' reports in the institutional category. Notably, the lack of government support for 'pioneering' farmers, a common theme in the literature, was not mentioned on any of the projects. On the other hand, regulations like the *zoning plan "open landschap"*, the *"herplantplicht"*, the *"KAT certification*", *bird flu regulations*, and *strict fertilization or mowing rules,* were reported as challenges in the field but not in the literature.

3.2.3.3 Social

Considerable overlap was found between the literature and field data in the social category. First, the barrier that farmers' have limited experience with AF aligned with farmers reporting that they were specialized in animals and not in plants or trees. Further, the beliefs that AF only works if enough people adopt it and that it is difficult for farmers to obtain knowledge about AF, overlapped with the reported challenge of a lack of succesful AF projects. On the other hand, neither the notions that foresters have little experience with AF, nor that older farmers are more reluctant that younger farmers to adopt AF came up in the field data. The perceptions of woods being the enemy of farming and the community having a negative attitude towards AF were also not reported by the animal farmers. At the same time, the reported challenges of farmers having to monitor, evaluate, and make adjustments to the AF system, and needing a lot of perseverance when working with nature were not found in the literature. A farmer's comment that the organic sector should not grow too big was also a novel issue.

3.2.3.4 Environmental

Lastly, only the topic of limited space was found in both the literature and field data. The other perceived barriers (i.e., flat land, and acidic or low-fertility soil) were not mentioned by Dutch animal farmers. On the other hand, the widely reported threats of predation, drought, and disease were not found in the literature.

3.3 Dutch animal-AF actors and influence scores

The following presents the results of the analyses on actors involved in AF development across the Dutch livestock industry. Through a systematic identification and categorization process, eight key *actor types* were established (Table 11). The findings position *researchers* as knowledge brokers, translating complex ecological principles into practical tools for farmers and policy actors. The *CoP* brings together early adopters, researchers, and policymakers in a feedback loop where experiences inform future policy and research. It also serves as an advocacy platform, pushing for tailored support for AF within existing subsidy schemes. *Government* actors play a central role in AF development through policy formulation, subsidy provision, and knowledge sharing. *Farmer associations* act as political and informational gatekeepers for large segments of the agricultural sector and remain mostly on the side of conventional farming.

Environmental NGOs, on the other hand, support AF development by curating knowledge, building awareness, and applying pressure for stronger policy incentives. *Agri-businesses*, like those involved in feed, dairy processing, and retail, can shape the economic incentives for AF adoption but remain largely silent on AF. Banks and other *financial institutions* support AF development through lending practices, risk assessments, and green investment programs. Lastly, *pioneering farmers* or early adopters are crucial for the diffusion of AF practices, as they serve as key sources of experiential knowledge.

Actor types	**Roles (objectives & activities)**	**Actors**
Researchers	Conduct research, inform policy, and disseminate knowledge	- Louis Bolk Instituut - Wageningen University Research
Community of Practice (CoP)	Facilitate knowledge transfer, networking, and advocacy	- Agroforestry Netwerk Nederland
Government	Provide subsidies, create national & regional sustainability strategies, and share AF case studies	- European Union - Ministerie van Landbouw, Natuur, en Voedselkwaliteit - Rijksdienst voor Ondernemend Nederland - Provinces - Municipalities

Farmer associations	Represent farmers, influence policy, support collective action, and determine industry trends	- Land- en Tuinbouworganisatie - BoerenNatuur
Environmental NGO's	Disseminate AF knowledge and advocate for sustainable agriculture	- Stichting Agroforestry Netwerk Nederland - Groen Kennis Net - Boeren met Natuur
Agri-businesses	Develop agricultural products, influence farming practices, supply chains, and markets – mostly in support of conventional industrial farming	- ForFarmers - Friesland/Campina - Ahold Delhaize
Financial institutions	Provide financial services, investments, risk assessments, and market access related to sustainable farming and innovation	- Rabobank - ABN AMRO
Pioneering farmers	Implement AF practices, share knowledge, and inspire peer learning and transitions	- Farmers identified in inventory (Chapters 2.1 & 3.1)

Table 11. Classification of actors in AF development across the Dutch livestock industry

Finally, *actor types* were given an influence score reflecting the degree to which they acknowledged and engaged with the four *problem dimensions* (Figure 5). The following describes the findings in detail.

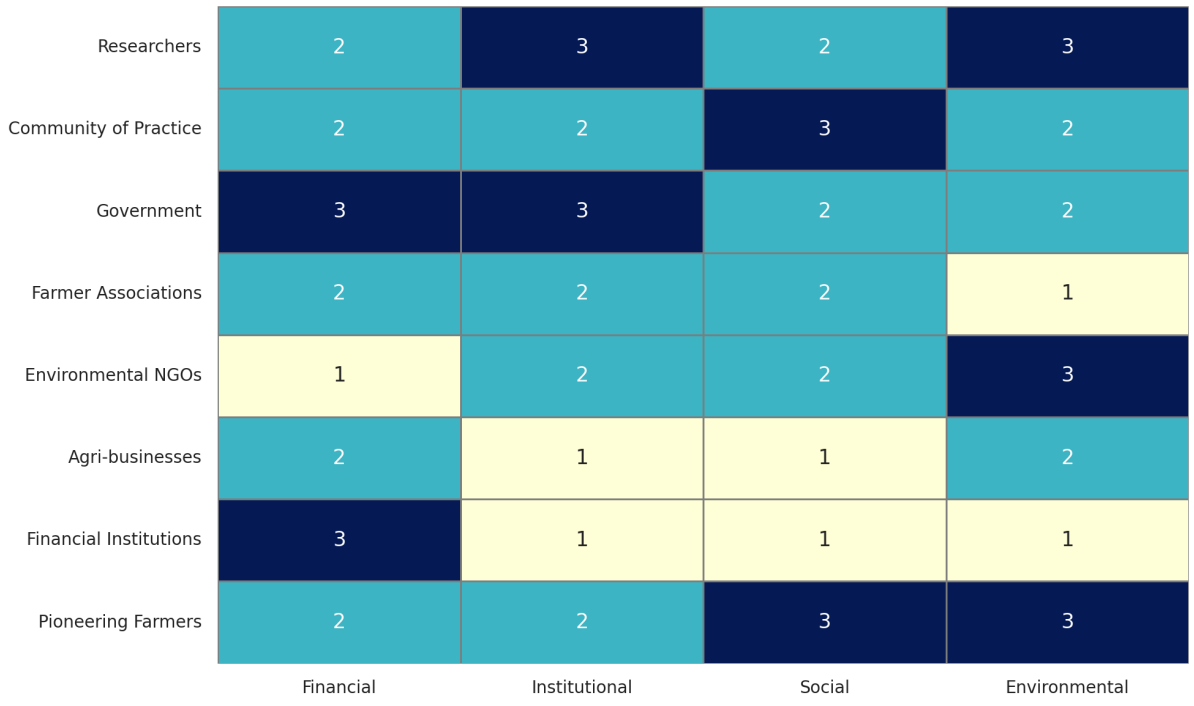


Figure 5. Influence scores for actor types per problem dimension

Researchers were strongly connected to the institutional (3) and environmental (3) dimensions. Their work frequently addressed regulatory challenges and spatial constraints, while also proposing strategies to overcome them. Further, *researchers* were linked moderately to social (2) and financial (2) aspects, as they adressed farmer attitudes and the economic viability of AF (e.g., profitability, liquidity, land competition), but offered limited concrete solutions and omitted some of the reported challenges. For example, the challenge of marketing a distinctive product was not addressed.

The *CoP* was most strongly engaged in the social dimension (3), with themes of knowledge exchange, peer learning, and farmer-to-farmer networking appearing frequently. It was also moderately linked to financial (2), institutional (2), and environmental (2) issues, since it organizes workgroups and shares practical strategies, for instance to address project maintenance, regulatory frameworks, and tree protection or specific animal-tree combinations. However, the themes of funding, market development, and product differentiation were rarely adressed.

Government actors had a high institutional influence score (3), as they appeared central in discussions of regulatory issues (e.g., zoning plans, replant obligations, mowing rules). Their connection to the financial problem dimension was also strong (3), due to their control over agricultural funding instruments and their perceived support of high-tech innovations instead of nature-based approaches such as AF. Social and environmental linkages received moderate scores (2), reflected in frequent mentions of pioneering farmers, and regulations such as bird flu-related restrictions or mowing requirements intersecting with AF practices, respectively.

Farmer associations were moderately engaged with financial (2), institutional (2), and social (2) themes. The financial linkage was reflected primarily by the **BoerenNatuur** organization's connection to the *Agrarisch Natuur- en Landschapsbeheer (ANLb)* subsidy scheme. The institutional linkage was reflected primarily by actors' claims to mobilize farmers at scale, which (e.g., in the context of carbon markets) was a perceived barrier to AF adoption. Furthermore, instances of knowledge diffusion and farmer-to-farmer learning emphasized in the social dimension appeared in the form of actors like **PluimveebedrijfNL**

sharing AF case studies and practical advice. Environmental themes in relation to AF adoption were rarely addressed by these actors (1).

Environmental NGOs showed a strong connection to the environmental dimension (3), regularly promoting AF's ecological benefits while sharing example projects and management advice to help farmers, some directly addressing the reported threats of predation, drought, or disease. These actors had moderate institutional (2) and social (2) scores, as they were closely related to the themes education, advocacy, and public engagement, but not to the challenges reported by Dutch animal farmers in these categories. Their engagement with financial themes was limited (1), as little attention was given to funding issues or solutions such as improving business models.

Agri-businesses received a moderate influence score for the financial (2) and environmental (2) dimensions, reflected by their mentions of improving supply chains, mobilizing consumer demand for sustainability goals, and nature-inclusive initiatives. However, references to AF both in general as in the livestock industry were lacking, so they did not receive the highest score. Their institutional (1) and social (1) influence remained limited, as they were rarely mentioned alongside specific regulations or topics of farmer attitudes and education.

Unsuprisingly, *financial institutions* were closely linked to the financial dimension (3), reflected by their focus on funding opportunities for AF development (e.g., through loans or carbon credits), and mentions of AF boosting agricultural output. Nonetheless, few mentions of AF in the livestock component were found. They were weakly connected (1) to the other dimensions, where their involvement was either minimal or indirect.

Lastly, *pioneering farmers* were highly influential in the social (3) and environmental (3) dimensions as their reports directly demonstrate AF viability among peers in specific ecological contexts. Their financial (2) and institutional (2) links were moderate, reflected by their involvement in pilot projects and subsidy programs while otherwise not offering solutions.

4. Discussion

The following chapter discusses the main findings of this study in light of the knowledge gaps presented in the introduction, alongside the limitations of the chosen analyses and recommendations for future research. Recommendations for governance of AF development in the Dutch livestock industry are provided throughout.

The inventory conducted in the first stage of this study presented a 'deepening' of the 2021 Louis Bolk Institute's inventory, by focusing exclusively on animal farms and incorporating greater detail regarding the integration of specific tree genera with specific livestock types. This stage addressed the first major knowledge gap identified in the literature—namely, the lack of systematic insight into existing AF practices on Dutch livestock farms. The findings can inform future governance measures and potential research pathways. For instance, the

high number of walnut, willow, and apple trees, alongside the prevalence of single-species orchards suggest that economic motivations (e.g., efficient production of fruits, nuts, and timber) outweigh ecological considerations (e.g., improving biodiversity). Actors could therefore incentivize more biodiverse planting by offering higher subsidies or certification benefits for farms that integrate a mix of native tree and shrub species. In addition, the analysis reinforces the internet's role as a key tool for data collection and knowledge dissemination, aligning with recommendations in a previous study to foster AF visibility and promote social learning through accessible media (Louah et al., 2017).

However, the findings do not provide the full picture. For instance, the inventory omitted certain sectors (e.g., duck or mink farms) and failed to capture a statistically significant sample. Every farm and AF project has unique features and the findings are therefore not representative of all AF projects on Dutch animal farms. The usage of exclusively online data enlarges these issues, as animal farmers that have developed AF systems without reporting this online were left outside of the analysis. The data included in the analysis might also have been wrongly reported or incomplete. Finally, the overall quality of the projects (e.g., in terms of socio-environmental benefits) was also not included as a factor, leaving questions as to which practice works best in which situation unanswered. A key recommendation for future research in these respects this topic would be to administer in-person surveys or questionairres to a statistically representative sample of animal farmers, with questions relating to the quality of projects as well, as this would allow for a more comprehensive understanding of the current AF landscape.

The next stage tackled another key knowledge gap: the limited clarity in the literature regarding which AF barriers are particularly salient to Dutch livestock farmers. The comparison of reported challenges and perceived barriers highlighted several important topics. Financial problems were most prominent, with findings suggesting the need for targeted subsidies and other financing tools, previously emphasized by authors like Felton et al. (2021) and Tega & Bojago (2023), to promote AF development across the livestock industry. On the institutional side, several novel problems emerged that suggest the government can support AF adoption by revising or removing obstructive regulations, including the "open landschap" zoning plan, the "herplantplicht," strict fertilization and mowing regulations, the KAT certification system, and bird flu restrictions. A key social problem in the livestock context was the shortage of example projects to learn from,

confirming previous academic findings and reinforcing recommendations in the literature to increase AF practice awareness, visibility, and education (Louah et al, 2017; Hoes & Aramyan, 2022). Further, the environmental problems were not aligned between literature and field data, reaffirming the importance of context specific research. For instance, the reported environmental challenges suggest that AF governance measures for the Dutch livestock industry should include system maintainance support.

It should be noted, however, that a limitation of this research phase was that the weight and importance of the statements analyzed was not quantified, and that the field data reflects individual opinions more than broad consensus. Further, the literature barriers included problems that do not apply to the Dutch context due to the research scope of some of the studies involved. The analysis may also have been biased due to its exclusive reliance on online sources and the statements being subject to personal interpretation and translation inaccuracies by the researcher. Future research could mitigate some of these issues through surveys or interviews that assign importance ratings to perceived barriers and rely on multiple researchers to validate the interpretation of responses. Despite these limitations, the analysis offered valuable insight into the specific constraints Dutch animal-AF farmers face and how they compare with broader literature.

The actor analysis and influence mapping addressed the final major knowledge gap: the limited understanding of how actors influence AF development in the livestock context, and how they engage with specific problems, in the Netherlands. The actor types researchers, pioneering farmers, government, and— to a lesser extent—the CoP are helping destigmatize AF in the Dutch livestock sector by showcasing sector-specific success stories, offering workshops, and fostering peer-to-peer learning networks, corresponding with the suggestion by Louah et al. (2017) that multi-actor social learning and ecological education are key to scaling up AF. The governance challenge for these actors lies not in inventing new solutions, but in scaling, coordinating, and refining existing ones. Given the central role of farmer websites and the internet in general in disseminating knowledge, a specific recommendation for the CoP is to centralize and curate online AF content, while also making it accessible in print or in-person formats for less digitally connected farmers. Additionally, researchers could investigate the long-term outcomes of integrating AF into livestock farming systems, including productivity, biodiversity, and resilience metrics. Environmental NGOs played a key role in providing ecological education – but they

addressed the other problem dimensions to a lesser extent, while financial institutions and governmental actors were found to offer monetary and educational support – but often omitted specifically adressing the livestock component. Tailoring AF programs, such as educational campaigns to provide easier access to loans or subsidies, to the livestock industry context are therefore recommended for each these actors. Moreover, these actors, as well as agri-businesses, are positioned well for creating marketing campaigns for AF products stemming from the livestock industry. Finally, the findings echoed Hoes & Amaryan (2022), who argued for supporting pioneering farmers and embedding their efforts into formal governance structures. The pioneering livestock farmers identified in this study are clear examples of these "niches of innovation." Supporting them through targeted research, greater visibility, and dedicated financial incentives is expected to accelerate uptake across the sector.

The actor analysis was, however, limited by its reliance on public online materials, which may overrepresent some actors and underrepresent others (e.g., small-scale local governments or advisory services). It was also potentially biased due tot the researcher personal interpretation of web content. Future research could improve this analysis by identifying additional actor types or better assessing relationships with the problem dimensions, and mitigate the limtations discussed above by opting for in-depth interviews or stakeholder workshops and involving multiple researchers.

5. Conclusion

This study set out to investigate the extent to which agroforestry (AF) has been adopted in the Dutch livestock industry. A multi-step research approach was used to gain insight into emerging AF practices and other characteristics, identify key problems reported in the literature and by animal farmers, and reveal which other actors influence AF development and to what extents they are related to specific issues.

A dataset was compiled in the first stage of the study consisting of publicly available descriptive information gathered from farm websites, blogs, news articles, and other grey literature to map emerging trends across Dutch livestock farms. Descriptive statistical analysis revealed that: 1) AF is especially popular among Dutch animal farmers keeping

chickens or cows, 2) that orchards and hedgerows are the preferred AF practices, and 3) that willows and walnuts are the most common tree or shrub genera. Most of the observed systems were relatively small-scale and involved a diverse mix of plant genera and AF practices, suggesting that AF development in this context is characterized by extensive, experimental projects outside of mainstream industrial agricultural chains. At the same time, the existence of multiple larger scale projects involving individual productive plant genera integrated with individual animal types in efficient-to-manage configurations like orchards, suggests a sub-set of farmers have moved beyond early stages of AF development towards optimized systems where economic motivations are important drivers.

The second stage of this study explored key challenges to AF as reported by the literature as well as by farmers across the livestock industry. Financial and institutional barriers were found to be most prevalent, confirming insights from previous literature. High investment costs, obstructive regulations, and issues with certification schemes were identified as problems. Social and environmental challenges were also present but to a lesser extent. A shortage of example projects to learn from was reportedly an issue in this context. Notably, some environmental barriers emphasized in literature were not echoed by livestock farmers, pointing to the need for more context-specific research into ecological constraints. Overall, the findings suggest that tailored subsidies, regulatory reform, and enhanced peer learning could help lower the threshold for livestock farmers to adopt AF.

The final stage of the research revealed several actor groups—particularly researchers, pioneering farmers, governments, and the Community of Practice—who are actively shaping AF development and invovled in multiple dimensions of reported challenges. Notable activities ranged from promoting awareness of existing projects, facilitating knowledge exchange among different actors, and offering long-term loans and subsidies. Strengthening these efforts, while supporting pioneering farmers and integrating their work into formal governance frameworks, offers a promising pathway for broader AF adoption.

In conclusion, AF in the Dutch livestock sector is emerging, diverse, and driven by a growing network of engaged actors. The governance challenge lies not in inventing new ideas but in supporting, refining, and scaling existing ones. Future research should aim to provide a more

statistically representative data on AF adoption, assess the effectiveness of different systems, and deepen our understanding of actor dynamics across governance levels. Doing so will help build the coalitions and conditions needed to support more climate-resilient, financially viable, and biodiversity-friendly forms of livestock farming in the Netherlands and beyond.

References

Castle, M., Gravsholt Busck, A., Kristensen, S. B. P., & Primdahl, J. (2021). Farmer perspectives on agroforestry governance: A comparative study of Denmark and the UK. *Agroecology and Sustainable Food Systems, 45*(10), 1452–1472. https://doi.org/10.1080/21683565.2021.1924414

Castle, M., Primdahl, J., & Kristensen, S. B. P. (2022). Land-use governance and multifunctionality: Agroforestry systems in a European context. *Land Use Policy, 113*, 105894. https://doi.org/10.1016/j.landusepol.2021.105894

Central Bureau for Statistics. (2022). Landbouwcijfers 2022. Centraal Bureau voor de Statistiek. Retrieved from https://www.cbs.nl

Central Bureau for Statistics. (2024). Landbouwcijfers 2024. Centraal Bureau voor de Statistiek. Retrieved from https://www.cbs.nl

den Herder, M., Moreno, G., Mosquera-Losada, M. R., Palma, J. H. N., Sidiropoulou, A., Santiago-Freijanes, J. J., ... & Kay, S. (2017). Current extent and stratification of agroforestry in the European Union. *Agriculture, Ecosystems & Environment, 241*, 121–132. https://doi.org/10.1016/j.agee.2017.03.005

Felton, M., Jones, P., Tranter, R., Clark, J., Quaife, T., & Lukac, M. (2023). Farmers' attitudes towards, and intentions to adopt, agroforestry on farms in lowland south-east and East England. *Land Use Policy*, 131, 106668. https://doi.org/10.1016/j.landusepol.2023.106668

Hilborn, R., Banobi, J., Hall, S. J., Pucylowski, T., & Walsworth, T. E. (2018). The environmental cost of animal source foods. *Frontiers in Ecology and the Environment, 16*(6), 329–335. https://doi.org/10.1002/fee.1822

Hoes, A.-C., & Aramyan, L. (2022). Beleidsperspectieven voor landbouwtransitie: Agroforestry als systeeminnovatie. Wageningen University & Research.

Jara-Rojas, R., Bravo-Ureta, B. E., & Martínez-Rodríguez, M. R. (2020). Adoption of agroforestry practices: A comparative analysis between temporary and permanent crops. *Agroforestry Systems, 94*, 1899–1913. https://doi.org/10.1007/s10457-020-00531-3

Jones, D. L., Cross, P., Withers, P. J. A., DeLuca, T. H., Robinson, D. A., Quilliam, R. S., ... & Edwards-Jones, G. (2022). Nutrient sustainability in agroecosystems: A challenge for the 21st century. *Frontiers in Environmental Science, 10*, 804496. https://doi.org/10.3389/fenvs.2022.804496

Louah, L., Visser, M., Blaimont, A., & de Cannière, C. (2017). Barriers to the development of temperate agroforestry as an example of agroecological innovation: Mainly a matter of cognitive lock-in? *Land Use Policy*, 67, 86–97. https://doi.org/10.1016/j.landusepol.2017.05.001

Luske, B., Prins, E., & van den Berg, L. (2020). Voorstudie gewascode agroforestry: Advies voor erkenning en duidelijke regelgeving. Louis Bolk Instituut.

Luske, B., Prins, E., & van den Berg, L. (2017). Lessons learned: Agroforestry for ruminants. AGFORWARD Project.

Meeuwissen, M., Feindt, P. H., Midmore, P., & Finger, R. (2019). A framework to assess the resilience of farming systems. *Agricultural Systems, 176*, 102656. https://doi.org/10.1016/j.agsy.2019.102656

Mosquera-Losada, M. R., Moreno, G., & Pardini, A. (2009). European agroforestry systems. *Agroforestry – The future of global land use* (pp. 45–86). Springer. https://doi.org/10.1007/978-94-007-4676-3_5

Prins, E., Luske, B., & Reichgelt, A. (2021). Inventarisatie agroforestrysystemen in Nederland. Louis Bolk Instituut.

Prins, E., Bestman, M., Roelen, S., van Veluw, K., Rombouts, P. (2021). Advies Community of Practice Agroforestry: Opschaling landbouw met bomen door verbinden en kennis delen. Louis Bolk Instituut.

Raum, S., & Rawlings-Sanaei, F. (2022). WCM: A web content‐based method of stakeholder analysis. *MethodsX, 9*, 101635. https://doi.org/10.1016/j.mex.2022.101635

Rijksoverheid, (2020). Bos voor de toekomst: Uitwerking ambities en doelen landelijke Bossenstrategie en beleidsagenda 2030

Tega, A. K., & Bojago, A. B. (2023). Constraints and determinants of agroforestry adoption among smallholder farmers. *Journal of Sustainable Agriculture Research, 12*(2), 45–59. https://doi.org/10.22004/ag.econ.321514

Telwala, Y. (2023). Unlocking the potential of agroforestry as a nature-based solution for Localizing Sustainable Development Goals: A case study from a drought-prone region in rural India. *Nature-Based Solutions*, 3, 100045. https://doi.org/10.1016/j.nbsj.2022.100045

Van Zanten, H. H. E., van Ittersum, M. K., & de Boer, I. J. M. (2018). *The role of farm animals in a circular food system. Global Food Security, 21*, 18–22. https://doi.org/10.1016/j.gfs.2019.06.003

Waldron, A., Mooers, A. O., Miller, D. C., Nibbelink, N., Redding, D., Kuhn, T. S., ... & Gittleman, J. L. (2017). Reductions in global biodiversity loss predicted from conservation spending. *Nature, 551*(7680), 364–367. https://doi.org/10.1038/nature24295

Yadav, G. S., Das, A., Lal, R., Babu, S., Meena, R. S., Saha, P., ... & Datta, M. (2019*)*. Soil health and carbon footprint under conservation agriculture with and without agroforestry systems in the north-eastern Himalayan region, India. *Science of The Total Environment, 660*, 1583–1596. https://doi.org/10.1016/j.scitotenv.2019.01.097

Web-content references

Animal farmers: Annex 2C and 3

Other actors: Annex 4

Annex 1: Inventory of agroforestry projects

1A. Louis Bolk inventory (projects on animal farms) (Prins et. al., 2021)

In the table below, created with data from a previous inventory of AF in The Netherlands conducted by the Louis Bolk institute in 2021, the label 'undefined' refers to instances where the size of the project was not given; the animals farmed were unspecified or listed as 'silvo(pastoral)', 'dairy/meat cattle', 'poultry'; or where the year it was established was unspecified. The table excludes one column called 'Planned area in ha' and one project in Limburg (sheep grazing an area of 500 ha).

Province	*No. of projects*	*Total area in ha*	*Animal (counts)*	*Year started (counts)*

Drenthe	2	5.7	chickens (2)	2005 (1), undefined (1)
Flevoland	3	14.5, undefined (1)	chickens (2), undefined (1)	2012 (1), 2018 (1), 2019 (1)
Friesland	1	undefined (1)	undefined (1)	2020 (1)
Gelderland	28	70.9, undefined (1)	chickens (16), goats (1), pigs (1) undefined (10)	2005 (1), 2007 (1), 2010 (4), 2016 (2), 2018 (8), 2019 (2), 2020 (6), undefined (4)
Groningen	2	5	chickens (2)	2017 (1), undefined (1)
Limburg	5	6.6, undefined (1)	chickens (3), undefined (2)	1950 (1), 2015 (1), 2019 (1), 2021 (1), undefined (1)
North Brabant	43	110, undefined (3)	chickens (7), cows (1), pigs (5), sheep (2), undefined (28)	2010 (2), 2015 (5), 2016 (1), 2017 (2), 2018 (7), 2019 (12), 2020 (2), undefined (12)
North-Holland	1	7	chickens (1)	2017 (1)
Overijssel	10	28.75	chickens (3), cows (1), chickens + cows + pigs (1), chickens + pigs (1), pigs (1), sheep (1), undefined (2)	2010 (1), 2013 (1), 2014, (1), 2015 (1), 2017 (1), 2019 (1), 2020 (1), undefined (3)
Utrecht	6	10.8, undefined (1)	chickens (3), undefined (3)	2012 (2), 2018 (1), 2019 (1), undefined (2)
South-Holland	4	11, undefined (1)	chickens (1), undefined (3)	1995 (1), 2018 (1), 2019 (1), undefined (1)
Zeeland	3	11.5	chickens (1), undefined (2)	2016 (1), 2018 (1), 2019 (1)

1B. Location, farm type, size, year started

ID	*Farm Name*	*Location (province)*	*Farm type*	*Size AF (ha)*	*Year started*
1	Dennenhoeve	Drenthe	Chickens	1	2007
2	Pluimveebedrijf Rijmense	Flevoland	Chickens	4,5	?
3	Knook de Visser	Flevoland	Chickens	3,1	2019
4	Van Kampen	Friesland	Chickens	2,3	2020
5	Gerit Jukema	Friesland	Chickens	3	2015
6	Woudstra's Plaets	Friesland	Cows	0,1	2020

7	Conny van Den Top en Jan Vaarkamp	Gelderland	Chickens	2	2020
8	Van Deelen	Gelderland	Chickens, Cows	1	2013
9	De Nieuwe Baankreis	Gelderland	Chickens	1	2019
10	Van Mourik	Gelderland	Chickens	2	2018
11	‘t Paradijs	Gelderland	Chickens	3,5	2020
12	Nieuwhof	Gelderland	Chickens	1	?
13	Erik & Ester van Butselaar	Gelderland	Chickens	0,5	2005
14	Eikemaheert	Groningen	Chickens	3	2018
15	W.H.O. Strous	Limburg	Chickens	0,2	?
16	Leuker1818	Limburg	Chickens, Cows	5	2019
17	De Regte Heijden	Noord Brabant	Cows	1	2014
18	Hillekenshoeve	Noord Brabant	Cows	2	?
19	De Kerkhoeve	Noord Brabant	Cows	0,5	2013
20	Hanne Hoeve	Noord Brabant	Cows	2	2019
21	De Koekoek	Noord Brabant	Cows, Pigs	5	2014
22	Torentjeshoef	Noord Brabant	Goats	1	?
23	Geitenbos	Noord Brabant	Goats	1	2011
24	Sprankenhof	Noord Brabant	Chickens, Sheep	1	2019
25	BoerInNatuur	Noord Brabant	Cows, Sheep, Chickens, Turkeys	20	2018
26	Anna Hoeve	Noord Holland	Cows, Goats	0,1	?
27	Melkveehouderij Gert Jan Al	Noord Holland	Cows	2	?
28	Dikhoeve	Noord Holland	Sheep	?	?
29	Fruittuin van West	Noord Holland	Chickens	6,5	2014
30	Mark en Anita	Noord Holland	Sheep	35	?
31	Boerderij Hooghei	Overijssel	Cows	1	?
32	Van der Weerd	Overijssel	Chickens	0,25	2013
33	De Melkbrouwerij	Overijssel	Cows	1,5	2019
34	Notengaard Bisschop	Overijssel	Chickens	5,5	2005
35	Varkensbedrijf Neimeijer	Overijssel	Pigs	4	2017
36	Boerendiekhuus	Overijssel	Sheep	1	2014
37	De Zandschulp	Utrecht	Chickens	6	2013
38	Bloemenweidemelk	Utrecht	Cows	1,5	2021
39	Boerderij Tussen de Hagen	Utrecht	Cows, Pigs, Chickens	3	2019
40	Verbeek	Utrecht	Chickens	3,5	2012
41	EKOZ	Zeeland	Chickens	4	2013

1C. Practice, size (animals), trees and shrubs

ID	AF practice	No. of animals	Trees & Shrubs
1	Orchard, Hedgerow	3000	Oak, Willow, Chestnut, Boxwood, Spruce, Holly
2	Orchard	43000	Willow
3	Hedgerow, Solitary Tree, Thicket	25000	Willow, Alder, Oak, Beech, Elderberry, Ash
4	Orchard, Solitary Tree	52000	Apple, Walnut
5	Hedgerow	50	Walnut, Hazel
6	Solitary Tree, Orchard, Thicket	120	Hawthorn
7	Orchard	5000	Walnut
8	Orchard	25000	Willow
9	Orchard	10000	Walnut
10	Orchard	30000	Walnut
11	Orchard, Solitary Tree, Thicket	9000	Willow, Alder, Hawthorn, Hazel
12	Solitary Tree, Hedgerow, Thicket, Orchard	10000	Walnut, Grape
13	Orchard	6000	Willow, Walnut, Alder, Hawthorn
14	Riparian Strip, Thicket	15000	Willow, Hawthorn, Hazel, Apple, Elderberry
15	Orchard	?	Walnut
16	Solitary Tree, Hedgerow, Orchard, Foodforest	?	Willow, Hazel, Walnut, Ash, Alder, Currant, Apple, Pear, Apricot, Sea Buckthorn, Hawthorn
17	Orchard	120	Hazel, Walnut
18	Hedgerow, Thicket, Solitary Tree	?	Willow
19	Hedgerow, Solitary Tree, Thicket	130	Willow, Alder
20	Orchard, Solitary Tree	8	Walnut
21	Orchard, Hedgerow, Thicket, Riparian Strip	100	Oak, Chestnut, Walnut, Apple, Pear, Cherry, Willow, Reed
22	Orchard, Hedgerow	850	Willow, Alder, Hazel, Currant, Oak, Maple
23	Hedgerow, Thicket, Orchard	1400	Willow, Hazel, Alder, Ash
24	Foodforest, Orchard	?	Walnut, Chestnut, Apple, Pear
25	Foodforest, Solitary Tree, Hedgerow, Thicket	35	Apple, Pear, Currant, Plum, Peach, Hazel, Walnut, Chestnut, Silverberry, Cherry Plum, Flowering Quince, Ginkgo, Sea Buckthorn
26	Hedgerow	65	Brambles
27	Riparian Strip	?	Reed
28	Riparian Strip	600	Willow
29	Orchard	250	Walnut, Apple, Cherry, Pear, Plum

30	Riparian Strip	200	Willow, Reed
31	Solitary Tree, Hedgerow, Thicket	60	Oak, Brambles, Maple
32	Orchard	80000	Willow
33	Hedgerow, Orchard, Solitary Tree	50	Chestnut, Walnut, Apple, Pear, Currant
34	Orchard	?	Walnut, Hazel, Chestnut
35	Foodforest, Solitary Tree	670	Hazel, Chestnut, Oak, Medlar, Silverberry, Mulberry, Holly
36	Orchard	60	Apple, Plum, Walnut
37	Orchard	15000	Willow, Apple
38	Orchard, Thicket	140	Walnut
39	Hedgerow	300	Apple, Pear, Chestnut, Walnut
40	Orchard	15000	Walnut, Apple, Cherry, Pear, Plum
41	Orchard	45000	Willow

Annex 2: Barriers and challenges

2A. Literature barriers, sources

Barrier:	*Louah et al., 2017* ***Source:***	*Jara-Rojas et al., 2020*	*Felton et al., 2021*	*Hoes & Aramyan, 2022*	*Tega & Bojago, 2023*	*Telwala, 2023*
1. Farmers have limited experience with AF (planting trees/shrubs).	Page 89	Page 9	Page 8	Page 12	Page 9	
2. Foresters have limited experience working with agriculture.	Page 89					
3. AF is only feasible if many people come back to agriculture.	Page 89					
4. Woods, woodland edges, and the likes have always been the enemy of farming.	Page 89					
5. The short-term financial return of an AF plot is low.	Page 89		Page 8		Page 9	Page 3
6. To do AF, existing machinery must be questioned.	Page 89	Page 9				
7. Difficult to demonstrate the financial potential to farmers. (e.g., farmer believes AF practices decrease the agricultural output or the value of the land)	Page 89		Page 8		Pages 8 & 9	
8. Farms too large to have time or space to adapt.	Page 89					
9. Older farmers more reluctant than younger ones.	Page 89	Page 9				
10. Land ownership requirement.	Page 89		Page 8			
11. Flat land unfavorable for AF (esp. vs. intensive cropping).		Page 9				
12. Acidic soil unfavorable for AF.		Page 9				
13. Low-fertility soil unfavorable for AF.		Page 9				

14. Small herd size.		Page 9		Page 14		
15. Land at maximum capacity (e.g., small plot, existing paddocks).		Page 9			Page 13	Page 4
16. Too high of an investment: seeds, planting, maintenance, equipment costs		Page 9	Page 8			Page 3
17. Loans unavailable.		Page 9				
18. Lack of savings.	Page 89	Page 9	Page 8		Page 9	Page 3
19. Lack of liquidity.		Page 9				
20. No knowledge of where advice can be obtained.			Page 8			
21. Farmer believes community has negative attitudes towards AF.			Page 8			
22. Lack of government support for AF "pioneers" (e.g., innovation subsidies go to low-emission stables)				Pages 12 & 14		
23. AF (pioneering or smallholder) farmers have similar administrative accounting burdens as conventional farmers.				Pages 12 & 13		Page 8
24. Fierce market competition for land.				Page 13		
25. Difficult for farmers to access carbon market: technical complexities, uncertainty, high transaction costs, mobilizing substantial numbers of smallholder farmers to ensure sufficient CO2 storage, limited data availability and monitoring capacity.					Page 9	Page 8

2B. Animal farmer challenges, sources

ID	Farm Name	Source type(s)	Source link(s)
1	Dennenhoeve	-	-
2	Pluimveebedrijf Rijmense	News/Media Outlet	www.debeterewereld.nl/eten-drinken/kippen-uitloop/
3	Knook de Visser	Agroforestry Network	www.agroforestrykip.nl/voorbeeldbedrijven/biomassateelt-knook-devisser/ & www.vbne.nl/klimaatslimbosennatuurbeheer/uploads/ein

		Website, Case Study	drapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf
4	Van Kampen	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijven/boomweide-appels-van-kampen/
5	Gerit Jukema	Farmer Association Website	www.landbouwmetnatuur.nl/initiatieven/agroforestry-in-oosterbierum/
6	Woudstra's Plaets	Farmer Website, Research Platform	www.groenkennisnet.nl/project/melkveebedrijf-agroforestry-woudstras-pleats-boeren-met-bomen & www.woudstraspleats.nl/
7	Conny van Den Top en Jan Vaarkamp	-	-
8	Van Deelen	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijven-wilgenteelt-van-deelen/
9	De Nieuwe Baankreis	Agroforestry Network Website, Case Study	www.agroforestrykip.nl/voorbeeldbedrijf/walnotenteelt-bij-biologisch-pluimveebedrijf-de-nieuwe-baankreis/ & www.vbne.nl/klimaatslimbosennatuurbeheer/uploads/eindrapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf
10	Van Mourik	Agroforestry Network Website, Case Study	www.agroforestrykip.nl/voorbeeldbedrijven/noten-en-houtteelt-van-mourik/ & www.vbne.nl/klimaatslimbosennatuurbeheer/uploads/eindrapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf
11	't Paradijs	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijf/walnotenteelt-bij-biologisch-pluimveebedrijf-de-nieuwe-baankreis-2/
12	Nieuwhof	News/Media Outlet	www.debeterewereld.nl/eten-drinken/kippen-uitloop/
13	Erik & Ester van Butselaar	News/Media Outlet, Case Study	www.nieuweoogst.nl/nieuws/2018/09/19/kippen-scharrelen-tussen-appelbomen & https://edepot.wur.nl/253748
14	Eikemaheert	Farmer Association Website, Farmer Website	www.landbouwmetnatuur.nl/initiatieven/biologisch-gemengd-bedrijf-eikemaheert & www.eikemaheert.nl/kip/
15	W.H.O. Strous	Case Study	www.core.ac.uk/download/pdf/77086084.pdf
16	Leuker1818	Farmer Website, Agroforestry Network Website	www.leuker1818.nl/agroforestry/ & www.re-generation.cc/pionier/mark-venner/
17	De Regte Heijden	Farmer Website	www.deregteheijden.nl/
18	Hillekenshoeve	-	-
19	De Kerkhoeve	Case Study	Luske et al. (2017). Lessons learned, Agroforestry for Ruminants. AGFORWARD.
20	Hanne Hoeve	Farmer Association Website, Farmer Website	www.landbouwmetnatuur.nl/initiatieven/hanne-hoeve/ & www.hannehoeve.nl/hanne-hoeve-ons-verhaal/
21	De Koekoek	Farmer Association	www.landbouwmetnatuur.nl/initiatieven/natuurlijk-weide-en-akkerdomein-de-koekoek/ &

		Website, Retail Store Website, News/Media Outlet	www.ekoplaza.nl/nl/merk/de-koekoek & www.groenontwikkelfondsbrabant.nl/wp-content/uploads/2021/07/landgoed-de-koekoek-opgemaakt.pdf & https://www.nieuweoogst.nl/nieuws/2022/12/07/pipie-smits-van-oyen-risico-bestaat-dat-provincie-agroforestry-aanmerkt-als-bos
22	Torentjeshoef	Case Study	www.louisbolk.nl/sites/default/files/publication/pdf/2931.pdf
23	Geitenbos	Agroforestry Network Website	www.voederbomen.nl/nieuws/page/3/
24	Sprankenhof	Case Study, News/Media Outlet	www.vbne.nl/klimaatslimbosennatuurbeheer/projecten/63/voorbeeldproject-walnotengaard-udenhout & www.sprankenhof.com/wp-content/uploads/2019/05/De-Draad-magazine-nr-2-2019.pdf
25	BoerInNatuur	Farmer Website	www.boer-in-natuur.nl/boerderij-dieren-koeien-schapen-en-kippen/#voedselbos
26	Anna Hoeve	-	-
27	Melkveehouderij Gert Jan Al	-	-
28	Dikhoeve	-	-
29	Fruittuin van West	Farmer Website	www.fruittuinvanwest.nl
30	Schapenboerderij Lutjebroek	Farmer Association Website	www.landbouwmetnatuur.nl/initiatieven/de-schapenstreek-biologische-schapenboerderij-lutjebroek-nh/
31	Boerderij Hooghei	Farmer Association Website	www.landbouwmetnatuur.nl/initiatieven/boerderij-hooghei/
32	Van der Weerd	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijven/wilgenteelt-van-der-weerd/ & www.vbne.nl/climateslimbosennatuurbeheer/uploads/eindrapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf
33	De Melkbrouwerij	Farmer Association Website	www.landbouwmetnatuur.nl/initiatieven/de-melkbrouwerij/
34	Notengaard Bisschop	Farmer Website, Research Case Study	www.notengaardbisschop.nl & www.library.wur.nl/WebQuery/wurpubs/fulltext/542366
35	Varkensbedrijf Neimeijer	Research Case Study, News/Media Outlet	library.wur.nl/WebQuery/wurpubs/fulltext/542366 & www.nieuweoogst.nl/nieuws/2017/03/22/pionieren-met-een-agrarisch-voedselbos
36	Boerendiekhuus	Farmer Association Website	www.landbouwmetnatuur.nl/initiatieven/boerendiekhuus/
37	De Zandschulp	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijven/wilgenteelt-de-zandschulp/ & www.vbne.nl/climateslimbosennatuurbeheer/uploads/eindrapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf

38	Bloemenweidemelk	Farmer Website	www.bloemenweidemelk.nl/
39	Boerderij Tussen de Hagen	Farmer Association Website	www.melkvee.nl/artikel/446531-bomen-vast-onderdeel-landbouwsysteem-bij-biologische-melkveehouder-van-zandbrink/
40	Verbeek	Agroforestry Network Website	www.agroforestrykip.nl/voorbeeldbedrijven/walnotenteelt-verbeek/ & www.vbne.nl/klimaatslimbosennatuurbeheer/uploads/eindrapportage-c3-agroforestry-in-kippenuitlopen.f1246e.pdf
41	EKOZ	-	-

Annex 3: Animal farmer transcripts

1. Erik and Esther van Butselaar – ID13

It is ideal for us, because chickens have a lot of hiding places. They also eat the apples off the ground', Esther van Butselaar observes. She has several years of experience with the chickens in the orchard. 'Space in the Netherlands for planting trees is scarce and with this project we improve the living environment of the chickens and we can capture more CO2. This way we kill two birds with one stone', Boosten assures.

At the beginning there were some snags to the double use of the ground. 'There was some discussion at certifier KAT about whether you can have an economic dual purpose in an outdoor area. They allow that here', says Boosten. According to Van Butselaar, this is because the fruit trees belong to someone else. "It's completely separate from each other. The fruit grower does the fruit and we do the chickens. It's a win-win situation. We needed their land and we could provide it.'

'We have calculated that there are about 2700 hectares of chicken free range in the Netherlands and it would be nice if we could plant half of that with trees within ten years', says Boosten. In September, Probos will organize four excursions to example locations for different types of planting for chicken runs.

The first round of organic farming with “Coral” hens went well. The second and third rounds with the same brand of hens went worse and worse. Esther: “We had problems with the E. coli bacteria and the hens were bald at 24 weeks. The fun quickly fades away.” Together with the Verbeek hatchery, improvements were sought. The Lohmann Brown Lite was then chosen. Business operations were further tightened. An important starting point was that the rearing of laying hens does not stop at 18 weeks and the laying round does not start at 18 weeks. After 18 weeks, the education continues, during the following 10 weeks, attention is now paid to the education and development of the hens. In practical terms, this means, among other things, that the hens are taken care of as well as possible: a preheated house, adjusted feed composition and feeding times. The height of the water towers is adjusted so that the pullets can reach the water optimally. Offering distractions in the form of lime stone blocks,

water bottles and alfalfa hay, for example, is also important. In addition, the hens are not let out immediately, but are given the opportunity to get used to the new house during the first few weeks. Then they gradually move out into the attractive and well-groomed range. Esther is very satisfied with how things are going after the adjustments, now 3 laps later. Clear agreements have now been made and these are being actively followed up on both sides. She feels supported by this and motivated to continue with the organic laying branch with full conviction. Esther: “If things are going well, you will also be less stressed yourself and that will benefit everything”.

There are many fruit trees in the outdoor area. It offers the hens good protection against danger from above and plenty of opportunity to forage to their heart's content. Pruning wood on the ground provides additional distraction for the hens. Esther: “Birds of prey are not really a problem, but we do have to remain alert to foxes. Leaving the hatches open at night can have fatal consequences.” On the east side of the barn, the hens also have access to a lawn in addition to fruit trees. All in all, the range with the pretty hens creates a beautiful picture for organic poultry farming! The results of the previous and current flock (48 weeks) are fantastic: high laying percentages and hens with good feathers. The hens of the current couple were reared by Dick van Westreenen. Esther went to see the rearing of the previous couple and sees the importance of this tuning moment. Esther: “At first I was surprised that the hens had to be ordered more than a year in advance because of the planning. You are then still busy starting a new round. In combination with our busy family and a man who works full time, I have to consciously plan a visit with the breeder”.

The hardest thing about organic? “Prevent the hens from pecking. At the start of each couple you have to be there all the time and stay alert and sharp. If the light enters the house at just the wrong angle, the hens can start heaping on each other in fright. If you are not around at such a moment, the damage is great.” What do I like most about organic? “When you see the hens walking in the orchard: wonderful, enjoy. The moment of going outside is also fantastic, when they all whiz outside. I like it when passers-by stop to look at the chickens in the range and I also like to show our chickens to interested parties, for example to the children of the local primary school.” Esther indicates that the poultry branch is a profitable economic activity for the family that she enjoys working on, but the organic sector should not go too far in terms of company size. The image of healthy hens that go outside well and are visible to the environment is important. “In terms of size and appearance, our company fits in well with this image and I assume that this guarantees the continuity of our company.”

2. Notengaard Bishop – ID34

Notengaard Bisschop van Roderik and Paulien de Vries is one of the largest nut orchards in the Netherlands. The hazelnuts have been there for five years now and the walnuts for about 17 years. To achieve maximum production, the walnuts have to grow for another 10-20 years. There are many different varieties. This was done on purpose because the production of nut trees varies greatly from year to year. The young walnuts and hazels have drip irrigation, which was very important in the dry springs of recent years. Until now, Roderik has not spent much time on fertilizing and pruning the trees, which starts now that the trees are old enough. A problem are the rooks and crows, which take up to 1,000 kg of walnuts per year. Laying hens are kept in a mobile pen with outdoor access that is moved every week. The outdoor spout is a metal construction inspired by the system of the American farmer Joel Salatin. The

metal construction is necessary to keep predators out. The chickens are also an experiment to see if they can help against the hazelnut borer. This beetle lays its eggs in the nuts, which then hatch into larvae. After eating the nut, the larva falls to the ground where it lives at a depth of 10-15 cm until the next season when the nut borer pupates. The beetle then climbs back into the hazel and the cycle repeats again. Roderik hopes that the chickens will eat the larvae and beetles and thus reduce the damage. The chicken coop slowly moves through the orchard and they only have a limited surface area available, so the question is whether this farming system can help against the nut borer.

The walnuts are harvested by hand in September and October with a hand harvesting roller machine and then dried in the drying cabinet on the farm. They are selected for quality and then sold to a processor or made into walnuts with honey or walnut oil. The rest is composted again. Everything is done by hand because it is too expensive for a small company to buy the appropriate machines. Roderik is not worried about the sale of the nuts, the nut price is good. He does not yet have an organic certification. If production increases, the intention is to have the soil SKAL certified.

3. Johan Verbeek – ID40

Johan Verbeek from Renswoude (province of Utrecht) has 16,000 organic laying hens with 6.5 hectares of free range. Since 2012, part of the range has already had 120 half-trunk fruit trees: apple, pear, plum and cherry.

Motivation for agroforestry
Johan Verbeek wants trees in the free range because they contribute to the well-being of the chickens. He also wants to contribute to the environment by capturing CO2.

The experience with the fruit trees that are already there is that they are susceptible to disease and make too many demands in terms of labor at the right time and expertise. Nut trees are less susceptible to disease than fruit trees and require less maintenance. That is why Johan has now opted for walnuts. He has planted 2 ha with 200 walnuts and is considering replacing the old fruit trees with walnuts.

At the end of December 2018, Johan planted 2 ha with four walnut varieties: 100 Broadview, 50 Proslavski, 26 Coenen and 25 Plovdiski. The trees are in rows; in the row the trees are 8 meters apart and the rows are 10 meters apart. The trees have each been given a 'sock' to protect against the chickens.

With five people (own work and a gardener) all 200 trees were planted in one day. The landscaping company brought a spading machine, a drill for planting holes and a post drill. Thanks to the GPS on the spading machine, the planting holes could be drilled in nice straight lines. The trees are secured with poles and provided with protection. Thanks to the supervision of a good adviser (walnut grower and gardener Roderik de Vries) at the start of the planting, the trees could be planted properly in one go. For example, how deep you plant the trees is important; walnut is often planted too deeply. The fruit trees that were already there have not caused any problems with any regulations whatsoever. That is why Johan Verbeek does not expect any problems for the new trees.

To ensure that the new plantings would survive, Johan watered a lot during the dry growing season in 2019. As a result, the walnuts are well set.
The planting went well. So good that Johan also participated in the follow-up project in 2019 to further increase the agroforestry planting area in his range. In March 2020, another hectare was planted, again walnut with a planting distance of 8×10 meters.

The trees are doing well, but are noticeably affected by the dry habitat (sandy soil). Johan saw that during a dry period, the top of the walnuts died, only to sprout again at the bottom, which is detrimental to the growth and development of the crown shape.

Watering during periods of drought is therefore necessary on sandy soil that is sensitive to drought. In addition to sprinkling, Johan gave each tree 50 to 60 liters of water individually to prevent dehydration and premature leaf fall.

The walnuts should eventually provide hiding places for the chickens. The trees are still too young to provide that shelter. The chickens really look for shade on the older fruit trees in sunny weather. Whether this will also be the case for the walnuts and whether the chickens will go further into the range is still too early to judge.

Johan indicates that he is primarily a chicken farmer, not a walnut farmer, which can have implications for management when busy. Activities such as properly securing posts along trees so that the trees can grow nicely straight along them are therefore perhaps carried out a little later than desirable from a walnut point of view. As a tip, Johan says to outsource the maintenance if you don't have the knowledge yourself.

Johan indicates that the investment costs are very high. You not only have to deal with the purchase costs of the trees, but also with the costs of planting, for example to have the planting holes neatly drilled so that there is still room for machines to drive in between to mow.

4. Van der Weerd – ID32

Jan van der Weerd's free-range poultry farm has a total of 80,000 free-range chickens, divided over four barns, with a total outdoor area of 50 hectares (of which only 2 hectares per location are actually used by the chickens prior to planting). In the outcrops there are standard fruit trees and a few bamboo bushes.

Jan van der Weerd planted willows because he expected it to be good for the chickens, for example because there is more shade for them under the plants. Van der Weerd is one of the exemplary companies where plants were planted in 2013 in the 'Kiplekker under the willows' project. In April 2013, two varieties of willows (Inger and Tora) were planted on two pieces of 0.25 hectares (15,000 cuttings per hectare).

The willows were fenced off for the first 3 months, until the willows were about a meter high. This way the chickens could not harm the willows. This was a bit longer than Van der Weerd had expected in advance. In the first year, the Tora willows grew much better than the Inger willows. In both willow varieties, part of the willows have fallen out. Van der Weerd later

implanted long willow cuttings of 1 meter in these places, which he cut from his own willows.

The willows are growing well now. Now that it's up and running, all in all it's not too bad for him. The willows provide shade for the chickens and the chickens now go further into the range. Van der Weerd notices very little difference in predation, except that the buzzards cannot get to the chickens now. They now only catch chickens that walk on the grass.

The chickens really like the willows: they jump into the willows to eat the leaves and they also eat the bark off the Torah willows. They find the bark of the Inger willows less tasty, they are not eaten. Another unexpected advantage: the neighbors also benefit from the willows. They now have a nice view of willows that hide the barn from view.
Van der Weerd is thinking about planting another part of the range with willows, but that depends on the KAT regulations for now. Van der Weerd is toying with the idea of sawing off the willows at a height of 1 meter (by hand), so that the willows are high enough and the chickens can remain in the range. But in any case, he will not harvest the willows all at once.

Van der Weerd has noticed that other poultry farmers are also interested in growing willow in the free range. His main tip for poultry farmers is to plant cuttings of at least 1 meter. These cuttings are a bit more expensive to purchase, but it saves you a lot of work, because you have to fight less weeds and you no longer have to temporarily screen off the outdoor area. "And then the work is really nothing and the chickens have a nice range!", says Van der Weerd.

5. Wim Thomassen from De Zandschulp – ID37

Wim Thomassen's organic poultry farm De Zandschulp in Overberg has 27,000 organic chickens, divided over 2 locations. There is an organic apple orchard in the range. In addition, veal calves and dairy goats are kept, De Zandschulp facilitates a care farm.

A few years ago, Wim Thomassen was looking for something to plant part of the outdoor area in addition to the part that is planted with fruit trees. During that search, he came across the Kiplekker project under the Willows. An advantage of willows is that they can be fired in your own biomass stove after harvesting. Another option was to plant the spout with Miscanthus, but Thomassen would then have to add some extra fuel in the biomass stove. He decided to participate out of curiosity. It seemed like a nice challenge.

At the beginning of April 2013, 1 hectare was planted with the willow varieties Inger and Tora (15,000 cuttings per ha). After about two and a half months, the chickens were released into the free range.

The willows are growing faster than Thomassen had expected, there is already a whole forest! What was disappointing was that more weed control had to be done than had been estimated in advance. Thomassen also had to pay (replace damaged and dead plantings), after which the chickens were not allowed to go there for six to eight weeks and weeds had to be controlled again. But otherwise Thomassen is very satisfied so far. The chickens use the entire range, they can also be found outside a lot and they don't lay fewer eggs. There is also much less predation by birds of prey, also compared to the predation in the orchard.

The harvest will be done mechanically at the highest possible height to keep the period that the chickens are not allowed to reach it as short as possible. Thomassen would like to advise poultry farmers who also want to plant part of their range with willows that you should not do it for financial reasons. He thinks it's a bonus that he can use the willows himself in his biomass stove, but it's not the main thing. Each planting type has its own pros and cons that you need to weigh carefully.

For poultry farmers who opt for willows, his most important tip is to really be on top of weed control. In addition, in the first few weeks, no chicken is allowed to get to the willows to let the willows run well.

Not only Thomassen is very satisfied with his range, the jury of the jury of the election “most beautiful chicken range” was also impressed. In March 2015, Wim Thomassen's range was chosen as the most beautiful range of the year 2015. The expert jury concluded that the chickens apparently find the willow a good planting, because they use the entire range and can be found outside much more often than inside. The jury also found the double use innovative and the fact that everything is well taken care of. There have been many positive reactions to the award.

6. Fruittuin West – ID29

“Our orchard is a playground, dining area and also a workshop for the chickens. They bathe in the sand, run & romp and find shelter under the trees. The chickens play an important role on our farm; they are part of our cycle. They eat bugs that we would rather not see in our orchard, because they are harmful to our fruit trees. We supplement them with fruit and vegetables that are no longer good enough for our store. In winter, when there is less green grass and herbs growing in the orchard, they also get spelled. So they have a varied menu all seasons. With us, just like in the wild, roosters walk among the hens. The roosters provide peace in the flock.

Our chickens lay eggs every morning. We have about 240 laying hens. Most hens are of the Lohmen breed. This breed is known for good quality eggs. Due to the variety of vegetables, fruit and other feed, the eggs have an unprecedented good taste. The laying hens lay an average of one egg per day. Sometimes a little more, sometimes a little less. When it is cold we often find slightly fewer eggs, but sometimes we are suddenly surprised with an abundance of eggs.

Unfortunately, bird flu has been detected in the Netherlands again. That means that we also have to house our healthy chickens. Our chickens are - due to their good resistance from the healthy outdoor life - much less susceptible to bird flu than most other chickens in the Netherlands. But it does not alter the fact that we also have to participate in the confinement obligation.”

7. Van Mourik – ID10

Willem van Mourik's organic laying hen farm in Dreumel has 30,000 laying hens and covers an area of 12 hectares, of which 2 hectares have been planted in this project. There have been pollard willows in the range for some time, around which the new planting has been fitted.

The main reason for Willem van Mourik to plant trees in the range is to create shelter for the chickens. In addition, the dual-purpose idea behind the combination of functions in the run-off plot was an interesting argument for opting for the combination of trees and chickens.

Walnut is often specifically managed (pruned) to generate optimal nut production, which does not benefit the wood quality (low, heavy crowns instead of long, straight trunks). With black nut (which also produces nuts), the emphasis in management is more often on wood quality. The fact that the combination of nuts, chicken and wood is actually still very new in the Netherlands triggered pioneer Van Mourik to opt for black nut in order to gain knowledge about how well this combination also works in the Netherlands.

At the end of December 2018, 300 black nut trees were planted on 2 hectares. The pollard willows that were already present in the outdoor area were planted in a pattern of 10 by 15 metres. The black nut is planted in between: in the pollard willow rows alternating with the pollard willows and between the pollard willow rows a row of only black nut, with 10 meters between the black nuts in the row.
Willem van Mourik plans to plant willow cuttings later in the black nut rows to compete with the nuts to improve the quality of the wood.

In preparation, Willem van Mourik marked the planting locations in the field, so that the trees could be planted efficiently on the day itself. He carried out the planting himself, with the start-up being supervised by gardener and nut grower Roderik de Vries.
A few weeks after planting it appears that the chickens are digging around the trees (with a risk of excavating the planting), so tubes were placed around the planting for protection, secured with a support stick. In this way, no part of the outdoor area needs to be closed off and the planting is still protected. The tree tubes will remain in place for about the first three years to allow the trees to take root properly. Tree poles will then be placed to support the trees against the strong wind that can sometimes blow around the company.

The entire process prior to planting went better than expected for Willem van Mourik. He has read extensively in advance about nut cultivation and the life cycle of nut trees. As a result, the story came to life much more for him and he realized that the combination with chickens and nut trees can work well.

As a tip, Van Mourik would like to say to take plenty of time to think out the planting well and to place it in the field. Wood/nut cultivation is a completely different branch of sport; as a poultry farmer you are not aware of what you should and should not take into account. It is important to take into account that you have to put in the time to think it through, you will reap the benefits later.

8. Knook-de Visser – ID03

Jan Knook's organic poultry farm started keeping organic laying hens at the end of 2018. The 10-hectare range is still bare and is divided into 9 compartments. Jan Knook would like to plant the range to provide shelter for the chickens and to ensure that chickens go further into the range. Jan Knook has opted for biomass cultivation with willow because there is an entrepreneur who is interested in the construction and operation of biomass plantations in Lelystad and the surrounding area. Jan Knook wants to enter into a partnership with this entrepreneur and thus outsource the entire construction, maintenance and harvesting to this entrepreneur. Jan sees this as a win-win, because his outdoor area is planted and at the same time he does not have to worry about the plants. In the planting plan, the willow strips are laid out in line with the openings of the house, so that the chickens can walk sheltered along the strips to the back of the range. There are open (grass) strips between the willow strips. This provides a sufficient overview of the range, so that any dead animals are noticed more quickly. At the end of the willow strips there is a head or headland, so that harvesters can easily turn at the end of the willow row to harvest the next row. The planting has not yet been realized, because at the time of writing the company does not yet have official permission from the certification body KAT and the Dutch control authority for eggs for the chosen design variant of the range.

.

Organic poultry farm Knook-de Visser in Lelystad has 25,000 laying hens, which can go outside in the compartmentalized range of a total of 10 hectares.
In December 2019, Kemp Schalkwijk planted 47,150 willow cuttings in the outdoor area for the production of woody biomass.

The Knook-de Visser family wanted to set up an agroforestry system in the outdoor area, so that the chickens could benefit from shelter and the planting could also yield a product in the long term. Jan Knook saw biomass willows as a great way to quickly provide shelter for his chickens and to contribute to the demand for biomass, which is expected to increase in the coming years. But there was no room for an extra industry to keep track of by himself. Collaboration with Bart Kemp of Kemp Schalkwijk, who was looking for land on which to grow biomass willows, offered a solution. Jan Knook has made his range available for planting. Kemp Schalkwijk took care of the planting and is responsible for management, harvesting and marketing of the biomass.

Spread over the 10-hectare outdoor area, the willows have been planted in double planting rows so that the biomass can be harvested mechanically in the future. Visibility axes of 6m wide have been maintained between the double plant rows for mowing work and to maintain a view of the range and the chickens.

The rows of willow cuttings start at a distance of 75 meters from the stable. To bridge this distance for the chickens, two rows with a total of 185 pollard willows have been planted in the space in between for shelter. The willow plantation covers an area of more than 3 hectares.

Despite the fact that the willow cuttings were planted in December 2019, and therefore had the chance to form roots in the mild winter, the young plantings suffered a serious blow from the persistent drought at the start of the 2020 growing season. Part of the cuttings are still sprouting or the leaves have turned yellow due to the drought.

9. *‘t Paradijs – ID11*

Farm 't Paradijs in Barneveld is an organic ‘care farm’ that combines the care branch with the agricultural business (pigs, laying hens, cattle and horticulture). The company has 9000 chickens, which have a range of 3.6 ha. To make the range attractive and to provide shelter for the (generally shy) white chickens, 't Paradijs signed up for the agroforestry project in 2019.

Farm 't Paradijs has opted for agroforestry in order to capture CO2 on the farm with the planting in the outdoor area and to be able to harvest a product from the planting in the long term. A number of fruit trees were already present in the outdoor area. This inspired to further expand this form of productive planting.

To ensure diversity of planting in the outdoor area, different types of planting have been chosen. Wood girths were chosen because they fit in nicely with the existing landscape. Rows of trees and canals can already be found around the farm and the outlet, and there is already a wooded bank along a ditch in the outlet. The girths will mainly be placed in the wetter part of the range, at right angles to the barn, to provide shelter and to guide the chickens further into the range.

In addition, walnuts have been chosen to harvest nuts from and as shelter to get the chickens outside as much as possible.

The planting was supposed to start in the spring of 2020, but this was eventually pushed back a year. In addition to the existing fruit trees, 1 hectare of walnut has been planted, with the trees planted at a distance of 10 meters. A quarter of the nut trees consist of varieties that produce nuts for direct consumption. The rest consists of nut varieties that produce nuts suitable for pressing oil.

The walnuts have been planted on the spot of the fruit trees, so that they fit better in the range and the fruit and nut trees together form a beautiful whole. The fruit trees have been moved within the range for this purpose.

In addition, 0.4 hectares of canals consisting of willow, alder, blackthorn and hawthorn have been laid out. At the edge of the forest, also part of the range, a thicket has been planted with all kinds of species, including hawthorn. More hedgerows will be planted in the autumn of 2021.

Planting turned out to be more work than expected. It was done with the participants of the farm. All in all, it was quite a job digging holes, adding soil improver, closing holes, inserting posts and tying them down.

It is still too early to really say whether the chickens move further into the range due to the shelter of the trees. At the beginning of the range you can see that the chickens are already under the hawthorns.

10. Ron and Gracia Verdel from De Nieuwe Baankreis – ID09

Together with partner Edward Nijk, Ron and Gracia have 10,000 organic laying hens with 6.5 hectares of free range. A vineyard was planted in part of the range about fifteen years ago.

The entrepreneurs want to use the trees to make the range more attractive for the chickens and to capture CO2. They chose walnuts because this variety lasts a long time.

One hundred walnut trees were planted in the spring of 2019. The trees are planted in rows that are 8 meters apart and within the rows the trees are 10 meters apart. A total of 1 hectare has been planted. The trees are protected with plant tubes against being eaten by the chickens. The planting takes place under the supervision of gardener and walnut grower Roderik de Vries. The entrepreneurs are satisfied with the guidance to choose the right planting material and to do the planting.

The trees fit into Skal's regulations. After visiting the plantations at Ron and Gracia Verdel, the KAT also approved this specific nut plantation. For the time being, the KAT is assessing each case individually and discussions are ongoing to clarify the rules for dual purpose use, but this recent experience indicates that walnut cultivation can be approved by the KAT after assessment.

The larger plant material was little affected by the chickens. The chickens could scratch around the trunks but did not damage the trees. The smaller (annual) plant material was eaten by the chickens and also had a harder time with drought and frost. Based on this experience, it is advisable, if possible, to opt for larger plant material so that the leaves are less accessible to the chickens right from the start.

11. Jaap van Deelen from De Glind – ID08

Jaap van Deelen's organic poultry and dairy farm in De Glind has 25,000 organic laying hens and has a range of 10 hectares. Maize, Christmas trees and standard fruit are grown in the range. In addition, alder, hawthorn and hazel also grow in the range.
Jaap van Deelen's company is one of the exemplary companies in which willow cultivation was introduced in the free range in the 'Kiplekker onder the Wilgen' project (2013-2015).

Jaap van Deelen wanted to plant his outdoor area a few years ago and during the search for possibilities he came across the pilot 'Kipplekker under the Willows'. He saw this as an opportunity to generate extra income from the range and he decided to sign up. In April 2013, one hectare was planted with willows using a planting machine (15,000 cuttings per ha).

Soon the willows started to sprout well. However, the weed pressure was disappointing, thistles in particular outgrew the willows. Due to this heavy weed pressure and barely visible willows, Van Deelen decided in June 2013 to give up part of the plot. In addition to chickens making use of it, the cows could also use it as 'grassland'.

In the spring of 2014, the remaining plots (approximately 0.5 hectares) were damaged and needed to be replanted. Students were deployed for this purpose, who did the work for Van

Deelen for a fee. The chickens make good use of the willow plantation and they keep the plot reasonably clean. No eggs are hidden in the plantation. The predation pressure from predators is comparable to the plots with a standard orchard and maize. From a commercial point of view, the willow plantation is somewhat disappointing, especially now that it is smaller than one hectare.

Van Deelen would like to give the tip to poultry farmers who are interested in combining willow cultivation and free range cultivation to plant a considerable area (at least about three hectares). According to him, less than one hectare is not commercially interesting. Planting on clean (weed-free) land is best according to Van Deelen. He has also noticed that it is important to start weed control early. As with corn, it is best to start before the weeds become visible. Finally, Van Deelen would like to inform interested parties that the land is also an important factor. His experience is that willows grow best on moist and nutrient-rich soil.

12. Mark Vonk from Sprankenhof – ID24

Mark indicates that there is a lack of experience and good examples for setting up an agroforestry system. This is also his reason for participating in the pilot, so he can be an example for others. The trees on his property are generally doing well, except for the sweet chestnuts. All but one of these died from the summer drought. 5 walnuts have also died due to sweeping damage from deer, he has replaced these trees in the meantime.

Mark thinks the advantages of the pilot are the time that is available to look at others, the extensive reflection on setting up a plan and therefore the piece of advice that is available. Mark indicates: 'many people have cold feet about planting trees on farmland. But here we look at how trees can be planted on the farm without it getting in the way of the rest. It is accessible and non-binding, what more could you want?' He does not yet see any disadvantages of the pilot. He would also advise other farmers to do agroforestry if their farm is suitable. According to him, not every piece of land is eligible, for example, laws and regulations sometimes prohibit the planting of trees on certain pieces of land, and not all land is suitable for growing. Moreover, he says that as a farmer you have to feel like it: 'it is not corn or grain, it is a crop that you plant for the long term and it is sometimes a difficult story for farmers that you do not earn any income for the first 15 years.' According to Mark, what could encourage farmers to participate is that you can do it as a group or that there is a network organization where information can be shared. Realizing sales together would also be beneficial.

13. Rick and Arjuna Huis in 't Veld from De Melkbrouwerij – ID33

In Lettele, near Deventer, Rick and Arjuna's milk brewery is located. At this organic dairy farm they not only produce natural including milk, they also have chickens, a few pigs, a vegetable garden and hedgerows with fruits and nuts. They make the milk, yoghurt, kefir, buttermilk and butter themselves and sell it at home and via organic shops. In addition, the cooperative Eko Holland buys part of it as organic milk in bulk.

Rick and Arjuna keep fifty Maas-Rijn-IJssel (MIJ) cows at the Melkbrouwerij. These fifty cows are kept extensively; approximately 1 hectare per cow is available. The cows can

choose whether they want to go outside all year round. The MRIJ breed originates from the region, is robust and is also a dual-purpose cow. The calves that are not needed to maintain the herd are sold on to the organic cattle farm Eco-fields.

All cows still have their horns. Horns play a role in thermoregulation and metabolism. The cows can also express their natural behavior more. The barn is spacious so that conflicts between cows do not lead to injuries. In addition, the barn is open and designed as a hill barn with litter. The cows stand on a thick layer of litter that is continuously replenished. The manure and urine is mixed in the straw. The resulting manure is high in organic matter. After composting, they put it on the land, which promotes soil life and meadow birds.

Rick and Arjuna's land consists only of grassland. Part of this has not been plowed over for 40 years and is permanent herb-rich grassland. This brings benefits; more soil life, higher organic matter, carbon sequestration and little labor required.

Rick and Arjuna want to produce more than just organic and nature-inclusive milk. They want to promote biodiversity, involve the city and society and provide education. But above all they want a more beautiful landscape. They aim to restore a small-scale natural landscape with more room for biodiversity. Together with MTD landscape architects, they created the Melk en Noot plan ; the combination of edible hedgerows , diverse farm management and strip grazing of their grassland. In order to realize this plan, the idea was first worked out on paper. With their submitted idea they have won the Brood en Speel competition, which means that the development of their ideas is supported with money and knowledge.

One hectare of wooded banks has now been planted, mainly in places where wooded banks used to be. These ramparts contain various edible species, some for humans, others for animals. In this way, the wooded banks are used multifunctionally. Biodiversity is promoted, the landscape is decorated, citizens are involved, animals are provided with minerals and shade, and the trees and shrubs provide ecosystem services to the farmer.

In addition, Rick and two others from the village have set up an agroforestry testing ground. Rows of hazelnuts and walnuts have been planted on this piece of land in combination with herb-rich grassland. In the future, the ambition is to become even more diverse and broader. The dairy brewery is then not only a brewery for milk, but other animals are also kept and there is room for vegetable production. The combination of these various agriculture is used to make special products such as nut butter or fruit kefir. These can then also be sold locally.

The future ideas for the dairy brewery are progressive and very nice on paper, but the road to nature-inclusive is not one without bumps. The motivation and plans are not lacking, but the feasibility sometimes proves difficult. For example, there has been a significant water shortage on the high sandy soils of Lettel since 2017. Good organic matter and trees can partly solve this problem; but due to disappointing rain, many species in the wooded bank do not survive. This creates the moral dilemma of whether or not to invest in an irrigation system. It's a big investment and doesn't sit well with the low-input system they're trying to create. But if the drought continues in the coming years, the sustainability of the company will also be at risk.

There are also obstacles within the short chain initiative of the dairy brewery. In order to get a return from progressive nature-inclusive agriculture, it is often recommended to start a farm shop and to set up your own short chains. However, making a distinctive product that the

consumer is willing to pay more for is quite difficult. The price that is now asked for milk, butter and yoghurt is not much higher than the cost price. This increases considerably when you make small-scale products. Being more distinctive or a larger sales is therefore an important development point in achieving a better revenue model.

Involving citizens is also an important spearhead in business operations: working together with society on a biodiverse and beautiful landscape. The dairy brewery uses land from ‘Land van ons’ to farm on. Land van ons is a cooperative that wants to buy agricultural land throughout the Netherlands with the help of citizens and use it for nature-inclusive, biodiversity-promoting agriculture. In this project, citizens become co-owners of the land in exchange for money and can possibly sell it later. In this way, ‘Land van ons’ hopes for structural improvement, which is not dependent on short-sighted agricultural policy or farmers' profit motive. In addition, the farm has a membership system of about a hundred families, who buy eggs and pork in addition to milk, and are allowed to pick fruit and nuts from the wooded bank.

14. Mark Venner from Leuker1818 – ID16

The dairy farm of the Venner family is an example of the farm of the future, with the conversion from traditional agriculture to agroforestry. It is a completely different, new way of farming: instead of working with nature, we let nature take its course as much as possible. With the main goal: producing food. After planting the food forest, we leave nature alone and let it do its thing. There is no hoeing, plowing or spraying. All that's left is to harvest. Lazy farmers, therefore, with nature instead of against it. The soil depleted by traditional agriculture is gradually regaining its once rich biodiversity and vitality. And that's not just good for people; also for animals, birds and insects, which we already see increasing in number and species!

Layer by layer
The food forest is a vital ecosystem designed by man following the example of nature. It has a vegetation layer with tall crown trees, at least three other vegetation layers, a rich forest soil life and a robust size. A food forest is home to a richly varied, rapidly increasing biodiversity. The Leuker food forest will produce a multitude of fruits. A selection from the 'assortment': walnuts, sweet chestnuts, apples, pears, plums, quince, olive willows, shipova, kaki fruit, Szechuan pepper, Siberian honey berry and much more. Alders have been planted around the food forest to serve as windbreaks. The native wood girths create a blossom arch, a place for our pollinators.

Food forest and climate
Food forests have a positive impact on our climate. Just like normal forests, food forests help to remove CO2 from the air. Young forests in particular eagerly absorb CO2: as they grow, they store it in their leaves, branches and soil. The Leuker food forest is expected to remove at least 10,000 tons of CO2 from the air in the coming years. An additional advantage is that a food forest is much better able to withstand the prolonged drought and extreme rainfall as a result of climate change than traditional agriculture. A real win-win for people and nature.

It takes time to turn a bare piece of land into a forest: it takes about seven years before the food forest is sufficiently covered and productive. Making the transition from traditional agriculture to a food forest therefore requires patience, investment and a good dose of guts. As pioneers with a rich family history in traditional agriculture, we know better than anyone what this entails. We are happy to share this knowledge and experience with farmers, entrepreneurs and private individuals who are thinking about a new, more sustainable future. And where better to do that than from our own food forest?

15. Ron van Zandbrink from Boerderij Tussen De Hagen – ID39

Ron van Zandbrink is an organic dairy farm from Stoutenburg (UT). On their farm called he and his parents keep 90 dairy cows and associated young stock. When Van Zandbrink fully cooperated in the dairy farm in 2018, 250 chickens, a few pigs and fruit and nut trees were added to the farm.

Van Zandbrink first started with a small piece of 0.3 hectares where apple and pear trees were planted. Van Zandbrink: “That part was a bit inconvenient for grazing the dairy cows, now that there are fruit trees it is a nice sight for the customers of our farm shop. We had a dry year when planting the fruit trees. Every week we had to water the trees quite a few times. Of the 25 trees, only three trees did not make it, so luckily that went well.”

During the webinar, Van Zandbrink explains that the trees are multifunctional. "In time they will produce fruit that we can eat or sell ourselves, they will also provide shade for the cows and they naturally contribute to biodiversity." On those 0.3 hectares, Van Zandbrink's young stock grazes between the trees and there is also sufficient space to pass between the trees with a tractor. Zandbrink has protected the trees with electric wire.

Van Zandbrink soon wanted to expand with the trees. On a piece of 3 hectares he started working with nut trees. Walnuts for the most part, but also a number of sweet chestnut trees on a part of the plot that is slightly wetter. On the plot he has installed an irrigation system for watering. “Hoses run from a water reservoir along the trees and slowly drain the water into the ground. Those nut trees were planted in the spring of 2021. It was very wet then, so unfortunately I was not able to test the irrigation system in practice.” Cows also graze between the trees on that plot and he had to protect the trees against being pushed over. “On that plot we made a power wire around the entire row of trees. The start of the electric wire is underground so that we do not create blind spots in the meadow.”

Van Zandbrink cannot yet say what the trees will yield economically and he has no real expectations. “The trees are multifunctional and it will take some time before they start producing anything. The main economic crop of the two plots remains grassland.” As a tip, Van Zandbrink advises to start small and to place the trees and any hedges in such a way that they can be used multifunctionally. So, for example, also for shade or as natural partitions.

The conversation was led by Evert Prins, who, as a researcher at the Louis Bolk Institute, supports farmers and policymakers in making agroforestry possible. Prins expects that it will become increasingly easier for farmers to get started with agroforestry. In December, the

Agroforestry Network Netherlands was launched with the efforts of the Louis Bolk Institute, which aims to generate and share knowledge and bring farmers into contact with each other.

16. Goat Forest (Gerrit Verhoeven) – ID23

The dairy goats of Anton van de Bruggen (Tilburg) have entered the feed trees for the first time. In April 2011, various willow cultivars were planted in the pasture for the goats to nibble on. Goats are so-called "intermediate feeders", they prefer to eat a mixture of grass, leaves and small twigs mixed together. The goats are now allowed to nibble on 1 year old branches (pruned last year) and 2 year old branches. While nibbling, the goats are observed by a student from CAH Dronten. Interestingly, the goats not only use the trees to eat, but also use the trunk to rub their horns and head. Since the bark is damaged, the question is whether the trees will survive this. This is one of the things that will be followed up in the coming year. In the coming period, part of the willows will be opened up to the goats. So on sunny, dry days it may well be that you see a herd of white goats nibbling on the willows at the "Torentjeshoeve".

17. The Goat Farm/Torentjeshoef (Anton and Ingrid van de Bruggen) – ID22

After the first study club meeting, Anton and Ingrid van de Bruggen quickly showed their interest and saw opportunities for trees on their farm. During the first conversation, a number of key factors for the design choice emerged:
• Goats are real nibblers and like a varied diet including trees, which also promotes animal health;
• The aim is for animal welfare to graze, but the home plot where the goats roam is very wet in spring and autumn. Goats don't like walking in the wet;
• Every year about 5-8 m3 of wood is burned in the various wood stoves;
• Extra work for clients on the care farm.
Van de Bruggen eventually decided to plant a number of strips of willow according to the Swedish system on the wettest part of the house plot. There is still room to mow grass between the willow lanes. Due to the problem of keeping the goats out of the planting, Anton and Ingrid now choose to plant the entire area with willows and only harvest mechanically.

18. Pig farm Neimeijer – ID35

Jeroen and Nieske Neimeijer took over the company in 2012 from Jeroen's parents. Until 2012 it was a conventional farm with large stables without an outdoor area for the pigs. The entrepreneurs have switched to organic because of their interest in animal welfare and animal health. Jeroen: “It is also a lot of emotion that runs there.” The company has four hectares of private land available for 72 sows and 600 fattening pigs. At another location they still have 6.5 hectares available for feed production (barley and grass). About 95 percent of the pigs are slaughtered and sold via De Groene Weg. They slaughter, process and sell the remaining five percent on the farm itself.

In collaboration with Food Forestry Development, they are developing an agroforestry system for pigs with the aim of better meat quality and better animal health. The design has not only been developed with the pigs in mind, but also to make the landscape more beautiful and attractive to visitors and to restore the ecosystem. Paths lead visitors along different plots, so they can see the pigs up close. The company is located on poor sandy soil. As a result, there is a high risk of nutrients leaching from the pig manure, trees can help prevent this. The piglets are born outside and stay with the sow in the two farrowing pastures for six weeks. Then they go to the permanent pasture where they stay for six to seven months. The design is conceived in such a way that the pigs are moved between different fenced plots in a kind of rotation system. This is so as not to disturb the ground vegetation (grass-herb mixture) and the roots of the trees too much. Around the plots are various woody plants that are tested for feed quality and plant density. There are chestnuts, oaks, salt bushes, mulberries, hazels, medlars, Asian pear and silverberry. These are protected from the pigs' rooting by an electrical wire. The pigs can eat the fallen fruits of the medlars. The silverberry offers shade in the summer but is also evergreen, which gives the pigs shelter in the winter and creates a warmer microclimate for the piglets. The salt bushes planted between the path and the plot can be fed to the pigs by visitors. Through the choice of species and design, they hope to make the system increasingly richer and make the animals healthier. Experiments have also been carried out with other types of feed, with products that could be grown on the farm. Because no other companies have a similar system, it is a big search. This makes it very complex, making monitoring and gradual adjustments very important.

19. Boerendiekhuus – ID36

In the meadows near the Boerendiekhuus in Genemuiden, 60 sheep and two rams walk between 100 standard apple trees of different Old Dutch varieties. The trees were planted in 2014 and occupy 1 hectare. The trees were planted by Cor Pierik and his family, who have been managing the land for 6 generations now. Setting up an agroforestry system fits well with the diversity within their farm.

Various Old Dutch apple varieties have been planted, including the Elstar, Benoni, Bramley's Seedling, Notarisappel and Glorie van Holland. The choice for apples came from the family's own interest. As a board member of the Agricultural Nature Association, Cor came into contact with a landscape package that was offered by the Private Landscape Services Foundation IJsseldelta (SPLIJ). An annual fee is paid for keeping 100 standard fruit trees on one hectare. These landscape packages are part of the province's strategy to restore and maintain valuable landscape elements. The piece of land consists mainly of peat, with a small layer of river clay on top. It is important for the trees that the soil does not get too wet, so the trenches are dug out annually for good drainage. Apple trees can be adopted to involve people in the project. The people can then choose and maintain the tree themselves. The apples can be harvested on the annual apple picking day. When the trees are in bloom, people often come by to see them.

When the trees produce a lot of fruit, a market for the apples can be considered. In 2019, the harvest was 800 kg of apples, of which 500 liters of apple juice was made by the Welsumse Sapmobiel , a mobile cart that can squeeze juice from various types of fruit on location. This juice is sold to friends and family and served in the tearoom in the yard. This is managed by

the daytime activities , where 3 days a week people are professionally guided who cannot get a job on the labor market. The farm shop of the Boerendiekhuus is mainly people from the area, or guests of the group accommodation and B&B who stay on the property.

Cor has had little to do with obstacles by law and regulations. The hectare on which the standard fruit trees are planted is designated 'agriculture'. Despite exceeding the limit of 50 trees per hectare, no change of use to 'nature' has been introduced due to the permit he has with the SPLIJ. The trees, which are on private land, are pruned once a year. The other meadows are largely leased from Staatsbosbeheer and are located in a Natura2000 area, which means that a number of rules must be taken into account. For example, no fertilizer or plant protection may be used. There are also rules for protecting meadow birds, such as late mowing and monitoring nests. Meadow birds such as the black-tailed godwit, redshank, lapwing and curlew are still abundant in this area. In addition, there is a colony of black sterns and the white-tailed eagle regularly comes to forage in the area. The corncrake has also sometimes brooded there.

The various facets of the farm ensure a modest revenue model . The sheep are mainly kept as a hobby, because there is little market demand for mutton. The lambs that are born in the spring will be slaughtered within a year. The B&B and group accommodation provide the main income. The rental of the space for daytime activities and caravan storage also generates some money. In addition to sheep, there are also 12 Lakenvelder cows in the meadow, one of which is slaughtered every year for (own) meat consumption. The sale of apple juice is also a source of income. There is no cost reduction by implementing the agroforestry system. The added value of the system is mainly aesthetic. The fruit trees look beautiful and the feeling of picking your own fruit is very valuable.

Cor himself works at CBS and his wife runs the guesthouses on the property. As a farmer's son, he likes to work on the farm. It is a pity that so little can be earned from small-scale agriculture. If agriculture is to provide the main income, then it all has to be much larger and more professional. A day's work at the company does not yield him much financially, but it is the days that often bring satisfaction and provide a varied existence.

20. Mark and Anita – ID30

Mark and Anita have an organic sheep farm in Lutjebroek. It is immediately clear that they are hard workers. Mark takes care of the sheep and the land 24/7, Anita spends at least as much time in the cheese and ice cream factory and in the farm shop. Daughter Feike runs the care branch of the farm as if she never did anything else. Without this mentality, Mark and Anita would never have gotten this far. Both do not come from a farming family and setting up a farming business was therefore not self-evident. It had a lot of feet in the earth. They met each other at the Warmonderhof training, school for biodynamic agriculture in Dronten. They found each other in their passion for nature and for the animals. Together they made a search through Germany and Drenthe to their own farm in Lutjebroek.

In 1999 they took over the farm, including sheep, in a very dilapidated state. Since then they have been working hard to make it a wonderful company. They now have 200 sheep on 35 hectares of land, which they lease from Staatsbosbeheer. The sheep are therefore real natural grazers. And you can taste that in the dairy products, of which the ice cream is the unique selling point. In the summer you can sail past the farm with a boat for homemade ice cream

in up to 20 types. In addition to dairy production, there is a small meat branch and the company is a certified care farm. Four days a week, patients are received for daytime activities on the farm.

The fact that the sheep graze in nature has many advantages, both for the health of the sheep and for the environment. The grassland is minimally worked, making it strong and diverse. As a result, the sheep can graze outside for a long time and they get a varied diet that keeps them healthy. In addition, the farmland offers a place for a wide variety of plant and animal species. The grassland is rich in herbs such as plantain, dandelion, thistle, clover and water mint. The land is also rich in many species of birds such as the buzzard, Montagu's harrier, snipe, grebe, barn owl, sparrows and all kinds of reed warblers. This is also due to the variety of trees and plants along the fields and ditches, such as reeds and willows. The variety of species ensures a balanced and strong ecosystem on and around the farm.

Moreover, the grassland also performs well in dry years. Due to the diversity of species and the high groundwater level, Mark experienced few problems with the extremely dry summer of 2018. “I even have grass left!” he says with pride.

Farming with nature does not only have advantages. The land lease entails many strict rules, which hinders farmer Mark in his work. Mowing and fertilizing is only allowed at set times, on certain plots and to a limited extent. That sometimes leads to frustration. More flexibility in the regulations would therefore not be an unnecessary luxury. The same applies to the manure and phosphate legislation that many innovative farmers encounter.

In addition, Mark has little influence on the accessibility and safety of his plots. Due to the many ditches and bridges, some plots are difficult to reach, which makes management with machines very difficult. The ditches also ensure that sheep drown regularly.

Natural land management is certainly not an automatic process either. “If you don't mow it, you will only get reeds and alders!”. Furthermore, not all sheep, cows and goat breeds can cope with so much nature. They must be strong varieties that can handle diversity. Highly overbred breeds that are adapted to a one-sided diet for high milk production are not suitable for this. All in all, it requires a lot of perseverance from a farmer to farm in and with nature. Fortunately, Mark and Anita do not lack that.

Annex 4: Actors’ web-content sources

Researchers

1. Louis Bolk - Louis Bolk, 2024 www.louisbolk.nl/projecten/agroforestry-landbouw-en-bomen-integreren
    a. Masterplan: Luske et al., 2020 www.louisbolk.nl/publicaties/masterplan-agroforestry

2. Wageningen University Research - WUR, 2024 - www.wur.nl/nl/onderzoek-resultaten/dossiers/dossier/agroforestry-2.htm

Community of Practice

3. Agroforestry Netwerk Nederland - ANN, 2024 - www.agroforestrynetwerk.nl

Government

4. European Union - EU, 2020 - www.europarl.europa.eu/RegData/etudes/BRIE/2020/651982/EPRS_BRI(2020)651982_EN.pdf
5. Rijksdienst voor Ondernemend Nederland RVO, 2024 - www.rvo.nl/onderwerpen/glb-2024/agroforestry
6. Ministerie van Landbouw, Natuur, en Voedselkwaliteit - www.groeiennaarmorgen.nl
7. Provinces and municipalities
    a. Provincie Noord-Holland www.noord-holland.nl/Loket/Vastgoed_en_grond/Verpachtingen/Agroforestry_op_provinciale_pachtgrond_in_Haarlemmermeer#:~:text=Het%20perceel%20dat%20ter%20beschikking,hectare%20(245.000%20vierkante%20meter)
    b. Gemeente Voorst - https://www.voorst.nl/nieuws/artikel/subsidie-aanleg-agroforestry-voor-duurzame-landbouw-met-goed-verdienmodel

Farmer associations

8. Land- en Tuinbouworganisatie - www.lto.nl
9. BoerenNatuur - www.boerennatuur.nl
10. Nederlandse Melkveehouders Vakbond (Dairy) - www.nmv.nu
11. Nederlandse Vereniging van Pluimveehouders (Poultry) - www.nvpluimveehouders.nl
12. PluimveebedrijfNL (Poultry) - www.pluimveebedrijf.nl

Environmental NGOs

13. Stichting Agroforestry Netwerk Nederland - www.agro-forestry.nl
14. Groen Kennis Net - www.groenkennisnet.nl
15. Boeren met Natuur - www.boerenmetnatuur.nl

Agri-businesses

16. Ahold Delhaize - https://www.aholddelhaize.com/sustainability/our-position-on-societal-and-environmental-topics/sustainable-and-regenerative-agriculture/
17. ForFarmers - www.forfarmersgroup.eu/en
18. FrieslandCampina - www.frieslandcampina.com/nl/

Financial institutions

19. Rabobank - acorn.rabobank.com/en/blog/category/agroforestry/
20. ABN AMRO - www.abnamro.nl/nl/privatebanking/over-private-banking/300-jaar-meespierson.html

Pioneering farmers

21. Inventory farmers – Annex 3